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Les actions françaises depuis 1854 : analyses et découvertes

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Hegoak ebaki banizkio
neria izango zen
ez zuen aldegingo.
Bainan honela
ez zen gehiago txoria izango.
Eta nik txoria nuen maite,
Eta nik, eta nik, txoria nuen maite.

Hymne à la liberté

Si je lui avais coupé les ailes
Il aurait été à moi
Il ne serait pas parti
Mais alors
Il n'aurait plus été un oiseau
Et moi,
C'est l'oiseau que j'aimais ...

Pour les financiers, hasard en basque peut se dire zoria qui viendrait de txoria qui désigne l'oiseau *à Victor et Louise,*

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Les actions françaises depuis 1854 : analyses et découvertes

David Le Bris
sous la direction de
Georges Gallais-Hamonno

INTRODUCTION

Cela fera bientôt 30 ans que le marché des actions joue à nouveau un rôle majeur en France. Au cours du XX^{ème} siècle, le rôle du marché dans l'économie a suivi une courbe en forme de U (le « Great Reversal » de Rajan et Zingales, 2003) touchant un point bas au début des années 1980. Ce rôle du marché dans l'économie peut être mesuré par le rapport capitalisation boursière des actions sur PIB. Au-dessus de 20 % avant 1914, ce chiffre chute à la suite de chacun des deux conflits mondiaux pour tomber, en 1983, à un minimum de seulement 2 %. Commence alors un formidable rebond tiré à la fois par la hausse des cours et par les dénationalisations et privatisations. En 1994, le ratio capitalisation sur PIB retrouve enfin son niveau de 1914 refermant ainsi d'une manière étonnamment concordante le XX^{ème} siècle historique. En France comme ailleurs, le XX^{ème} siècle aura été, pour le meilleur mais souvent pour le pire, celui de la toute puissance de l'Etat. Le marché financier n'avait pas disparu mais il était presque totalement orienté vers les besoins de l'Etat.

La question aujourd'hui n'est plus de s'interroger sur le bien-fondé d'un marché financier pour les entreprises. Il devient même difficile de trouver une légitimité à la voix qui soulèverait cette interrogation. Le problème est plutôt d'appréhender correctement le comportement d'un marché d'actions sur la longue durée, c'est-à-dire au-delà des aléas conjoncturels. En cela, les 30 dernières années ne constituent pas une période représentative ; bien au contraire. Depuis le début des années 1980 les cours ont d'abord connu une croissance vertigineuse : près de 1 500 % de hausse lors du sommet enregistré en 2000. Puis, depuis dix ans, ils stagnent malgré de forts soubresauts. La hausse des cours de la fin du XX^{ème} siècle est de très loin la plus forte jamais enregistrée dans l'histoire. Cette hausse correspond à une baisse symétrique et tout aussi inédite des taux d'intérêt. Au début des années 1980, ils sont à un niveau inconnu depuis le Consulat (plus de 17 %) avant de connaître une décrue quasiment continue pour les amener à 2,50 % à la fin août 2010 soit le plus bas niveau jamais enregistré. Il faut donc prendre garde à ne pas généraliser les observations effectuées sur cette période exceptionnelle. Il n'y a aucune chance pour que les 30 prochaines années ressemblent aux 30 dernières.

S'il renaît il y a 30 ans, le marché des actions en France a une histoire bien plus longue que nous nous proposons de mettre à profit. Des sociétés par actions apparaissent lorsqu'elles trouvent un contexte favorable. Ce ne sont jamais les projets qui manquent mais toujours les capitaux pour les financer. Pour s'y investir, il faut qu'une épargne préalable suffisante permette d'abaisser l'exigence de l'investisseur jusqu'à coïncider avec la rentabilité du projet. Pour que cette rencontre ait lieu et donne naissance à une entreprise, la sécurité juridique est un chaperon indispensable.

La sécurité juridique est indispensable pour que l'épargnant donne du crédit à une valeur mobilière en lieu d'une propriété immobilière. La sécurité juridique est indispensable pour ne pas douter de la pérennité de la propriété détenue en commun et accepter ainsi des investissements dont l'amortissement sera long. Enfin, elle est indispensable pour garantir l'indépendance de la personnalité de l'entreprise vis-à-vis de ses actionnaires et dirigeants afin que chacun puisse vendre sa part au plus offrant. Dans ce contexte, et grâce au morcellement de la propriété, peuvent émerger des projets qui exigent des capitaux importants.

Ainsi, les premières sociétés par actions apparaissent à Toulouse, dans l'Occitanie médiévale, à travers des compagnies de barrages sur la Garonne. Les moulins du Castel-Narbones et du Bazacle sont cotés à partir de 1350 et respectivement jusqu'en 1900 (municipalisation) et 1946 (nationalisation par EDF)[1]. Des entreprises d'une ampleur supérieure prennent forme quelques siècles plus tard. A la suite des succès des compagnies des Indes Hollandaises (Vereenigde Oost-Indische fondée le 20 mars 1602) et Anglaises (East India Company fondée en 1599), différentes entreprises françaises[2], dont la fameuse Compagnie du Mississipi, sont autorisées par la puissance publique et dotées de privilèges spéciaux pour exploiter des territoires lointains. Toutefois en 1816, au lendemain de la tempête révolutionnaire, seules deux entreprises sont cotées à Paris : la Banque de France et les Trois Ponts sur la Seine.[3] Progressivement, des canaux, des compagnies d'assurances, des

[1] Voir Sicard (1953).

[2] Ainsi la Compagnie d'Afrique, est l'une de ces compagnies de commerce avec monopole. Elle est fondée dans de meilleures conditions que beaucoup d'autres, organisée sur des bases moins larges et avec beaucoup moins de luxe. Elle reçoit le privilège de la pêche du corail et une petite souveraineté à la Calle (actuel Sénégal) et installe son siège à Marseille. Elle ne se lance pas dans d'ambitieux projets de villes ou de colonisation. Absorbée elle aussi par Law en 1720, elle parvient à en sortir sans en avoir trop souffert. La Compagnie d'Afrique parvient à se maintenir sans grande secousse jusqu'en 1791 en donnant de 4 à 7 % de dividende (Bonnassieux, 1892).

[3] Pont des Arts, pont du Jardin des Plantes et pont de la Cité. Ces actions des Trois Ponts donnaient toutefois lieu à des transactions fort espacées; durant les quatre premiers mois de 1816, elles furent cotées onze fois seulement. Francois-Marsal (1928).

banques, des chemins de fer et diverses entreprises s'ajoutent à la liste. Au milieu du siècle, la bourse de Paris peut ainsi arborer le visage d'une cote large et diversifiée.

Nous nous proposons d'explorer ce qu'a été la bourse française avant sa récente renaissance. Mais à partir de quand commencer cette étude ? A cette date, la bourse française doit être suffisamment développée pour autoriser des comparaisons de long terme sans biais d'immaturité. L'objet premier de ce travail étant la reconstitution d'un indice CAC 40 historique (HCAC 40), il fallait que les 40 entreprises sélectionnées présentent dès le départ une envergure suffisante. De nombreuses entreprises peuvent afficher une capitalisation boursière élevée mais ne faire l'objet que d'échanges occasionnels. Un critère approchant la liquidité a donc été retenu : le nombre d'actions ne doit pas être inférieur à 10 000. Et c'est seulement à partir de 1854 que sont cotées plus de 40 entreprises affichant plus de 10 000 actions.[4] Cette limite temporelle prive l'indice d'une vingtaine d'années de marché boursier actif mais permet de gagner en cohérence et en homogénéité sur l'ensemble de la période. La principale date de fin correspond à celle évoquée de la renaissance du marché et plus précisément 1988 avec la création de l'actuel indice CAC 40. Toutefois, la plupart des études que nous présentons sont menées jusqu'aux années les plus récentes.

Ce souci de la longue durée impose des sacrifices sur l'exhaustivité car l'étude du sujet implique au préalable une laborieuse collecte de données. Tout d'abord, il a été choisi de se limiter aux entreprises françaises car même si les épargnants français peuvent détenir des titres étrangers, construire un indice national est une première étape avant d'envisager l'impact de la diversification internationale (abordée dans les chapitres 7 et 8). La base de données est constituée par les cours mensuels des 40 entreprises sélectionnées chaque année pour faire partie de l'indice CAC 40 historique (HCAC 40). Pour éviter tout biais de survivance, en début de chaque année, la capitalisation boursière de l'ensemble des sociétés cotées est calculée. Les 40 premières intègrent l'indice. Ce choix de 40 titres permet d'être cohérent avec le CAC 40 moderne mais il satisfait surtout deux critères. D'abord, il a été montré qu'une vingtaine d'actions suffisent pour éliminer tout risque spécifique. Autrement dit, un indice composé d'une vingtaine de titres ne mesure que le seul risque de marché

[4] En 1853, 247 sociétés ont été relevées mais pour seulement 85 sont indiqués le nombre de titres et un dernier cours. La Compagnie du Nord affiche 400 000 titres tandis que les Assurances Sauvegardes Maritimes et Océan se limitent à 200 actions. Le nombre de titres par entreprise est en moyenne de 36 804, la médiane se situant à 6 000 titres ; elle est à 12 000, quand on ne tient pas compte du secteur très dispersé des assurances. En 1853, seulement 37 entreprises affichent plus de 10 000 titres.

(Statman, 1987). Par ailleurs, 40 titres suffisent pour être représentatif de l'ensemble de la cote. Les capitalisations boursières étant très concentrées, ces 40 plus grosses entreprises représentent environ 70 % de la capitalisation boursière française totale aujourd'hui et près de 90 % au milieu du XIXème siècle.

Environ 75 000 cours cotés sont nécessaires sur la période. Nous avons relevé ces données dans différents périodiques financiers conservés à la Bibliothèque Nationale de France (voir chapitre 1). En tenant compte du calcul de l'ensemble des capitalisations en début d'année et des différentes informations sur les sociétés (dividende, nombre de titres ou valeur nominal), c'est près de 200 000 valeurs qui ont été collectées manuellement.

Armés de cette base de données, nous souhaitons montrer, du point de vue d'un financier, ce qu'ont été les actions françaises depuis 150 ans. Face à une ambition aussi large, des choix, autrement dit des renoncements, sont nécessaires. Naturellement, la performance des actions constitue un sujet incontournable qui sert de trame à l'ensemble de notre ouvrage. La réalité observée impose ensuite des faits saillants qui justifient d'y consacrer un chapitre (les guerres, les krachs, les secteurs, le risque)[5] ; d'ailleurs, et c'est logique, la plupart de ces faits saillants coïncident avec les explications potentielles de la performance des actions. De plus, nous avons privilégié les sujets pour lesquelles de nouveaux outils peuvent être proposés (sur les krachs ou sur le bénéfice de la diversification). Ou encore, ceux appelant une scrupuleuse démarche hypothético-déductive (la performance sous les gouvernements de droite est-elle meilleure ? Ou bien, les investissements en titres russes étaient-ils rationnels ?). Inévitablement, les choix effectués sont aussi fonction d'inclinations personnelles. Certains regretteront l'absence de telle approche ou de telle question ; l'agenda de la recherche ne connaît pas de limite.

Cette thèse de doctorat s'inscrit dans ce qu'il conviendrait maintenant d'appeler une « tradition orléanaise », impulsée par Georges Gallais-Hamonno, d'approche historique de la finance. Ainsi, des nombreuses thèses sur les marchés financiers avant 1914 : Pedro Arbulu (1998) sur les actions, Jacques-Marie Vaslin (1999) sur les Rentes de l'Etat français, Alex

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[5] Ces sujets sont d'ailleurs exactement ceux identifiés par G. Gallais-Hamonno dans son introduction au volume II du *Marché financier français au XIXème siècle*, p.7.

Viaene (2001) sur les marchés à terme et à prime, Angelo Riva (2005) sur la concurrence entre bourses italiennes, Rezaee (2010) sur les obligations privées ou encore Loredana Ureche-Rangau (2002) sur les emprunts roumains dans l'entre-deux-guerres ou tout récemment Thi Hong Van Hoang (2010) sur le marché de l'or dans la seconde moitié du XX^{ème} siècle. Tradition orléanaise dans laquelle s'inscrit aussi Christian Rietsch. Un ancien orléanais, Pierre-Cyrille Hautcoeur (1994), a également puissamment contribué à ce mouvement par sa thèse sur le marché boursier et le financement des entreprises de 1890 à 1939.

Par la variété des sujets abordés, notre ouvrage est à l'image du travail de Siegel (1994). En reconstruisant un indice boursier, il s'inscrit dans la lignée de Lenoir (1919), Dessirier (1932), Denuc (1934), Arbulu (1998) ou Petit-Konczyk (2006) pour la France ou de Cowles (1938) pour les Etats-Unis. Pour une part, il s'apparente aux travaux menés sur les actions belges à l'université d'Anvers (Annaert *et al.*, 2010) ou à ceux de Dimson et Marsh (2001) et Acheson *et al.* (2009) sur les actions anglaises en ce qu'ils cherchent à reconstruire des indices solides. Goetzmann (1993, 2001, 2004) est également une référence incontournable pour ce type d'exercice ; de même que Flandreau (par exemple Flandreau et Zumer, 2004) sur des sujets plus européens.

Le travail le plus proche, que le nôtre recoupe même parfois, est bien évidemment celui de Pedro Arbulu (1998). Ce dernier reconstitue un indice pour les actions françaises depuis les premiers cours de la Banque de France jusqu'à 1914 afin de pouvoir le chaîner à ceux proposés par la Statistique Générale de France puis l'INSEE pour le XX^{ème} siècle. Par souci d'homogénéité, il reprend les méthodes SGF-INSEE, et ainsi perpétue, bien involontairement, deux biais dans la mesure de la performance des actions qui justifient le présent exercice (voir chapitre 1). Par ailleurs, SGF-INSEE nous ont légué une série d'indices sectoriels et un indice général pour les actions mais les séries individuelles sont perdues. Les séries individuelles actuellement disponibles ne remontent pas au-delà de 1977 (base Eurofidai). Le travail de collecte ici réalisé offre une base de données loin d'être exhaustive mais qui autorise des études impossibles jusqu'à présent.

Notre travail de finance sur données longues doit se situer dans les champs de la connaissance qui lui sont proches. Dans son introduction au volume II du *Marché financier français au XIX^{ème}*, Georges Gallais-Hamonno délimite trois champs : l'histoire financière, la finance moderne et la finance historique. L'aspect histoire financière est celui qui se rapproche le plus du métier d'un historien de l'économie (Barjot, 2002). Dans notre travail, cette approche est indispensable afin de contextualiser certains phénomènes mais aucun chapitre ne s'y consacre exclusivement. Cet effort a déjà été amplement réalisé, notamment grâce aux deux volumes publiés aux Presses Universitaires de la Sorbonne sur le *Marché financier français au XIX^{ème} siècle*. Sur le cas des actions, la thèse de Pedro Arbulu consacre des développements entiers à cette approche.

Notre démarche s'affirme résolument moderne, et donc de finance moderne, dans les outils mobilisés pour la compréhension des phénomènes ; même si la dernière modernité économétrique n'a que rarement guidé les choix. Mais il faut espérer que certains développements pourront parfois échapper à la catégorie finance historique. Cette dernière sous-entend une étude de faits historiquement délimités dans le passé alors que nous proposons des études continues d'hier à aujourd'hui. Toutes les recherches en finance, exceptées quelques approches purement théoriques, se consacrent à l'étude des événements passés. Par défaut, ce passé dépasse rarement quelques décennies ; sauf aux Etats-Unis où des bases de données sont disponibles depuis 1962 (CRSP) et même 1925 (S&P). Quand s'arrête la finance historique et quand commence la finance ? Le présent exercice se veut être de finance sur données longues, une « *long-term finance* ».

Certains aspects et même certains chapitres sont très descriptifs. Ils correspondent à ce que l'on nomme la première étape de la démarche scientifique : décrire la réalité observée. En effet, l'originalité de ce travail ouvre de nouveaux champs ou au moins éclaircit ce qui était parfois dans le flou par manque de données. Cette nécessaire description impose toutefois un effort de structuration avec *a minima*, une mise en perspective et le plus souvent une problématisation que les faits observés suggèrent. Ainsi nous débutons par l'indispensable description de l'évolution des performances des actions françaises mais elles sont mises en résonance avec l'histoire économique française (chapitre 1). Le chapitre 3 décrit l'impact des guerres sur le marché des actions mais révèle aussi que, au-delà de la seule perte de valeur pour les actionnaires, ces conflits sont structurants pour les décennies ultérieures. Ou encore le chapitre 4 qui mesure la part respective des différents secteurs économiques en montrant que les entreprises de services dominent sur le long terme et que, à l'encontre de certaines idées reçues,[6] une industrie forte (à l'aune de sa capitalisation boursière) n'est pas statistiquement associée à une croissance élevée du PIB.

Toutefois, cette étape descriptive prend soin d'éviter tout historicisme ou toute démarche inductive. Le but même de notre travail est de chercher dans le passé, non pas des « lois inexorables du Destin de l'Histoire » (Popper, 1936) mais un élargissement du champ d'expérimentation. D'ailleurs, la longue durée, si elle offre quelques continuités (le poids boursier des entreprises de service par exemple) montre surtout l'instabilité des phénomènes, à commencer par celui de la rentabilité réelle des actions là où d'autres croyaient avoir identifié des constantes.[7] L' « étape descriptive » qui jalonne notre propos offre donc une confirmation d'une vision indéterministe (Popper, 1936) de l'histoire humaine.

La théorie de l'efficience informationnelle des marchés financiers s'intègre parfaitement dans cette approche indéterministe des événements. Un marché efficient (Fama, 1991) intègre parfaitement la totalité des informations disponibles. Est ainsi valorisé dans chaque cours coté, l'ensemble de ce qui peut être anticipé ou probabilisé. Le cours ne varie qu'en fonction d'informations nouvelles qui n'ont pas pu être probabilisées, c'est-à-dire en fonction d'événements aléatoires ; ce qui est à l'origine de la marche aléatoire des variations de cours. Nous mettons explicitement à contribution la théorie de l'efficience des marchés pour aider à expliquer la surperformance des actions sous les gouvernements de gauche (chapitre 4) ou pour montrer comment les « véritables krachs » correspondent bien à des événements importants (chapitre 5). Nous la sollicitons implicitement à de nombreuses reprises dès que sont mobilisés les outils d'optimisation du point de vue de l'investisseur (chapitres 2, 7 ou 8).

Appliquer à un contexte très différent les théories récentes de la finance, notamment celles issues de la « Modern Portfolio Theory », est un exercice pertinent. Par leurs interactions sur le marché, les hommes établissent ce que Hayek (1973) dénomme un « ordre spontané » fruit « de l'action des hommes, non de leurs desseins ». Cet ordre s'oppose bien évidemment à l'ordre naturel car il est purement humain mais il n'est pas non plus le fruit d'une organisation construite et réfléchie par l'homme. Les théories financières modernes formalisent des lois qui gouvernent cet ordre spontané. Elles se veulent universelles. Les

[6] Par exemple, le rapport *Pour une nouvelle politique industrielle* de Jean-Louis Beffa, remis en 2005 qui s'inscrit dans cette longue lignée.

[7] La rentabilité réelles des actions aux Etats-Unis montre une certaine continuité sur longue période : une rentabilité réelle de 6 à 7 % notamment mise en évidence par Siegel (1992) poussant certains, comme Smither and Wright (2000) à la nommer « Siegel's constant ».

mobiliser sur des épisodes bien antérieurs à leurs formalisations constitue donc un très intéressant exercice de validation. Ainsi, la relation s'établissant entre rentabilité et risque des actifs financiers avant 1914 est parfaitement vérifiée (chapitre 8) de la même manière qu'à tout moment s'établit une certaine prime de risque rémunérant la détention d'actions par rapport à un investissement sans risque.

« Les faits économiques agissant et réagissant les uns sur les autres, effets et causes tour à tour, présentent, il faut en convenir, une complication incontestable. Mais quant aux lois générales qui gouvernent ces faits, elles sont d'une simplicité admirable. »[8] Ce sont ces « lois générales » qui sont ici mobilisées. Pour pouvoir les manier, la réalité observée est « réduite » à un nombre de phénomènes suffisamment limité pour autoriser des tests. Toutefois, cette réduction méthodologique et la modélisation qui en découle s'efforcent de n'être employées que pour la recherche de relations causales et tentent de ne pas trop s'éloigner de la réalité des phénomènes.

De nombreux éléments de notre travail respectent une scrupuleuse démarche hypothético-déductive. Ainsi est testée l'hypothèse selon laquelle les gouvernements de droite sont plus attentifs aux entreprises (chapitre 4) ou l'égale rentabilité des actions en France et aux Etats-Unis (chapitre 2). Ou encore, le test de la rationalité de l'achat d'emprunts russes avant 1914 en remettant en cause les théories d'un investissement tiré par l'alliance diplomatique ou la seule avidité des banques (chapitre 7). Des phénomènes artificiels sont parfois modélisés pour permettre une expérimentation plus efficace comme des tests de type bootstrap pour apprécier la part de responsabilité du hasard (chapitre 4).

Enfin, nous proposons plusieurs nouveaux outils d'analyse ; nouveautés qui sont suggérées par les spécificités des réalités historiques observées. Ainsi la très faible corrélation des actifs financiers internationaux jusqu'à 1914 oriente vers une nouvelle méthode de décomposition du profit de diversification entre faible corrélation et plus forte rentabilité (chapitre 8). De la même manière, l'instabilité du niveau du risque des actions en France suggère une mesure des krachs ajustée pour la volatilité précédente (chapitre 5).

Le format retenu pour cet ouvrage est celui de neuf chapitres qui sont autant d'« articles » indépendants. L'immense avantage de ce format est que chaque chapitre se

[8] Frédéric Bastiat, « Midi à quatorze heures ».

suffit à lui-même. Le lecteur qui s'intéresse à un seul des aspects traités pourra se contenter de lire le chapitre concerné sans avoir besoin de se référer aux précédents développements. La principale faiblesse de ce format est une contrepartie naturelle de cet avantage. Il s'agit des répétitions que doit subir le courageux candidat à la lecture d'une traite de la totalité de ce document. Ainsi, la présentation succincte des données occupera un paragraphe dans presque tous les chapitres alors que le premier chapitre s'y consacre de manière détaillée. De la même manière, des graphiques ou tests qui servent la démonstration dans deux chapitres imposeront une répétition fastidieuse. L'autre inconvénient de ce format est le manque d'homogénéité du présent ouvrage. Par exemple, certains chapitres sont en anglais (parfois médiocre) quand d'autres sont en français. Certains mettent plus en valeur la technique financière quand d'autres se concentrent sur des problèmes historiques. Ou encore, trois des chapitres sont directement redevable à un co-auteur alors que les six autres le sont moins. Que le lecteur veuille bien nous en excuser.

Ces neuf chapitres recouvrent trois thèmes qui articulent trois parties. La première traite des performances, la seconde des continuités malgré les chocs, enfin la troisième de la diversification de portefeuille.

Dans la première partie, il est vérifié si les guerres peuvent expliquer la sous-performance des actions françaises par rapport à l'emblématique cas américain. Le premier chapitre nous révèle que ce que nous croyons savoir des performances des actions françaises était erroné. Brown *et al.* (1995) ont mis en évidence le biais du survivant du cas américain : le marché américain n'est pas représentatif car c'est celui de l'économie qui a connu les plus grands succès. Depuis, des séries boursières ont été collectées pour d'autres pays (Dimson *et al.*, 2002). Mais dans la plupart des cas, il s'agit du recyclage de séries existantes dont les méthodes (et parfois mêmes les objectifs initiaux, Hautcoeur, 2006), s'éloignent largement de ce qu'il convient de faire pour mesurer la performance offerte à un actionnaire. Les potentielles faiblesses de différents indices internationaux sont présentées.

En France, la série qui faisait référence a été conçue par la Statistique Générale de France, prolongée par l'INSEE et, utilisée rétrospectivement par Arbulu (1998) pour reconstruire un indice avant 1914. Cette méthode tolère d'importants biais de survivance (par exemple, l'exclusion *ex ante* des valeurs nationalisées à la Libération) et surtout applique méthodiquement un biais dans les pondérations. L'indice général résulte d'une pondération d'indices sectoriels qui sont eux-mêmes non pondérés. Dans chaque indice sectoriel, les petites entreprises sont donc sur-représentées par rapport à leur capitalisation boursière alors que les grosses valeurs sont sous-représentées. Comme il est connu que les petites capitalisations offrent des rentabilités supérieures, la performance globale est largement surestimée. Cette surestimation apparaît nettement en comparant cette série avec celle, entièrement reconstituée que le chapitre 1 présente.

La série reconstituée cherche à approximer ce qu'aurait été le CAC 40 s'il avait existé. Sa composition est déterminée en sélectionnant chaque année les 40 premières capitalisations boursières. Ensuite, leurs cours sont collectés chaque mois. La variation mensuelle de l'indice est mesurée par la moyenne des variations des 40 titres, pondérée par leur capitalisation boursière. En appliquant cette méthode entre 1988 et 1997, les variations mesurées sont statistiquement identiques à celles du CAC 40 de NYSE-Euronext. En ajoutant les dividendes, eux aussi collectés, la rentabilité totale des actions françaises apparaît bien inférieure celle de la série Arbulu-SGF-INSEE. De plus, les performances se caractérisent pas une forte instabilité dans le temps.

L'instabilité des performances des actions françaises est parfaitement cohérente avec l'histoire économique française. Alors qu'avant 1914, les actions procurent une rentabilité positive relativement stable, les deux guerres mondiales provoquent de lourdes pertes pour les actionnaires. Mais le retour à la paix et à la croissance après la Libération ne permet pas un retour à la rentabilité. Les politiques hostiles au marché qui dominent cette période se traduisent parfaitement dans des performances médiocres : les actions ne protègent pas contre le risque politique. Il faut attendre le début des années 1980 pour que les actions redeviennent attractives. En revanche, les actions sont toujours plus rentables qu'un placement en emprunts d'Etat matérialisant ainsi une prime de risque. Quelle que soit la période, le niveau de cette prime est faible. Il n'est d'ailleurs pas incohérent avec les modèles d'aversion au risque. Ainsi, il n'existe pas d'énigme de la prime de risque en France alors que celle observée aux Etats-Unis est source de nombreux débats.

Dans le chapitre 2, la performance des actions françaises est comparée avec celle du marché le mieux connu et qui souvent sert de référence : celui des Etats-Unis. Depuis la Première Guerre Mondiale, la prime de risque est nettement plus forte aux Etats-Unis y compris dans les périodes de paix et de croissance économique de l'après-guerre ; la différence devient toutefois moins nette depuis les années 1980. Cette surperformance est confirmée à travers une série d'autres mesures (VaR, CVaR, Sharpe, Sortino, GainLoss, WinLose, CER) qui montrent que les performances américaines sont à la fois supérieures mais aussi nettement plus stables dans le temps. A l'inverse, avant 1914, on ne peut exclure une égalité des primes de risque et surtout celle des ratios de Sharpe qui mesurent la rémunération du risque pris. Cette rémunération identique du risque sur les deux marchés avant 1914 est cohérente avec la solidité, à cette époque, de la droite de risque internationale qui sera identifiée dans le chapitre 8.

Les données de long terme des deux pays sont aussi mises à profit pour tester la pertinence de l'optimisation de portefeuille entre actions et obligations suivant le modèle moyenne-variance. Des portefeuilles de variance minimale et Sharpe maximal sont construits chaque mois selon les données passées sur des fenêtres allant de une à cinquante années. La performance de ces portefeuilles le mois suivant est ensuite comparée à celle d'une allocation naïve constante de 80 % en obligations et 20 % en actions. Il apparaît qu'allonger la durée d'observations pour construire les portefeuilles n'améliore pas les performances. En revanche, l'optimisation est clairement plus performante que l'allocation naïve

Enfin, ces données de long terme sont utilisées pour mesurer l'impact de l'horizon de placement sur ces mêmes portefeuilles optimaux. Il est souvent fait l'hypothèse que l'horizon d'investissement n'a pas d'impact sur les choix optimaux car le risque ne serait pas modifié. C'est une conséquence de l'hypothèse de rentabilités indépendantes et identiquement distribuées. Aux Etats-Unis, la réalité semble contredire cette hypothèse : le risque des obligations demeure stable mais celui des actions baisse lorsque la durée de détention s'allonge (Campbell et Viceira, 2002). En France, le risque des actions ne baisse pas avec la durée de détention mais celui des obligations augmente nettement. Fruits de mouvements différents, les actions deviennent moins risquées que les obligations, en France comme aux Etats-Unis, au-delà d'une dizaine d'années de détentions. Cette variation des risques relatifs modifie la composition optimale des portefeuilles. En France, alors que pour un horizon d'une année, le portefeuille de variance minimale doit être composé de 27 % d'actions, il doit en contenir 100 % au-delà de 30 années (seulement 75 % aux Etats-Unis). Ces mesures offrent de précieuses indications pour les gestionnaires qui ont des engagements de long terme (assureurs ou épargne-retraite).

Le chapitre 3 enquête sur le coupable présumé de cette sous-performance française : l'impact des guerres. Les deux guerres mondiales ont de lourdes conséquences sur les actions. Tout d'abord au niveau des performances, la baisse en valeur réelle est de 70 % avec la Première Guerre Mondiale et de plus de 80 % avec la Seconde ; même si au cours de ce conflit, l'immense création monétaire couplée à une économie fermée, misent en place pour financer l'Occupation, provoquent une fuite vers les actifs réels dont les actions qui voient leurs prix s'envoler de manière provisoire. Toutefois, la perte est encore plus forte sur les emprunts d'Etat et, à l'inverse, l'or permet dans ces périodes troublées de préserver et même, durant la Seconde Guerre Mondiale, d'augmenter le pouvoir d'achat. Mais les guerres ont également d'autres conséquences structurelles sur le marché des actions. Déjà la guerre de 1870 avait provoqué une forte hausse des taux d'intérêt qui, à l'inverse des précédentes hausses (1830 et 1848), ne disparaît pas brutalement une fois le calme revenu. La baisse des taux d'intérêts s'étale sur la décennie suivante de manière graduelle et homogène. Symétriquement à cette baisse le cours des actions s'élève tout aussi régulièrement jusqu'au krach de janvier 1882.

La Première Guerre Mondiale voit la naissance d'un régime de forte volatilité pour la rentabilité des actions : l'écart-type est multiplié par trois après 1914. La stabilité des cours du XIX$^{\text{ème}}$ siècle ne sera jamais retrouvée, même dans la période de paix et de retour vers une monnaie plus « stable » d'après 1945. Autre conséquence, la quasi-disparition des sociétés de services publics auxquelles appartenaient nombre de « blue chips » de l'époque. Elles disparaissent car elles ne maîtrisent pas leurs prix de vente (fixés par contrat avec la puissance publique) alors qu'elles supportent les hausses de coûts provoquées par l'inflation. Ce type de société restera insignifiant jusqu'aux années 2000 avec la privatisation de France Telecom et la dénationalisation des entreprises de gaz et électricité.

Toutefois, ce retour est encore limité car le marché financier n'offre toujours pas un accès à des financements adaptés. Pour que ce type d'investissement devienne rentable, il faut faire coïncider leur durée d'amortissement avec la durée de vie de l'infrastructure ; c'est-à-dire trouver de la dette remboursable sur au moins 50, 60 voir 100 ans. Ce qui était la norme pour les obligations avant 1914 est encore presque impossible à obtenir aujourd'hui,[9]

[99] A noter, le très récent retour des obligations très longues avec une série d'émissions en 2010. Rabobank, banque néerlandaise notée AAA, a émis des obligations amortissables sur 100 ans tout comme la compagnie ferroviaire américaine Norfolk Southern pour des montants modestes de 350 et 250 millions de dollars mais à des taux faibles de 5,80 et 5,95 %. Sur des durées de 40 et 50 années, EDF et GDF-Suez ont émis pour des montants bien plus importants (1 milliard et 700 millions de sterling). Par ailleurs, des emprunts de type

réduisant le nombre d'infrastructures rentables pour un opérateur privé ; ici aussi, la mort du franc-or joue probablement un rôle pour limiter « l'horizon de confiance » de l'épargnant.

De plus, après 1945, certains services publics ont été confiés à l'Etat par choix politique (mais, le marché ne pouvant plus les financer, était-ce un véritable choix ou une nécessité implicite ?). C'est ici la conséquence majeure de la Seconde Guerre Mondiale : la disparition pour plusieurs décennies de certaines industries (banques, électricité, gaz, charbonnages). Au final c'est près de 30 % de la capitalisation boursière de 1939 qui est nationalisée dans des conditions financières peu avantageuses. Cela contribue à la réduction drastique du rôle du marché dans l'économie observée entre 1914 et 1945. Le bas niveau atteint après la Libération se maintient jusqu'en 1983. Ainsi, en francs constants, les entreprises françaises ne distribuent pas plus de dividendes en 1965 qu'en 1883 alors qu'entre-temps le PIB a été multiplié par 5. A la fin des années 1980, une série d'entreprises est privatisée peut être parce que le coût relatif du capital entre propriétaires publics et privés avait évolué (Rosa and Pérard, 2010). Grâce à ces privatisations et à la hausse des cours, le marché retrouve seulement au début des années 1990, le rôle qui était le sien avant la Première Guerre Mondiale. Cette éclipse du marché concorde parfaitement avec le XX^{ème} siècle historique qui aura été celui de l'Etat.

La seconde partie présente l'étonnante continuité des entreprises de services malgré les chocs constitués par l'impact des gouvernements et des krachs. Outre les guerres, les actions françaises supportent aussi des chocs provoqués par les politiques menées notamment par celles des gouvernements ouvertement hostiles aux entreprises cotées. Dans les deux premiers chapitres, le facteur politique a même été soupçonné d'être responsable de la mauvaise performance des actions entre la Libération et les années 1980. De manière plus systématique, le chapitre 4 teste la théorie selon laquelle les gouvernements à la droite de l'échiquier politique seraient plus favorables à la bourse. Des études similaires aux Etats-Unis ont mis en évidence l'énigme de la surperformance des actions sous les Démocrates (Santa-Clara et Valkanov, 2003). La France est un terrain d'expérimentation très pertinent car les alternances sont particulièrement nombreuses (157 gouvernements entre 1871 et 2008 contre

perpétuels, mais avec des options de remboursement pour l'émetteur assorties d'une révision de taux en cas de non remboursement, ont été émises par des sociétés comme Scottish & Southern Energy, Suez Environnement ou RWE (Rheinisch-Westfälisches Elektrizitätswerk).

seulement 18 dans l'étude américaine) et que, comparé aux Etats-Unis, gouverne parfois une gauche que l'interventionnisme ne rebute pas.

Le critère politique offre deux constats particulièrement saillants. Premièrement, le cours des actions présente une très nette surperformance les mois où un nouveau gouvernement est nommé. Ces mois-là, les actions progressent en moyenne de 1,15 % contre seulement 0,27 % le reste du temps. Cette différence, statistiquement significative, est cohérente avec l'idée que l'arrivée d'un nouveau gouvernement met fin à une incertitude à laquelle le marché donne un prix (Brown *et al.* 1988). Une procédure de bootstrap permet de vérifier qu'il n'y a qu'une faible probabilité que le hasard soit la cause de cet écart. En revanche, aucune différence n'apparaît selon la couleur du nouveau gouvernement. Deuxièmement, sur le long terme, les actions offrent une performance réelle de 4,40 % sous la gauche contre seulement 0,11 % sous la droite. Cette profonde différence, statistiquement significative, rend particulièrement profitable une stratégie d'investissement basée sur le critère politique (achat d'actions sous la gauche et placement au taux court terme sous la droite contre actions sous la droite et taux court terme sous la gauche). Ces stratégies permettent aussi de vérifier que la différence ne provient pas uniquement de quelques périodes exceptionnelles.

Le reste du chapitre se propose d'expliquer cette différence contre-intuitive. Il est d'abord vérifié que ce supplément de rentabilité sous la gauche n'est pas une contrepartie à un risque plus élevé ; au contraire, le risque, appréhendé par l'écart-type des rentabilités, est supérieur sous la droite. En revanche, une part de cette surperformance peut s'expliquer par un contexte macro-économique plus favorable. Après contrôle pour la situation macro-économique, la différence se réduit mais reste sensible ; la couleur du gouvernement n'est donc pas une simple « proxy » de la situation macro-économique. En revanche, un large écart apparaît dans les trois mois précédant une alternance. Les actions progressent nettement avant l'arrivée de la droite (donc dans une période attribuée à la gauche) et, inversement, baissent durant les trois mois qui précèdent le basculement à gauche (et donc attribuées à la droite).

Ainsi, une partie de la bonne performance observée sous la gauche provient des trois derniers mois qui intègrent l'anticipation de son remplacement par la droite. A l'inverse, la mauvaise évolution de la bourse sous la droite s'explique partiellement par les trois mauvais mois qui précédent l'arrivée de la gauche. En acceptant l'hypothèse selon laquelle le marché est suffisamment efficient pour anticiper les alternances trois mois à l'avance, la limite gauche droite est décalée. En retenant une délimitation gauche-droite fonction de ce que le marché peut anticiper et non la délimitation gauche-droite respectant les changements effectifs, la différence en faveur de la gauche disparaît presque totalement. Le hasard a alors toutes les chances d'être le seul responsable. Au mieux, il apparaît donc que la droite n'autorise pas de meilleures performances boursières. Ces constats impliquent qu'il est illusoire d'attendre d'un gouvernement *a priori* mieux disposé de plus grand succès économiques. Un gouvernement ne créé pas de richesse.

Les actions subissent d'autres chocs, parfois exogènes, que l'on nomme les krachs. Les krachs ne sont pas de simples anomalies qu'il conviendrait d'exclure des raisonnements financiers. Au contraire, les quelques événements extrêmes (positifs et négatifs) peuvent être vus comme décisifs pour la performance finale alors que dans la majorité du temps les variations se compensent juste les unes les autres (ainsi les 20 meilleurs mois, soit 1 % des observations, du HCAC 40 réalisent à eux seuls, 96 % du niveau final de l'indice). Mais l'identification et la mesure des krachs sont plus compliqués qu'il n'y paraît. La littérature sur le sujet est étonnamment pauvre (Patel and Sarkar, 1998) même si des études ultérieures se sont penchées sur le phénomène (Mishkin et White, 2002 aux Etats-Unis ou, pour la France, Arbulu et Gallais-Hamonno, 2002). Cette faiblesse est en partie dû au fait que l'étude de ces événements rares nécessite des séries longues. Le chapitre 5 met donc à profit le nouvel HCAC 40 pour étudier les krachs sur le marché français.

Le premier réflexe pour identifier les krachs est de retenir les pires variations en pourcentage ; la littérature ne divergent que sur la durée d'observations ou ses modalités précises. En classant les pires variations mensuelles du HCAC 40, nombre d'anomalies apparaissent. Ainsi, très peu de krachs sont enregistrés avant 1914. Le déclenchement de la Première Guerre Mondiale ou la défaite de 1870 n'apparaissent même pas parmis les records de baisse. A l'inverse, certains mois des années 2000 sont désignés comme krachs alors qu'ils n'ont marqué ni les marchés ni les historiens. Cette énigme a déjà été mise à jour sur les actions américaines : « Big news without big moves and big moves without big news » (Cutler *et al.*, 1989). Un modèle d'identification des krachs qui résout une partie de cette énigme est proposé.

Il apparaît que les plus fortes variations sont concentrées dans les périodes de niveau élevé de volatilité. Il est fait l'hypothèse que les investisseurs se « leverage » plus ou moins selon le contexte de volatilité afin de maintenir constant le risque effectivement pris. Le krach n'est plus alors une baisse importante dans l'absolu mais seulement compte-tenu du niveau antérieur de volatilité. Les variations de cours sont ajustées pour la volatilité antérieure en les mesurant en nombre d'écart-types de la précédente période. Ainsi, la baisse enregistrée lors du déclenchement de la Première Guerre Mondiale, en juillet 1914, est de seulement 7,14 % mais elle intervient dans un contexte de volatilité particulièrement faible (1,42 %). Elle représente donc une chute de 6,09 écart-types la situant au second rang de pires « krachs ajustés » alors qu'elle n'apparaissait que comme la 98ème des pires variations mensuelles mesurées en pourcentage. Ce modèle permet ainsi d'exclure des pires krachs toute une série des pires variations mensuelles qui ont comme seul mérite d'avoir lieu dans les périodes volatiles et, à l'inverse, de bien identifier comme des krachs les événements que l'histoire économique avait retenu comme tels.

La robustesse de la méthode à la période utilisée pour mesurer la volatilité antérieure est testée ainsi que la cohérence entre la volatilité agrégée au niveau de l'indice et les volatilités individuelles des titres. Puis, le modèle est appliqué à d'autres séries financières. L'ajustement produit plus d'effets sur les marchés qui connaissent de forts changements dans le temps de leur volatilité. Ainsi, les taux d'intérêts sur la dette à long terme de l'Etat britannique en données mensuelles depuis 1754 donnent également des résultats très pertinents quant aux krachs exclus et aux nouveaux identifiés. C'est aussi le cas sur les cours quotidiens du Dow Jones depuis 1898 et seulement dans une moindre mesure pour les actions américaines mesurées en variations mensuelles depuis 1815. En effet, la volatilité des actions américaines apparaît relativement stable dans le temps excepté durant la Grande Dépression (Schwert, 1989).

Malgré les chocs qu'il subit depuis 150 ans, le marché reste dominé par des entreprises de services. En étudiant le poids des différents secteurs économiques dans la capitalisation boursière au cours du temps, le chapitre 6 met en lumière la surprenante domination quasi continue des entreprises de services. L'image convenue veut que, d'un XIX^{ème} siècle industriel, l'économie française passe progressivement, et parfois douloureusement, à une économie de services au cours du XX^{ème} siècle. L'étude des capitalisations boursières du HCAC 40 ouvre une perspective bien différente. La capitalisation boursière offre à chaque instant une estimation de la valeur présente des richesses qu'une entreprise doit générer. Le classement des entreprises selon leur secteur d'appartenance présente un panorama des secteurs cotés les plus créateurs de richesse. A noter que ce profil des secteurs créateurs de richesse est différend de celui de l'économie car des pans entiers, ceux qui ne se prêtent pas à la concentration comme par exemple l'agriculture, ne sont pas cotés.

En retenant une définition large de l'industrie, comme toutes les entreprises qui fabriquent un produit, son poids au cours du XIX$^{\text{ème}}$ siècle que l'on présente comme industriel, ne dépasse jamais 7 % de la capitalisation. La sidérurgie pèse au plus 4 % et l'emblématique Creusot-Schneider a toujours été un nain boursier. La valeur relative de l'industrie n'augmente qu'avec la seconde révolution industrielle (principalement avec l'électro-chimie) pour culminer à 69 % en 1961. Depuis cette date, et conformément à la vision classique de la désindustrialisation, la part des sociétés de services augmente progressivement. La domination de l'industrie aura donc été très brève puisqu'elle représente plus de 50 % de la capitalisation boursière uniquement de 1948 à 1978. Et cette courte domination industrielle est en large part le résultat des chocs subis par certains secteurs des services. Nous avons vu que la Première Guerre Mondiale abat nombre d'entreprises de services publics alors que la Seconde fait arbitrairement disparaître du marché l'énergie (hors pétrole) et la finance.

Sur la durée, le secteur bancaire est une activité de services qui pèse lourd dans la capitalisation boursière. A partir de 1875, les banques commerciales (*i.e.* hors Banque de France) représentent plus de 15 % de la capitalisation boursière. Tombées à moins de 5 % suite aux nationalisations de la Libération, la capitalisation boursière de la finance remonte rapidement grâce à l'apparition de nouveaux acteurs répondant à de nouveaux besoins. Elle retrouve les 15 % dès 1972 puis définitivement après les dénationalisations de 1986. Il est à noter qu'à la veille de la récente crise financière, la finance ne représentait « que » 22 % de la capitalisation du HCAC 40, soit un niveau courant sur le long terme et très loin du record de 36 % observés en 1921-1923. Cette observation est également valable en mesurant la capitalisation boursière de la finance rapportée au PIB : il n'y a pas eu de véritable hypertrophie des banques à la veille de la récente crise.

La forte présence de l'industrie correspond à la période de croissance des « Trente Glorieuses » pouvant laisser supposer un lien de cause à effet. Une industrie forte correspond-elle à une croissance économique plus élevée ? Une régression entre le poids de l'industrie dans la capitalisation boursière et la croissance du PIB ne montre aucune corrélation. Le cas des « Trente Glorieuses » est donc exceptionnel. La France a connu la croissance avec une faible industrie : il n'y a aucune raison pour qu'elle ne l'expérimente pas à nouveau.

C'est la diversification du portefeuille d'un épargnant qui est interrogée dans la troisième partie, diversification au sein des actions françaises et à travers des titres étrangers. Le chapitre 7 consiste en une application du modèle de portefeuille optimal pour un épargnant français avant 1914 afin de tester si l'investissement français en Russie était ou non rationnel ? Les financiers contemporains connaissent sous le nom de « home bias » le constat que les investisseurs n'internationalisent pas autant leurs placements que l'indique une allocation optimale. Avant 1914, ce biais semble être inversé. C'est l'importance des titres étrangers dans l'épargne des Européens qui étonne et notamment celle des emprunts russes chez les Français. Longtemps, ce comportement a été expliqué par les relations diplomatiques (alliance franco-russe de 1892) ou par les importantes commissions que les banques percevaient sur ces émissions (Girault, 1973) : l'épargnant français aurait été instrumentalisé ou leurré. L'application de l'optimisation de portefeuille à un panel d'emprunts publics internationaux dément ces théories : le choix des emprunts russes était parfaitement pertinent du point de vue d'un investisseur français.

Un portefeuille optimal purement domestique est d'abord constitué avec les actions françaises (HCAC 40), les obligations de l'Etat français (Rente 3 %) et les obligations des entreprises françaises (Rezaee, 2008). Ensuite, les opportunités d'investissement sont enrichies par 8 emprunts publics internationaux (russes, allemands, italiens, argentins, espagnols, anglais, américains et municipaux américains). L'optimisation qui résulte de ces données préconise d'investir en emprunts russes 10 % du portefeuille, soit un niveau très proche de ce qui était effectivement réalisé. En combinant le portefeuille domestique avec un seul emprunt étranger, les emprunts russes proposent la seconde meilleure opportunité de diversification à égalité avec l'Argentine et l'Italie ; mais ces deux pays n'émettent qu'une quantité limitée de dette tandis que la Russie est le plus gros emprunteur mondial de l'époque (Ukhov, 2003). Le meilleur choix financier aurait été l'Allemagne grâce à la très faible corrélation entre les titres français et allemands mais la situation politique écartait cette opportunité.

Le choix des emprunts russes illustre le fait que les investissements à l'étranger permettent d'augmenter la performance d'un portefeuille et la première réaction est d'y voir le fruit d'une plus forte rentabilité étrangère. Pourtant, les analyses développées dans le chapitre 8 montrent que la principale incitation à l'investissement à l'étranger résidait dans les faibles corrélations et pas dans les rentabilités étrangères supérieures. Cette démonstration se fonde sur une nouvelle méthode pour décomposer le bénéfice provenant de la diversification entre deux titres. Elle utilise une hypothèse contrefactuelle de parfaite corrélation entre titre domestique et étranger afin de déterminer la part de la faible corrélation et celle de la plus forte rentabilité, dans le bénéfice total de diversification. Cette méthode est appliquée entre actions françaises et américaines et, plus cohérent avec les faits historiques, entre emprunts de l'Etat français et emprunts russes. Il apparaît clairement que c'est la faible corrélation qui constituait la plus grande source de bénéfice ; la plus forte rentabilité étrangère n'était souvent qu'anecdotique.

Ce puissant effet de la corrélation est le fruit des très faibles niveaux observés avant 1914. Les actifs internationaux présentaient une corrélation moyenne bien inférieure à ce qui est observée ces dernières années. Pour appréhender l'incitation à diversifier à travers le temps, l'évolution de la corrélation entre actions américaines et françaises est étudiée. Alors qu'elle était toujours inférieure à 0,2 avant 1914, elle connaît une forte hausse durant l'entre-deux-guerres et approche les 0,4 à la veille du conflit. Avec la Seconde Guerre Mondiale, elle retombe à un niveau très faible qui se maintient jusqu'aux années 1960. Elle est depuis nettement orientée à la hausse, malgré quelques baisses temporaires et atteint désormais un niveau record de 0,6. Il semble que le degré de corrélation entre marchés est lui-même fonction de la corrélation des variations de PIB. Avec les économies réelles de plus en plus intégrées ces dernières années, les actions présentent elles-aussi une corrélation importante ; inversement lorsque les PIB évoluaient de manière différente, les actions étaient elles aussi peu corrélées. Ainsi, est identifié le résultat paradoxal qu'avec l'intégration des économies réelles (PIB), l'incitation à acheter des titres étrangers diminue.

Si les actifs internationaux n'étaient que faiblement corrélés avant 1914, les marchés étaient toutefois intégrés ; deux marchés peuvent être intégrés sans être corrélés. Cette intégration se vérifie car le prix du produit vendu sur les marchés financiers, le risque, est le même à travers la planète. Les couples rentabilité-risque de différents actifs internationaux (actions, obligations publiques et privées, marchés monétaires) sont mesurés avant la Première Guerre Mondiale. Les différents actifs apparaissent parfaitement cohérents entre eux. Ils dessinent une droite de risque dont ils ne s'éloignent que modestement (R^2=0,60). Les actions renseignées (françaises, américaines et belges) offrent également une rentabilité cohérente avec leur risque. Cet alignement des actions sur la droite de risque est important car il signifie l'absence, à cette époque, d'une prime de risque excessive (« equity premium puzzle »). Il faut espérer que cette droite de risque internationale avant 1914 pourra s'enrichir des couples rentabilité-risques de nouveaux actifs. Elle pourra aussi servir de point de comparaison pour la rentabilité, ajustée du risque, d'un investissement à cette époque puisqu'elle donne le coût d'opportunité offert par le marché.

Enfin, le chapitre 9 étudie la première des diversifications, celle au sein d'un portefeuille d'actions françaises. Cette diversification permet à un portefeuille d'atteindre un niveau de risque plancher appelé le risque de marché. Contrairement au seul cas bien étudié, les Etats-Unis depuis Schwert (1989), le risque de marché des actions françaises présente une forte instabilité dans le temps. Alors qu'il baisse de manière graduelle jusqu'en 1914, il connaît une hausse vertigineuse dans l'entre-deux-guerres. Son niveau record est atteint autour de la Seconde Guerre Mondiale (et pas dans les dernières années marquées par le développement de certaines innovations financières). Malgré un retour vers des niveaux plus faibles dans la seconde moitié du XX^{ème} siècle, le risque des actions n'a jamais retrouvé son étiage d'avant 1914. Des changements structurels dans l'économie française peuvent théoriquement expliquer cette hausse du risque des actions. Une régression multiple confirme que trois variables sont statistiquement liées avec le risque des actions : une dummy pour la période post-1914 qui entre-autres correspond à la fin du Gold Standard, le taux d'inflation et le déficit public. Le modèle ainsi identifié approxime correctement les observations du niveau de risque avec un R^2 de 0,55.

Ce risque de marché correspond à celui d'un portefeuille bien diversifié, c'est-à-dire après élimination du risque spécifique (c'est-à-dire propre à chaque action ou idiosyncratique). A partir des volatilités individuelles des actions, le risque moyen d'un titre est reconstitué. Cette moyenne des risques individuels mesure le risque total. La différence entre le risque total et le risque de marché donne le risque spécifique autrement dit la part du risque qui est éliminée par la diversification. Cette part de risque, longtemps ignorée par les financiers car non-rémunérée dans le modèle du MEDAF, suscite à nouveau l'intérêt depuis quelques années. Notamment parce les observations empiriques montrent que le portefeuille moyen de l'investisseur individuel comporte une large part de risque spécifique autrement dit, que son portefeuille n'est pas correctement diversifié (Barber et Odean, 2000). Ce constat alimente le développement de la finance comportementale (Broihanne *et al.*, 2008). Mais, à la suite de Campbell *et al.* (2001), il est aussi à l'origine du regain d'intérêt pour le risque spécifique. Ces derniers étudient dans le détail la part respective du risque de marché et spécifique aux Etats-Unis depuis les années 1960.

Dans notre cas, le risque spécifique apparaît bien plus stable dans le temps que le risque de marché. Contrairement au risque de marché, le risque spécifique ne présente pas de grands mouvements coïncidant avec l'histoire économique. Alors qu'il constituait la majorité du risque total avant les années 1920, il n'en représente plus qu'un petit tiers aujourd'hui. La part relative du risque spécifique dans le risque total indique la part de risque qui peut être éliminée grâce à la diversification. En combinant la hausse progressive du risque de marché et la stabilité du risque spécifique, la part de risque que la diversification permet d'éliminer connaît une baisse progressive. Avant 1914, 60 % du risque pouvait être éliminé grâce à la diversification contre seulement 30 % dans les dernières années. Cette hausse du risque commun à toutes les entreprises se traduit également par une hausse de la corrélation moyenne entre actions.

Les 40 variations mensuelles de cours permettent de mesurer 780 coefficients de corrélation croisés. En cohérence avec la montée du risque de marché dans le risque total, le coefficient de corrélation s'élève de moins de 0,20 avant 1914 jusqu'à près de 0,60 lors de la Seconde Guerre Mondiale. Il redescend vers les 0,30 durant les années 1960 mais remonte ensuite pour se stabiliser autour de 0,40. Il entame une nouvelle hausse vers les 0,50 dans les années récentes. Comme pour la corrélation entre actions françaises et américaines, le faible degré de corrélation observé avant 1914 entre actions françaises n'a jamais été retrouvé. En assumant quelques simplifications, une relation théorique entre coefficient de corrélation et part du risque de marché dans le risque total est proposée.[10] Elle approxime très bien les relations observées.

Cette montée des facteurs communs au cours du XX$^{\text{ème}}$ siècle se traduit également sur le fameux diagramme de la baisse du risque par l'ajout successif de titres dans un portefeuille.

[10] Cette faible corrélation avant 1914 retire une grande partie de sa pertinence au « market model » si souvent utilisé de nos jours. En effet, les cours étant peu corrélés entre eux, le facteur marché n'a qu'un faible impact sur l'évolution d'un titre particulier ; le risque commun est faible par rapport au risque spécifique. Cette implication théorique n'est pas ici développée.

Ce diagramme, construit pour différentes périodes, résume ce qui a été souligné plus haut. Le risque supporté par une seule action (risque total) est faible avant 1914 et décroit vite (avec l'ajout de quelques titres seulement) et fortement (de 60 à 70 %) grâce à la faible corrélation. Dans les années récentes, la diversification entre plusieurs dizaines de titres permet de réduire de 30 % seulement un risque qui en plus est supérieur au départ. En comparaison, cette baisse d'un tiers du risque était atteinte avec seulement deux ou trois titres avant 1914. Avant la Première Guerre Mondiale, il est donc possible de parler de « super effet portefeuille » car avec une poignée de titres, le risque était abaissé de plus des deux tiers. Ce « super effet portefeuille » est cohérent avec l'image des portefeuilles individuels composés de seulement quelques actions conservées à domicile[11]. Cette manière d'investir était parfaitement rationnelle. A l'inverse, la gestion collective est aujourd'hui probablement indispensable pour bénéficier d'un maigre effet de diversification.

REFERENCES

Acheson G.G., Hickson C.R., Turner J.D. and Y. Q. Ye (2009), "Rule Britannia! British Stock Market Returns, 1825-1870", *Journal of Economic History*, 69, p. 1106-36.

Annaert J., Buelens F., De Ceuster M. De Schepper A. and W. Van Hyfte (2010) "Does the Dividend Yield Really Predict Stock Returns? Evidence from the Brussels Stock Exchange (1832-2008)", *Working Paper,* University of Antwerp.

Arbulu P. (1998), *Le marché parisien des actions au XIX^{ème} siècle : performances et efficience d'un marché émergent*, Thèse de doctorat, Université d'Orléans.

Arbulu P. et G. Gallais-Hamonno (2002), « Valeurs extrêmes et changements d'appréciation du risque à la bourse de Paris sur deux siècles », *Finance*, 23, p. 145-176.

Barber B.M. and T. Odean (2000), "Trading Is Hazardous To Your Wealth: the Common Stock Investment Performance of Individual Investors", *Journal of Finance, 5*5, p. 773-806.

Barjot D. (dir.) (2002), « Où va l'histoire économique », *Historiens et géographes*, 378.

Bonassieux (1892), *Les grandes compagnies de commerce,* Paris, Douliot et Gautier.

Broihanne M-H, Merli M. and P. Roger (2008), "Solving Some Financial Puzzles with Prospect Theory and Mental Accounting: a Survey", *Revue d'économie politique,* 118, p. 475- 512.

Brown S.J., Goetzmann W. N. and S. A. Ross (1995), "Survival", *Journal of Finance*, 50, p. 853-73.

Brown K.C., Harlow W.V. and S.M. Tinic (1988), "Risk Aversion, Uncertain Information and Market Efficiency", *Journal of Financial Economics*, 22, p. 355-385.

[11] Cette image manque d'observation scientifique.

Campbell J.Y, Lettau M., Malkiel B. G. and Y. Xu (2001), "Have Individual Stocks Become More Volatile? An Empirical Exploration of Idiosyncratic Risk", *Journal of Finance,* 51, p. 1-43.

Cowles A. A. (ed.) (1938), *Common-Stock Indexes*, Bloomington.

Cutler D. M., J. M.Poterba and L.H. Summers (1989), "What Moves Stock Prices", *Journal of Portfolio Management*, 15.3, p. 4-12.

Denuc J. (1934), « Dividendes, valeurs boursières et taux de capitalisation des valeurs mobilières », *Bulletin de la SGF.*

Dessirier J. (1929), « Nouveaux essais de statistiques sur les mouvements boursiers », *Journal de la société statistique de Paris*, p. 35-95.

Dimson E. and P. Marsh (2001), "U.K. Financial Market Returns, 1955-2000", *Journal of Business*, 74, p. 1-31.

Dimson E., Marsh P. and M. Staunton (2002), *Triumph of the Optimists: 101 Years of Global Investment Returns*, Princeton, Princeton University.

Fama E. (1991), "Efficient Markets: II", *Journal of Finance*, 46, p. 1575-1617.

Flandreau M. and F. Zumer (2004), *The Making of Global Finance 1880-1913*, Paris, OECD.

Francois-Marsal F. (1928), *Encyclopédie de banque et de bourse*, Paris, Crété.

Gallais-Hamonno G. (dir.) (2007). *Le marché financier français au XIXème siècle,* volume 2, Paris, Publication de la Sorbonne.

Girault R. (1973), *Emprunts Russes et Investissement Français en Russie 1887-1914,* Armand Colin, Paris.

Goetzmann W. (1993), "Patterns in Three Centuries of Stock Market Data", *Journal of Business*, 66, p. 249-270.

Goetzmann W. (2004), "Will History Rhyme? The Past as Financial Future", *Working Paper*, Yale ICF, no. 04-19.

Goetzmann W., Ibbotson R. and C. Peng (2000) ,"A New Historical Database for the NYSE 1815 to 1925: Performance and Predictability", *Journal of Financial Markets,* 4, p. 1-32.

Hautcoeur P-C. (2006), "Why and How to Measure Stock Market Fluctuations? The Early History of Stock Market Indices, with Special Reference to the French Case ", *Working Paper*, Paris School of Economics, 2006.10.

Hautcoeur P-C. (dir.) (2007). *Le marché financier français au 19ème siècle,* Volume 1, Paris, Publication de la Sorbonne.

Hautcoeur P-C. (1994), *Le marché boursier et le financement des entreprises françaises (1890 –1939)*, Thèse de doctorat, Paris I Panthéon-Sorbonne.

Hayek F. (1973), "Law, Legislation and Liberty", Chicago, University of Chicago Press.

Hoang T.H.V. (2010), *Le marché parisien de l'or de 1941 à 2009 : histoire et finance*, Thèse de doctorat, Université d'Orléans.

Lenoir M. (1919), « Le mouvement des cours des valeurs mobilières françaises depuis 1856 », *Bulletin de la SGF*.

Mishkin F. and E. White (2002), "US Stock Market Crashes and Their Aftermath: Implications for Monetary Policy", *Working Papers*, NBER, n. 8992.

Patel S. and A. Sarkar (1998), "Crises in Developed and Emerging Stock Markets", *Financial Analysts Journal*, vol. 54.6, p. 50-59.

Petit-Konczyk M. (2006), « Inventaire des séries de données historiques du projet Old Paris Stock Exchange 1919-1939 », *Economie et société*, série AF, 35.

Popper K. (1936), *The Powerty of Historicism*, private reading at a meeting in Brussels, 1944-45 as a series of journal articles in *Econometrica*.

Rajan R. and L. Zingales (2003), "The Great Reversal: the Politics of Financial Development in the 20th Century", *Journal of Financial Economics*, 69, p. 5-50.

Rezaee A. (2010), *Le marché des obligations privées à la bourse de Paris au XIXème siècle : performances et efficience d'un marché obligataire*, Thèse de doctorat, Université d'Orléans.

Riva A. (2005), *Compétition entre places financières : les bourses de Milan et Gênes à l'époque Giolitienne,1894-1913*, Thèse de doctorat, Université d'Orléans.

Rosa J-J and E. Pérard, (2010), "When to Privatize? When to Nationalize? A Competition for Ownership Approach", Kyklos, 63, p. 110-132.

Santa-Clara P and R. Valkanov (2003), "The Presidential Puzzle: Political Cycles and the Stock Market", *Journal of Finance*, 58, p. 1841-1872.

Schwert G. (1989), "Why does Stock Market Volatility Change over Time?", *Journal of Finance,* 44, p. 1115-1153.

Sicard G. (1953), *Aux origines des sociétés anonymes. Les moulins de Toulouse au Moyen Age*, Paris, Armand Colin.

Siegel J. (1994), *Stocks for the Long Run: a Guide to Selecting Markets for Long-Term Growth*, New York, Irvine.

Smither A. and S. Wright (2000), *Valuing Wall Street, Protecting Wealth in Turbulent Markets*, New-York, McGraw-Hill.

Statman (1987), "How Many Stocks Make a Diversified Portfolio", *Journal of Financial and Quantitative Analysis*, 22, p. 353-63.

Ureche-Rangau L. (2002), *Volatilité et défaut d'une dette souveraine : le cas des emprunts roumains cotés à Paris entre 1919 et 1939*, Thèse de doctorat, Université d'Orléans.

Vaslin, J.-M. (1999), *Le marché des Rentes françaises au XIXème siècle et la crédibilité financière de l'Etat*, Thèse de doctorat, Université d'Orléans.

Viaene A. (2001), *Les marchés à terme et conditionnels à la Bourse de Paris au XIXème siècle*, Thèse de doctorat, Université d'Orléans.

PARTIE I LES GUERRES EXPLIQUENT-ELLES LA SOUS-PERFORMANCES DE LONG TERME DES ACTIONS FRANÇAISES ? (1854-2007)

Lorsqu'un financier se penche sur l'histoire longue des actions françaises, sa motivation première est de rechercher combien ces titres ont rapporté à leurs détenteurs. Cet intérêt pour le passé peut se justifier par une simple valeur prospective : en finance, le moins mauvais des pronostiqueurs est en général le passé. Mais solliciter le passé est un travail exigeant. Le premier chapitre montre que les séries historiques de rentabilité des actions françaises dont nous disposions surestimaient nettement les performances à cause de méthodologies inadaptées. Il semble que des biais de même nature affectent parfois les séries utilisées pour d'autres pays. Une mesure correcte de la performance de l'actionnaire implique un laborieux travail de collecte et de traitement afin d'obtenir un indice solide. Différents tests de robustesse sont menés pour valider ce nouvel indice. Les performances médiocres des actions pendant une grande partie du XX^{ème} siècle sont cohérentes avec l'histoire d'un pays à la démographie stagnante (il n'y a pas plus de français en 1940 qu'en 1900) qui connaît deux conflits mondiaux ravageurs. Les actions demeurent toutefois le meilleur des placements pour l'épargnant qui arbitre entre des placements français. En revanche, elles n'offrent aucune « prime de risque excessive ».

Les actions américaines arborent un historique bien meilleur. Le chapitre 2 s'emploie à préciser cette surperformance américaine. Avant la Première Guerre Mondiale, les performances des actions françaises sont en ligne avec celles des Etats-Unis. Entre 1914 et 1945, la spectaculaire divergence est une conséquence attendue des deux conflits mondiaux. Plus surprenante est la poursuite de médiocres performances durant les « Trente Glorieuses ». Il faut attendre les années 1980 pour que la rentabilité des actions françaises se rapproche de celle observée aux Etats-Unis. Mais cette convergence se fait au prix d'un risque français qui demeure nettement supérieur. Les observations américaines ne sont donc pas universalisables. Les deux séries de long terme servent également à tester la pertinence de l'optimisation de portefeuille entre actions et obligations par rapport à une allocation naïve. Les portefeuilles optimisés offrent effectivement de meilleures performances le mois suivant leur définition. La fenêtre d'observation des rentabilités passées utilisées pour construire l'optimisation est sans impact. En revanche, l'horizon d'investissement a une importance décisive dans l'allocation optimale car les risques relatifs entre actifs obligations ne sont pas stables dans le temps.

Une grande part du décalage de long terme entre performances françaises et américaines trouve son origine dans les deux conflits mondiaux qui affectent plus douloureusement la France. Le chapitre 3 décrit l’impact des guerres sur les actions françaises. La première conséquence est une large perte de valeur réelle pour les actionnaires (-70 % suite à la première et -80 % après la seconde). Mais les guerres ont également d’autres conséquences structurantes sur le long terme. Le tribut payé à la Prusse après la défaite de 1870 provoque une élévation durable des taux d’intérêt. La baisse ultérieure du prix de l’argent accompagne (peut être même provoque) une envolée du cours des actions qui prend brutalement fin lors du krach de janvier 1882. L’inflation qui naît avec la Première Guerre Mondiale fait disparaître de la cote les entreprises de services publics dont les prix de vente sont figés par contrat alors que leurs coûts s’envolent. De plus, la volatilité des actions devient durablement plus élevée. Avec la Seconde Guerre Mondiale, des secteurs entiers disparaissent de la cote suite aux nationalisations qui touchent 30 % de la capitalisation d’avant guerre. Au final, chacun des deux conflits mondiaux contribue à abaisser le rôle du marché dans l’économie.

Chapitre 1, Un nouvel indice pour mesurer les performances des actions : « A Challenge to Triumphant Optimists? A Blue Chips Index for the Paris Stock-Exchange (1854-2007). » [12]

With Pierre-Cyrille Hautcœur[13]

Abstract: We analyze a new blue chips (large caps) stock index for France from 1854 to 1998. We detail its methodology and show that it differs profoundly from earlier indices, and that it is more consistent with the French financial and economic history. We suggest this result casts some doubt on many historical stock indices such as those gathered in Dimson *et al. Triumph of the Optimists*. We also provide some major results: investment in French stocks provided a positive real return during the 19th century, but a negative one – because of inflation and wars – in the 20th. Despite this century of negative real performance, stocks are still the best financial asset for the very long run but, with an equity premium lower than in the US.

Keywords: stock return, equity premium, index bias, 19th century, 20th century.

JEL classification: G1, G12, N23, N24.

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[13] Paris School of Economics – EHESS

Most empirical knowledge on the long-term performance of financial investments is derived from the behavior of the most successful markets. Those of the United States – and more broadly Anglo-Saxon countries – have been termed survivor markets. The United States, in particular, suffered no war on their national territory in more than a century, limited inflation and no true socialism. They developed modern financial theory and empirical studies earlier, so that their performance influences heavily what we think today about financial markets. Much of the rest of the world was not so fortunate. The Russian stock-exchanges and securities, which were thriving before World War One, disappeared for 70 years (on Russia, see Lizunov, 2002 or Borodkin and Konovalova 2003). Clearly, the fate of investors in Russian securities from 1917 to 1992 can be understood without portfolio indices. But Russian stocks and bonds were part of many foreign portfolios (not least French ones) up until the Soviet Revolution, so that global performance must take them into account for a global measure. The same is true for other markets such as those of Austria-Hungary or even China. In between happy Americans and poor Russians, most of Western Europe's stock exchanges suffered a chaotic 20th century, but without complete disruption (Germany being the limit because of the 1923 hyperinflation and the post-1945 dismantlement). Recent research has tried to broaden the sample of markets studied to include them, with much reason since many of them were among the worlds' most developed up until World War One or even during the interwar period (Brussels, Amsterdam, Paris, Berlin, Milan, etc), and they again weigh substantially in today's global portfolio. The 2002 synthesis by Dimson, Marsh and Staunton (Dimson *et al.*, 2002) proposes data on the 20th century for 16 countries, and ends up with an optimistic tone, although less enthusiastic than most of the literature on the US case. They show that with the exception of Sweden, Western European exchanges perform worse on average than those of overseas Anglo-Saxon countries (Canada, the U.S., Australia and South-Africa) and the U.K. (Dimson *et al.*, 2002, on Sweden, see Frennberg and Hansson, 1992). They attribute the poorer Italian, French, German or Belgian performances to the wars, inflation and nationalizations. But their data suggests that even in the worst case – Belgium – the long-term stock market performance remains positive (2.5 % yearly real return over the 20th century), and superior to that of other investments.

In this paper, we claim that a more detailed look at the methodology used in constructing stock market indices is required before any valid international comparison. Concentrating on the French case, we show that formerly accepted indices built on particular sets of assumptions can seriously mislead empirical finance research. If the theory and practice of indices has long been mastered by economists and statistical institutions (a 1922 book by Irving Fisher being still a major reference, see Fisher, 1922), stock market indices have been built in many countries up until recently with different objectives than the measure of the return for the investor (Goetzmann, 2006 or Hautcoeur, 2006). The Cowles commission in the 1930s was a pioneer in using indices in order to measure stock market performance from the point of view of an investor (Cowles *et al.*, 1938). In spite of this, even the Standard & Poor's index suffers serious flaws (Wilson and Jones, 2002, for a better index than the Cowles one, see Goetzmann *et al.*, 2000). In France, the only early attempt to build indices in that same perspective, that of the newspaper *Agefi* in the 1930s, was short lived.

In this paper, we propose a new stock index for the French stock market from 1854 to 1998, the first one built in order to measure variations in French stock prices from the point of view of the investor. We first describe the index's methodology, which is based on Euronext's HCAC 40, adapting it slightly to take into account some constraints from historical research. Basically, the index is a monthly index of the 40 most prominent shares among French firms, ranked by market capitalization. Since the selection is adapted every year, we avoid survivor bias. Our index is weighted by these capitalizations and its composition and weights are adjusted yearly. These characteristics, which are standard for today's indices, were frequently not present in older indices, which may explain a significant difference in their outcomes.

The first major result of this article is to provide new estimates of the long-term returns that holders of such a portfolio of French stocks obtained. We show that the price index (without dividends) didn't protect its owners against inflation. Its real performance was positive up until 1914 (in a period of stable prices) but it was substantially negative for the 20th century in spite of the rapid growth of stock prices since the 1980s.

When one turns to total return (including the dividend yield, supposedly tax-exempted), the performance is substantial from 1854 to1914 (more than 5 % yearly total return net of inflation), but very low for the 20th century as a whole. Since 1914, gold has proved to be a better investment than stocks.

These results contrast strongly with those of Arbulu and Gallais-Hamonno (Arbulu, 1998 and Gallais-Hamonno and Arbulu, 1995), who link the official 20th century indices to similarly constructed new indices for the 19th century and form the basis for French investment performance in the Dimson-Marsh-Staunton synthesis. We show that the reason for the divergence rests on the methodology adopted by Arbulu and the official indices, which suffer both survivor bias and weighting problems. In particular, they don't weigh the stocks by capitalization, consequently giving much higher implicit weights to small caps, leading to a seriously overvalued index in the long run.

Contrasting with the well-known results for the US, the low equity premium that we observe in France is in line with most models of risk aversion (for the US, see for example Ibbotson and Sinquefield, 1976 or Siegel, 1992). We then suggest that if our revisionist approach of French indices can be extended to other European markets, the equity premium puzzle may disappear in many of the cases discussed for example by Barro (2006), and end up (as some earlier studies already argued) as a mostly US phenomenon.

Finally, we argue that the evolution of the HCAC 40 in the twentieth century can be understood as the result of the wars and the inflationary periods, suggesting that the impact of major wars on private wealth has been underestimated up until now. The first section presents in detail the methodology of our index. Differences between earlier indices and ours are discussed and some robustness checks made in the next one. We then present the main results and the main changes in policy regimes that may explain the index performance in the long run, and conclude.

I Methodology: a weighted blue chips index along the lines of the CAC 40

The aim of this section is to detail the methodology we used to build the new index. In the very long run, even details matter, since any error is magnified by the effect of compounded interest. The index concentrates on stocks of French firms; not because French investors held only French stocks (they actually held many foreign ones, especially up until World War One according to Michalet, 1968), but because focusing on national securities is the first step generally used before considering the effects of international diversification, which could be measured using various foreign indices.

The procedure we use can be summarized as follows. The prices, dividends and number of shares are collected for all French stocks listed on the Paris official stock exchange for the first Friday of each year. Capitalizations are calculated for that date. We then take the 40 highest capitalizations for inclusion in the index for the following year, with two exceptions: when various securities of the same firm are listed, we only consider the one with the highest capitalization; we also exclude firms with less than 10.000 shares. For the 40 firms in the index, we gather monthly prices and calculate the market index by weighting these prices with market capitalizations, in order to make it reflect the actual market)[14].

We chose to build a blue chips index because the most important shares it includes are precisely those held by most investors[15]. Small firms were usually heavily dominated by family owners as in most continental Europe (see Barça Becht, 2001 or Chandler, 1990)[16]; their shares were sometimes listed in spite of being closely held because no constraint on minimum free float existed. This led these stocks to be illiquid, which was a major concern for ordinary investors (and led financial advisors to recommend avoiding them as Leroy-Beaulieu, 1906). Family control could also lead to agency problems and price manipulation, also threatening ordinary investors. Furthermore, both low liquidity and price deviations are also a problem for the building of an index and its interpretation (Dimson and Marsh, 1983). So the restriction to blue chips should help our index to represent the behavior of investors better[17] and to avoid including significant liquidity or risk premia, so that the long-term decline in returns could not be misinterpreted (Ben-Rephael *et al.*, 2008). These reasons explain the dominance of blue chips indices in financial analysis today.

Our index concentrates on French firms, which are defined by their legal status, not by the place they have their activity: the Suez and the first Panama canals are French firms. So are French subsidiaries of foreign firms such as Thomson-Houston. We consider for inclusion firms listed on all French exchanges. In practice, almost all blue chips listed on the official Paris Bourse, but there were a few exceptions, such as some Northern France coal mines that listed in Lille up to the early 1920s.

Diversification is usually considered as sufficient to eliminate specific risk when the number of stocks in a portfolio reaches thirty (Statman, 1987 for the US and chapter 9 for the French historical case). For an index weighted by stock market capitalizations, a somewhat higher number is better. We chose forty stocks in order to satisfy these requirements and to facilitate the linkage with today's CAC 40, the major Euronext-Paris index. It might be

[14] Free float would in theory be a superior alternative, but the amount of the free float cannot be reconstituted until that information started to be published in 2003 for Euronext's CAC40.
[15] Daumard (1973) provides information on portfolios held at death.
[16] British corporations may have had a more diversified ownership, see Kranks *et al.* (2009).
[17] A recent study of the individual accounts at a US stock broker in the 1990s finds an average portfolio of only four stocks, see Barber and Odean (2000).

argued that the number of stocks included should increase with time and the development of the stock market. Actually, the Paris stock exchange was well developed (in terms for example of market capitalization to GDP) quite early, and suffered a decline during the 20th century from which it recovered only in the last 30 years (Rajan and Zingales, 2003): as shown in Table 1, the proportion of our 40 firms in total market capitalization varied a lot, and with only a weak declining trend. It has also always been very high. These reasons – and the search for simplicity – led us to hold constant the number of firms in our index.

Table 1, Market capitalization of the Paris stock market (I) and that of the 40 firms in our index (II). All in current francs (euros in 2004).

	Capitalizations		
	total market value	*Cac 40 market value*	
	I	*II*	*II/I (%)*
1854	2,649,969,653	2,315,272,443	87
1864	4,359,991,607	3,971,862,650	91
1874	5,243,315,713	4,836,654,075	92
1884	9,430,442,250	8,285,218,090	88
1894	9,723,901,752	8,497,492,525	87
1904	11,153,390,647	8,656,808,620	78
1914	17,882,613,250	12,000,103,600	67
1924	46,504,668,688	23,141,902,070	50
1934	61,453,148,800	39,297,627,260	64
1945	344,273,820,138	146,588,425,880	43
1954	1,271,802,198,209	541,832,815,765	43
1964	64,432,788,900	41,592,062,800	65
1974	106,803,924,450	68,074,124,800	64
1984	260,161,534,600	162,726,587,500	63
1994	2,278031,642,440	1,624,454,500,000	71
2004	1,146,900,000,000	884,462,865,537	77

The list of the stocks included in the index is fixed following a stable, simple and transparent formula in order to avoid *ex-post* insight. This requires us to avoid today's practice of choosing the stocks composing the HCAC 40 among the 100 biggest capitalizations listed in Euronext-Paris, with the help of a scientific committee that we cannot reinvent for previous periods. We therefore include more simply the 40 stocks with the biggest capitalizations, and we rebalance the portfolio each year at the beginning of the year. The yearly rebalancing of the portfolio allows us to eliminate the survivor bias that affects many retrospective studies of stock prices. This is all the more important since a number of major firms failed during the period under study, and should not be excluded[18].

We added two minor criteria to the capitalization for the selection of stocks included in the index. The first one is a liquidity criterion: we decided to exclude from the index all firms with less than 10,000 shares. The reasons for this choice can be traced to the functioning of the 19th Paris Bourse, which sometimes listed stocks without wondering about the potential for an active market (Hautcoeur, 2007, see Courtois, 1855 for an early and frequently reprinted publication on listed firms). This was the case for some firms with a very small number of shares, especially whose statutes frequently even required the agreement of their Board for any stock transaction to be valid. We chose a low number, as 10,000 corresponds to one fourth of the average number of shares of all the firms listed on the market in 1853, the last year for which the number of firms satisfying the requirements for inclusion in the index is below 40 (the reason we start the index in 1854). In any case, that liquidity constraint only excludes a small number of firms and only during a short period, so that it cannot significantly affect the long-term performance of the index[19].

Our last criterion is the limitation to one category of stock per firm for inclusion in the index. Firms frequently had various categories of shares, especially in the 19th century: preference shares were less widespread than in the U.S., but the relationship between ordinary and other shares was sometime similar to that between ordinary and preference shares in the US. For example, <u>actions de jouissance</u> (enjoyment shares) were shares whose nominal value had been reimbursed (something frequent in the period, and even statutory in many firms whose activity depended on terminable concessions from the government, typically in railroads, electricity distribution and other utilities); this gave them no right to the “interest” part of the dividend on ordinary shares (usually 5 % of the nominal value), but a right to the “superdividend” above that “interest”. <u>Parts de fondateurs</u> (founders’ shares) were special shares, which were usually given to the firms’ founders and gave them a right to a fixed portion of the total payments of “superdividend” to all other shareholders. Shares with multiple votes became frequent in the 1920s and were prohibited by law at the end of that

[18] Early cases are Crédit mobilier (1867), Union Générale (1882), Comptoir d’Escompte de Paris, Société Industrielle des Métaux and the Panama canal (1889). More recent “quasi-bankruptcies” are Eurotunnel, Eurodisneyland, or Crédit Foncier de France.

[19] The only well-known firm that is excluded during a period because of that requirement is Saint Gobain, which is number 34 by capitalization in 1858 (a rank that increases later) but with only 4,364 shares (each priced at 33,000 francs, or some 100,000 euros in today’s money). One insurance company excluded up until the 1860s is Assurances Nationales Incendie (only 2,000 shares).

decade[20]. Since the rights to dividends of these various shares differ, their prices don't move identically (the prices of founders' shares and enjoyment shares are more volatile). Usually, founders' shares are quite closely held and would not qualify for the previous criteria; enjoyment shares increase in numbers and can become dominant in the long run for some firms.

We measure the capitalization of each category and include in the index only the one with the highest capitalization (which proves to be almost always the ordinary shares). Another solution would be to add-up the various categories into a single one or to include all categories satisfying the previous criteria. We decided on our rule for three reasons. Firstly, it is used today by Euronext for the calculation of the CAC 40[21]. Secondly, the addition of all categories into a single capitalization would create biases, since the rights on the profits of the various shares were usually different, as were their risks, justifying differences in prices and in price variations among them. Lastly, our rule is likely to reflect the behavior of investors, who probably, and with good reason, did not consider the holding of different securities in the same firm as useful diversification. In any case, this rule mostly affects a few railroads' actions de jouissance in the 19th century, and the Suez Canal in the interwar period. The year most affected is 1936, in which the activity and share price of the Canal were recovering while the French market suffered overall decline. During that year, not only were the ordinary shares of the Canal the first (by far) capitalization of the Paris Bourse, but its other shares represented more than the second and the third capitalizations put together (Table 2). Nevertheless, giving the Suez canal a weight in the index similar to that of all its shares in the capitalization would probably make the index too dependent on a single firm (at the peak, its ordinary shares represented 22.93 % of the HCAC 40, and the total of its shares as much as 32.02 %).[22]

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[20] For more details, see Hautcoeur (1999).

[21] The very existence of this rule probably modifies the behavior of today's firms, making them eliminate special shares to improve the likelihood of access to the HCAC 40 and the visibility that would give them. This was not the case in the past, but we still prefer to maintain that rule for the sake of continuity.

[22] Furthermore, this exclusion balances the fact than 40 % of the capital of Suez was owned by the British government and thus, not free float.

Table 2, First seven capitalizations on the Paris Bourse, the weight of Suez. January 1936.

Share names	Capitalizations
Canal maritime de Suez, ordinary shares	8,024,456,160
Crédit Foncier de France	2,291,250,000
Banque de France	1,697,250,000
Canal maritime de Suez, Société civile	1,652,111,850
Canal maritime de Suez, parts de fondateurs	1,634,000,000
Canal maritime de Suez, Actions de jouissance	1,394,668,800
Crédit Lyonnais	1,329,600,000

The prices used for the index are all transaction prices. On the Paris stock exchange, prices were set up until 1986 thanks to Walras-style auctioneers who gathered demands and offers for every stock and determined an equilibrium price (the fixing price) in a centralized manner at a fixed moment in the morning. Other prices could be quoted later in the day if transactions were sufficiently important. We chose to use the last price of the day for our index because some of the periodicals we used only mentioned that price.

The index is calculated using various periodicals, among which the most important is the official list price of the Paris Bourse, the *Cote Officielle*. We use a few other journals in order to complete for missing issues, incomplete data and for the shares that were not traded on the official market but on the unofficial *Coulisse*[23] or on provincial exchanges instead. The first step was to collect for the first Friday of every January the name, last price, nominal value, paid value, number of shares and dividends for every share mentioned in our sources (a number which varied from 100 to more than 600 during our period[24]). This first collection allowed us to calculate the capitalization of all important listed shares, and then to select the 40 most important ones. The second step consisted in collecting monthly prices for these 40 stocks for the first Friday of each month[25].

Within each year, our index is calculated using individual stock prices weighted by their capitalization, from January to January. Monthly returns are calculated as:

[23] The *Coulisse*, or “marché en banque” was developed outside the regulated *Bourse* during the 19th century. It was partly legalized from 1893 on. See Hautcoeur and Riva (2007) or Pollin (2007).

[24] These counts may not be exhaustive since some more shares could be traded on the Coulisse, provincial Bourses or OTC markets without being mentioned in journals, but they were marginal and could not modify our results, in particular the list of the forty major stocks.

[25] Friday was chosen because it does not correspond to settlement periods (forward operations were settled every 15 days or every month depending on the moment during our period), and because weekly periodicals, usually published on Saturday, gave Friday prices.

$$CAC\ 40_{t+1} = \frac{\sum_{i=1}^{40} number\ of\ shares^{i} * price\ of\ share_{t+1}^{i}}{\sum_{i=1}^{40} number\ of\ shares^{i} * price\ of\ share_{t}^{i}} - 1$$

where the numbers of shares are constant within each year.

Components are modified every January, using the new capitalization data and each year's index is chained to the next one using January's value as a basis. This index is based on the value of the official CAC 40 index when it was created on December 31st, 1987, which was taken as 1000.

Some technical choices were made, which we believe have no lasting impact on the level of the index. First, when a price was missing, the previous listed price was used. This happens rather frequently in the 19th century when repeated prices represent almost 16 % of the total, compared to only 4.5 % after 1914. Nevertheless, the impact should be limited because missing prices concerned mostly the smallest stocks in the sample (they represent only 2.6 % of the prices of the biggest capitalization in the index, compared to 16.4 % for the smallest). The ten biggest capitalizations, which weigh 61 % of the index on average, have only 3.88 % missing prices. Although one may consider these proportions as high, they are standard in historical finance (*e.g.* Goetzman *et al.* 2000), and they actually are a major reason for calculating blue chip indices rather than comprehensive ones. Most importantly, we don't think that our choice has any impact on our index's long-term performance.

Second choice: although the precise date at which dividends are paid have a short-term impact on equity prices payments, we don't adjust prices for that effect. First, because precise payments' dates are frequently not mentioned in our sources. Second, most importantly, because our aim is to measure long-term changes in prices, which are certainly not affected. For the same reason, we make no adjustment for capital changes (except for stock splits, for which prices were adjusted) or for firms appearing or disappearing during the year (IPOs, mergers, nationalisations, bankruptcies). Firms appearing during the year and big enough to be admitted in the HCAC 40 are included the next January. Firms disappearing are maintained up to the next January with the last price being used all months to that date (these repeated prices are included in those mentioned above). All these assumptions artificially weakly decrease the within-year volatility, but don't affect year to year changes in the index (at least as suggested by a check on the 1987-1997 period discussed in more detail below). Furthermore, these choices affect a limited number of prices, making it unlikely that the index is significantly modified.

That methodology is the one followed in order to build the pure price index. From the same sources we compute the return from dividends at the beginning of each year, which is added to the price index in order to build an index for total return. Below, whenever an index is mentioned without mention of dividends or total return, we mean the pure price index.

II Comparison to previous indices and robustness checks

2.1 Comparison

Figure 1 compares our index to the main existing indices which are usually linked to cover the whole period[26], and which we jointly call the Arbulu-SGF-INSEE index, with a common basis in 1854=108. Table 3 provides evidence that these differences were statistically significant for the periods covered by the three different authors. The discrepancies are enormous, but also surprisingly easy to explain.

The Arbulu-SGF-INSEE index links an index built by Arbulu for the 1802-1913 period to those built at the time by Statistique Générale de la France (SGF), the official statistical office, and later by its successor INSEE. This index – or part of it – has been used by all recent studies on the long run performance of the Paris stock exchange, mostly due to lack of alternatives and because of the inclusion of its most official parts in official publications[27].

The index built by SGF in the interwar period – as well as those of many other statistical institutions at the time – did not aim to measure the performance of a portfolio of stocks but rather to observe or anticipate fluctuations in macroeconomic activity (Hautcoeur,2006). For that reason, it did not focus on long-term level change. In order not to miss any impending crisis or recovery, industry indices included as many firms as possible, all of them on an equal basis since they all could equally signal down- or upturns. The aggregate index was weighted by industry capitalization but was based on these un-weighted industry indices. This method was maintained with little change by INSEE after 1945

[26] Hautcoeur and Petit (2004) or Petit (2006) provide an original index for the interwar period, with a methodology similar to ours. It includes 30 blue chips, with a slightly more conservative selection procedure since shares are chosen only if they remain at least 4 years among the biggest capitalizations of the Bourse. This may explain why it features somewhat more fluctuations.

[27] Gallais-Hamonno and Arbulu (1995), Jorion and Goetzmann (1999), Dimson *et al.* (2002) or Société des Nations (1939).

(INSEE, 1963). It was also the method used retrospectively by Arbulu (Arbulu, 1998, p.132 or Arbulu, 2007, p. 424).

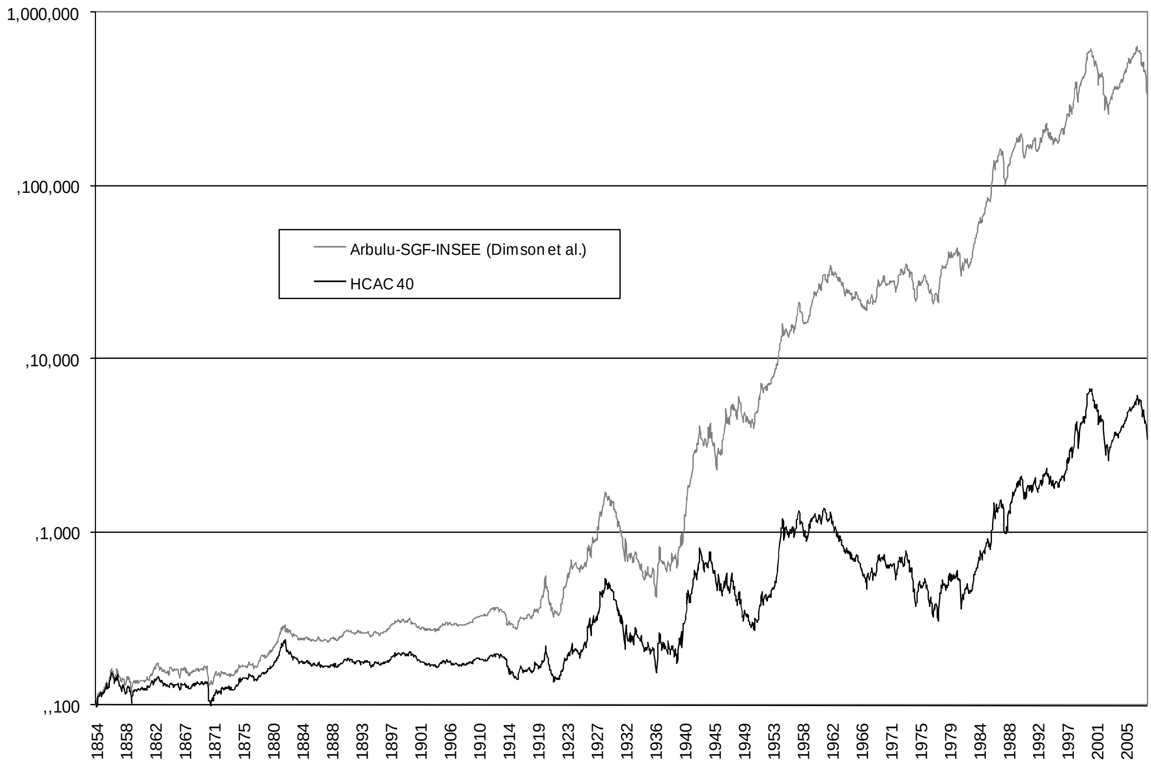


Figure 1, Our HCAC 40 index, Arbulu-SGF-INSEE index. 1854=108 basis (allows to join the official CAC 40 at 1,000 in 1988).

The upward bias stemming from broad un-weighted indices can be enormous, as one example will show. In 1963, Rhône-Poulenc was the most important French listed firm, with a market capitalization of 5.21 billion francs, or 4.6 % of a total market capitalization of 112 billion (INSEE, 1963). Within our HCAC 40 index, Rhône-Poulenc's weight is 10.35 %, since the total capitalization of the 40 first shares is 50 billion. In the SGF-INSEE methodology, Rhône-Poulenc is one among 22 firms in the Produits chimiques, électro-métallurgie et verreries group (mostly chemicals), whose weight is 15.6 % in the official index. The impact of Rhône-Poulenc shares is then 15.6/22 or 0.71 %, compared to its 10.35 % in our index. At the other end of the spectrum, Cotelle et Foucher – Javel La Croix, a chemicals firm with a capitalization of 74 million francs (or 0.066 % of the market, 70 times less than Rhône-Poulenc) also weighed 0.71 % in the index. Table 4 provides a measure for the chemicals industry in 1963 of the discrepancies between the weights in the index and those in the capitalization, showing that the overrepresentation of small firms was a general phenomenon, and one that could affect the index enormously. If, as we now know, the performance of smaller firms is on average superior to that of bigger ones, this overrepresentation of small firms creates an upward bias in the index (Fama and French, 1992 or Hamon and Jacquillat, 1992). For example, if the average difference in performance between firms included in our HCAC 40 and the others is 1 % a year, and the HCAC 40 includes only a tenth of the firms included in the SGF-INSEE index, that index should outperform the HCAC 40 by almost 1 % a year.

Table 3, Descriptive statistics for our index and the Arbulu-SGF-INSEE indices.

Descriptive statistics of Arbulu-SGF-INSEE and CAC 40								
	1854-1990		1854-1918		1919-1946		1947-1990	
	Arbulu SGF-INSEE	*Cac 40*	*Arbulu*	*Cac 40*	*SGF*	*Cac 40*	*INSEE*	*Cac 40*
Mean (annualized)	*6.34%*	*3.34%*	2.33%	1.04%	11.47%	6.40%	9.21%	4.81%
T-test (p-value)	*11.12%*		*42.98%*		*34.69%*		*29.20%*	
Standard Deviation (annualized)	*14.70%*	*16.35%*	7.36%	7.78%	23.16%	22.80%	15.87%	20.46%
F-Test (p-Value)	*0.00%*		*6.65%*		*72.04%*		*0.00%*	
Kurtosis	7.37	7.81	8.25	9.46	4.15	4.27	4.03	5.47
Skewness	58%	14%	-0.34	-0.50	0.60	0.58	-0.15	-0.40
Range	46%	58%	23%	26%	44%	41%	34%	53%
Minimum	-18%	-33%	-14%	-14%	-17%	-16%	-18%	-33%
Maximum	27%	25%	9%	11%	27%	25%	16%	20%
Count	1,643	1,643	791	791	336	336	528	528
Jarque-Berra	1,378	1,606	899	1,359	34	36	19	116
Confidence Level(95,0%)	0.0021	0.0023	0.0015	0.0016	0.0072	0.0071	0.0039	0.0050

Table 4, Actual share in total capitalization, weight in the INSEE index of stocks included in the "chemicals" industry index, and their ratio. All for 1963. Shares over-represented in the INSEE index (II/I >100 %) are in column 4, which gives the degree of over-representation. The same for under-representation in column 5.

	Market Capitalization		Weight in	weight in INSEE index /	
	in francs	*% Total Capitalisation*	General Index INSEE	% of the total market capitalization	
		I	*II*	*II/I*	*II/I*
Produits Chimiques d'Auby	103,962,700	0.09%	0.71%	771%	
Bordealise de Produits Chimiques			0.71%		
Glaces de Boussois	558,000,000	0.49%	0.71%	144%	
Le Carbonne-Lorraine	103,082,000	0.09%	0.71%	777%	
Clin-Byla	158,800,000	0.14%	0.71%	504%	
Cotelle et Foucher	**74,513,000**	**0.07%**	**0.71%**	**1075%**	
Jean Lefèbvre	146,640,000	0.13%	0.71%	546%	
Française des Glycérines	87,552,000	0.08%	0.71%	915%	
Huiles, Goudrons et Dérivés	122,949,000	0.11%	0.71%	652%	
Kuhlmann	841,522,000	0.74%	0.71%		95%
Roger Bellon	95,200,000	0.08%	0.71%	841%	
Laboratoire Toraude	83,700,000	0.07%	0.71%	957%	
Nobel-Bozel	214,405,000	0.19%	0.71%	374%	
Péchiney	1,815,460,000	1.61%	0.71%		44%
Gle d'Engrais Pierrefitte	145,935,000	0.13%	0.71%	549%	
Produits Azotés	170,550,000	0.15%	0.71%	470%	
Progil	493,050,000	0.44%	0.71%	162%	
Rhône-Poulenc	**5,213,000,000**	**4.61%**	**0.71%**		**15%**
Roussel-Uclaf	778,000,000	0.69%	0.71%	103%	
Saint-Gobain	2,613,863,000	2.31%	0.71%		31%
SIFA	207,060,000	0.18%	0.71%	387%	
Ugine	1,575,280,000	1.39%	0.71%		51%
Total market capitalization (INSEE)	**112,974,027,000**				

Other choices also cause substantial biases in the existing index. Arbulu's calculations suffer substantial survivor bias, since he chooses the shares to be included partly on the basis of their stability, more precisely he eliminates all shares which didn't remain listed at least five years, which makes him omit the Union générale (6th capitalization by size in 1882, 5.51 % of our HCAC 40, failed in 1882) or the Panama canal (9th capitalization in 1884, also soon failed), and the substantial downward impact of their failure on contemporary portfolios and attitudes towards stock investment[28].

A major flaw of the official indices built by INSEE after SGF is their treatment of nationalizations. Nationalized firms are excluded *ex-post*. They represented an enormous proportion of listed firms and even more of our HCAC 40, since they included all the railroads in 1937, and all the electricity, gas, coal, bank and insurance industries in 1945. We could not find details on how the SGF calculated the impact of 1936-37 nationalizations. Concerning the 1944-45 nationalizations, which represented 28 % of early 1939 HCAC 40

[28] On the psychological traits and consequences of the 1882 crash, see Zola (1891).

capitalization, the official index excludes the firms concerned from 1939 on (INSEE, 1950)[29], which leads to a important divergence between that index and one that would include them, as reported by INSEE insiders somewhat later (Laforest and Sallee, 1969).

Table 5, INSEE indices including or excluding firms nationalized in 1944-46. Source: Laforest and Sallee (1969)

INSEE Indices		
	Nationalized firms	
	included	*excluded*
December, 1st 1939	131	147
December, 1st 1941	380	432
December, 1st 1942	590	705
December, 1st 1943	529	676
December, 1st 1944	489	705
December, 1st 1945	450	798

In our own index, we treat nationalizations using the same rules as for other firms exiting the index. When a firm is nationalized and stops being listed, we retain the last quoted prices for the rest of the year and don't try to introduce non-market prices (such as the compensations paid by the government). The main banks are nationalized by the law of December 2, 1945, with application on January 1st, 1946; as a result there are no missing prices. In the gas and electricity industries, only one firm still belonged to our index in January 1946, in spite of the fact that the nationalization project was only presented in March 1946. This suggests that the market clearly anticipated these nationalizations, which were mentioned in the program of the Conseil National de la Résistance of March, 1944. The nationalization of coal mines was announced on December 14th, 1944 (with no details on compensations); their stocks remained listed in 1945 but their prices decreased quickly, so that none belonged to the HCAC 40 in January, 1945. Finally, no insurance firm was large enough to enter the HCAC 40. Nationalized firms then disappeared progressively from the HCAC 40 as they disappeared from the portfolios of investors, who turned to other stocks. Our methodology mimics that behavior just by maintaining consistently its own rules. It is likely that it underestimates the negative impact of nationalizations on the portfolios of their holders since in some cases, the government blocked the shareholders' investments during a long (highly inflationary) period before they obtained compensation that could be sold and

[29] INSEE, *Le mouvement économique en France de 1938 à 1948* (Paris, 1950), p. 162.

reinvested in other shares, when we assume this was done at the end of the year when the last price was quoted. Unsurprisingly, that period is the one with most divergences between our HCAC 40 and the official index.

We argue that the methodology of the existing Arbulu-SGF-INSEE index makes it greatly inadequate in order to measure the actual performance that could be obtained by investors, and that using it in that purpose would lead to a severe overestimation of that performance[30]. We synthesize them in table 6.

Table 6, Summary of the differences between the HCAC 40* and the Arbulu-SGF-INSEE index.

	stocks included	industries weighting	stocks weighting	survivor bias	treatment of nationalizations
CAC-40*	40	no industries	yes	no	standard
Arbulu-SGF-INSEE	most of them	Yes	no	some	Flawed

2.2 Robustness checks

Given the enormous difference between the traditional index and ours, one might reasonably ask for more robustness checks than just identifying the biases in the older index. A direct way to validate our own methodology is to compare it to the true CAC 40. We did so for the first decade of its existence (1987-97). Both indices are highly correlated, as can be seen in Figure 2.

Nevertheless, our own index performs slightly worse than Euronext's (7.5 percent less growth over 10 years, compared to a global rise of 185 %, or a 4 % difference). This difference is statistically not significant: tests do not reject the hypothesis of identical means, variances or distribution[31]. If it were, it would probably result from the choices in Euronext's selection method, that allowed smaller or more dynamic firms to be included, compared to our automatic selection method. In any case, that divergence is small compared to the one we observed between the Arbulu-SGF-INSEE index and our own.

[30] A comparison of the performances of our HCAC 40 and the SGF-INSEE-Arbulu index shows that the latter significantly over-performed the former in all decades but one since 1854.
[31] Khi² test of an identical distribution between the official HCAC 40 and ours is 20.45 (<36.41 as X^2 critical value 5 %).

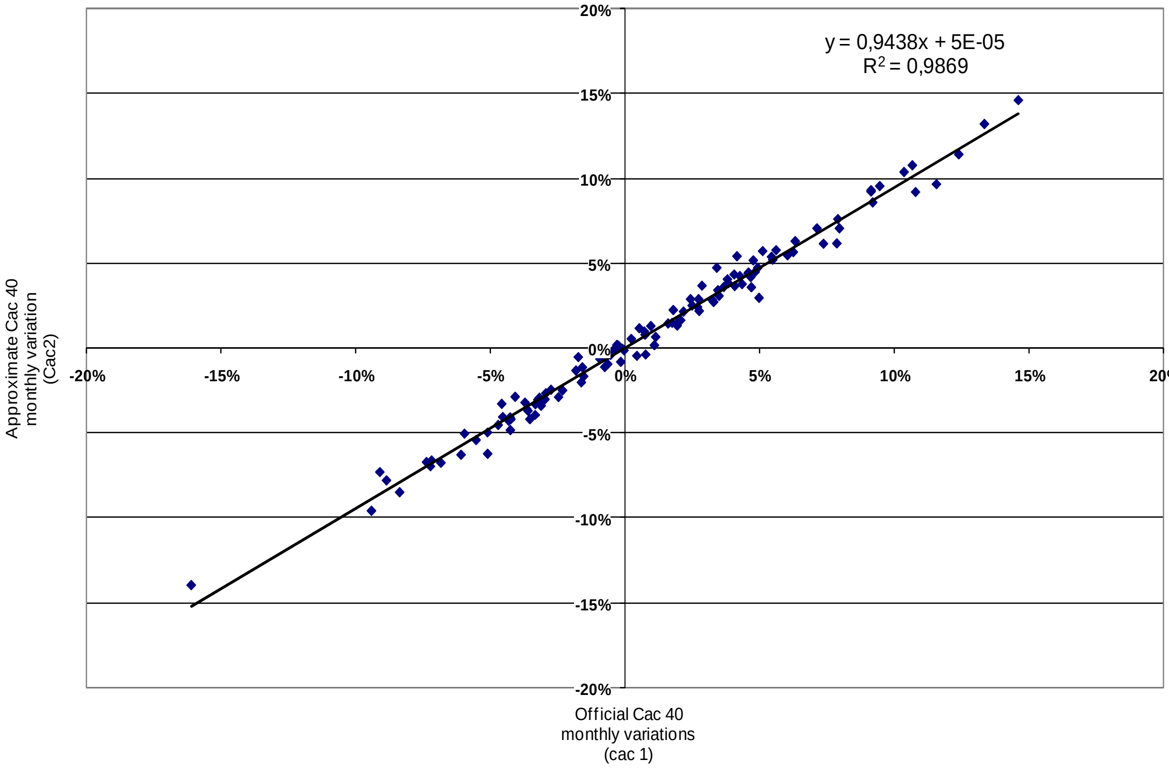


Figure 2, Correlation between the monthly price variations of the official and our index methodology. 1988-97.

We also use this period to distinguish the consequences of our selection method (strictly 40 first capitalizations) and our simplifying assumptions (rebalancing of the selection only once a year, no treatment within the year of mergers, nationalization or failure, little correction for some capital modifications). For that purpose, we calculate another index, CAC3, which is composed as the authentic one at the start of each year, but not recomposed during the year, and to which we apply our simplifying assumptions.

Table 7, Comparison of Euronext's CAC 40 (Cac1), our index (Cac2) and an index using the official CAC composition in each January but without the within-year adjustments (Cac3).

Annualised monthly price variations (1988-1997)			
	Euronext	Approximate Cac 40	
	Cac 40	*40 firsts capitalizations*	*same components*
	Cac1	**Cac2**	**Cac3**
Mean	12.32%	11.69%	12.90%
Standard-deviation	18.74%	17.80%	18.17%
Kurtosis	3.16	2.99	2.89
Skewness	-0.01	0.06	0.09
*T-test (p-value)**		*93.85%*	*94%*
*F-test (p-value)**		*57.88%*	*74%*
Correlation coefficient*		0.993	0.989

** compared with Euronext Cac 40*

Table 7 shows that – contrary to our index – this index performs *better* than the authentic CAC 40, suggesting that sample selection is the major cause of the negative difference between our index and the official one, and that our simplifying technical assumptions *per se* would more probably bias the index upward – if there is a bias. This would then mainly reinforce our conclusions.

The official CAC 40 also presents an assumption that we did not apply to our historical reconstruction: it imposes a 15 % maximum on the weight of any stock. Our historical data (Figure 3) show that the share of the biggest firm (even when restricted to its most important share, as described above) varies heavily, and that this 15 % ceiling was bypassed in 21 years of our sample. But recalculating our index with a 15 % ceiling showed no significant impact. Since such an assumption has little theoretical support, we preferred to retain our unlimited index.

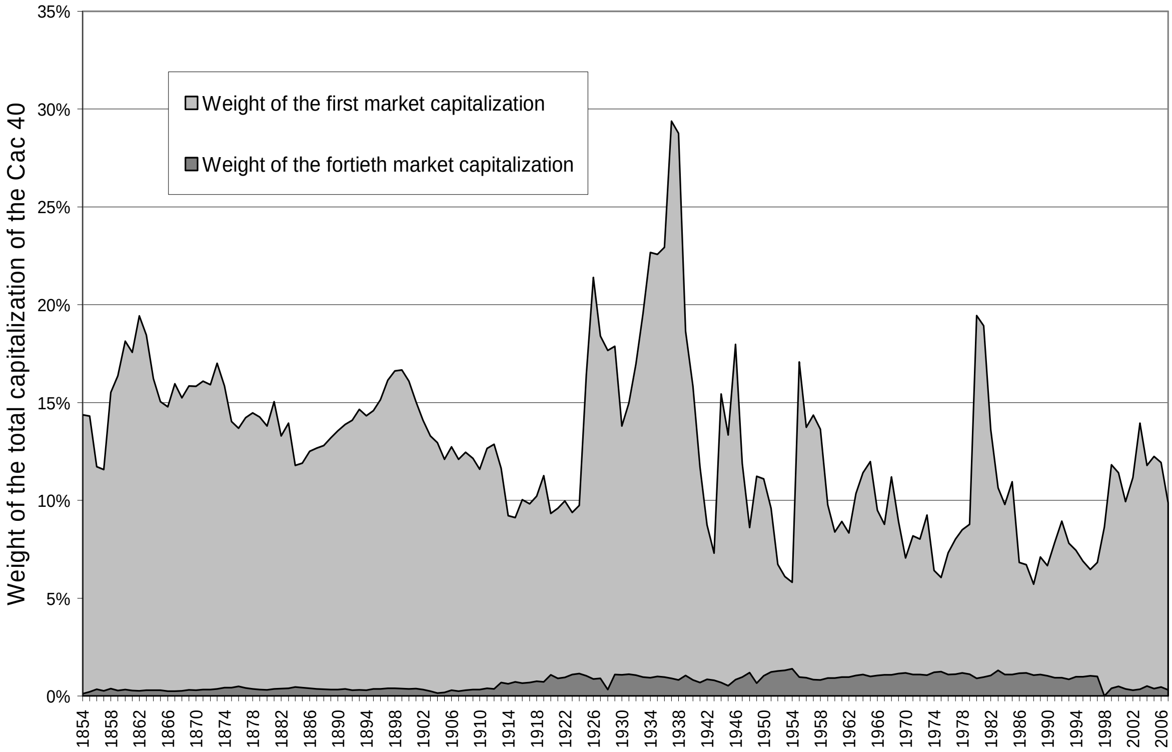
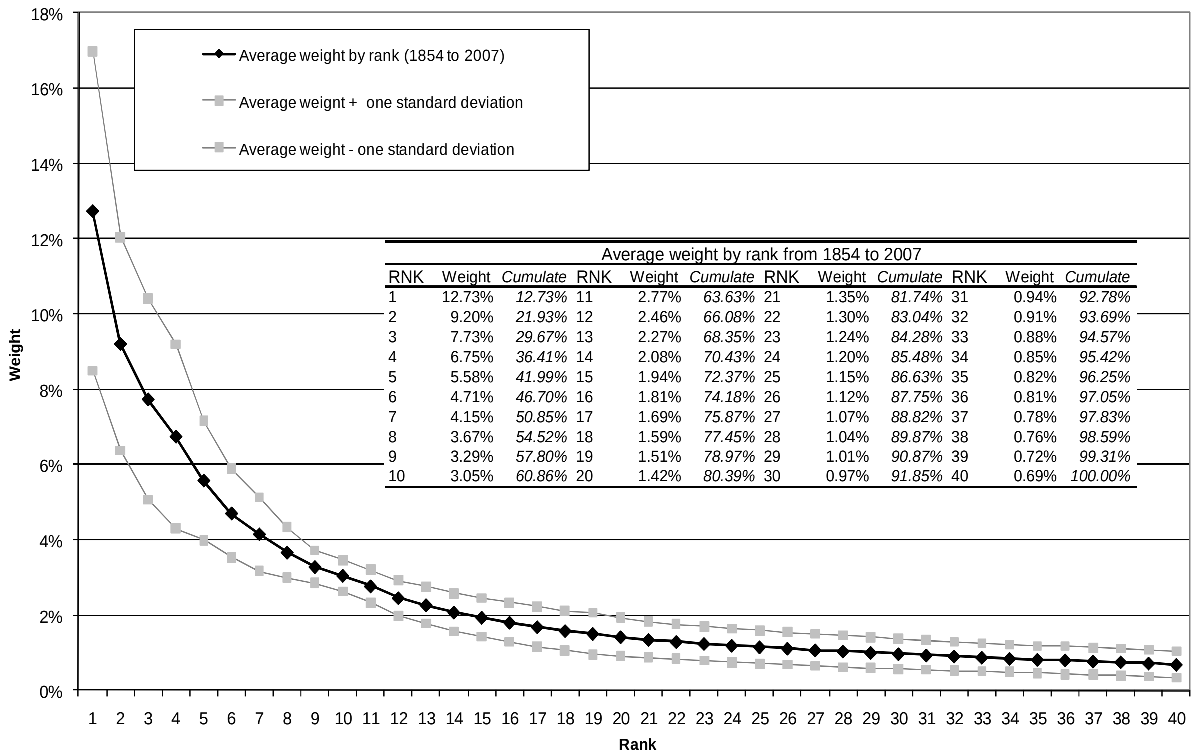


Figure 3, Shares of the biggest and smallest capitalizations in our HCAC 40.

Another robustness check considers the impact of the number of stocks included in the index. As we explained above, we chose a blue chips index in order to correspond to the behavior of most investors and to maximize the data quality. We chose 40 stocks for continuity with today's CAC 40 and because we considered 40 as a sufficient number for diversification purposes. Somewhat higher numbers would also be consistent with this rationale, but not necessary; broadening the index to 50 stocks would not change much, in any case, because the marginal stocks have very small capitalizations compared to the first 40. Figure 4 shows that the weight of the last 10 stocks included in the HCAC 40 is 8 % on average between 1854 and 2006, the weight of the 40^{th} one being 0.69 % on average. Adding a few more stocks would probably have little effect on the index. Admittedly, a constant number of stocks in the index implies a varying weight of the HCAC 40 firms within total market capitalization of Paris-listed stocks, but as we mentioned earlier, this variation has no trend. We consider this is not as important an issue as the standard diversification behavior of investors.



Average weight by rank from 1854 to 2007

RNK	Weight	*Cumulate*	RNK	Weight	*Cumulate*	RNK	Weight	*Cumulate*	RNK	Weight	*Cumulate*
1	12.73%	*12.73%*	11	2.77%	*63.63%*	21	1.35%	*81.74%*	31	0.94%	*92.78%*
2	9.20%	*21.93%*	12	2.46%	*66.08%*	22	1.30%	*83.04%*	32	0.91%	*93.69%*
3	7.73%	*29.67%*	13	2.27%	*68.35%*	23	1.24%	*84.28%*	33	0.88%	*94.57%*
4	6.75%	*36.41%*	14	2.08%	*70.43%*	24	1.20%	*85.48%*	34	0.85%	*95.42%*
5	5.58%	*41.99%*	15	1.94%	*72.37%*	25	1.15%	*86.63%*	35	0.82%	*96.25%*
6	4.71%	*46.70%*	16	1.81%	*74.18%*	26	1.12%	*87.75%*	36	0.81%	*97.05%*
7	4.15%	*50.85%*	17	1.69%	*75.87%*	27	1.07%	*88.82%*	37	0.78%	*97.83%*
8	3.67%	*54.52%*	18	1.59%	*77.45%*	28	1.04%	*89.87%*	38	0.76%	*98.59%*
9	3.29%	*57.80%*	19	1.51%	*78.97%*	29	1.01%	*90.87%*	39	0.72%	*99.31%*
10	3.05%	*60.86%*	20	1.42%	*80.39%*	30	0.97%	*91.85%*	40	0.69%	*100.00%*

Figure 4, Average weight of the firms in the HCAC 40 ordered by weight.

A last robustness check is provided by the calculation of an equally-weighted index based on the same sample as ours. Unsurprisingly, the performance of the equally-weighted index, which over-weights the (relatively) small firms in the index, is better than that of our capitalization-weighted index (table 8). This confirms the importance of a strict selection method and of the frequent adjustments in sample and weights.

Table 8, Differences between equal-weight and market cap weight HCAC 40. 1854-1997.

	Dividend Yield		**Annual Price variation**			**Total Nominal Return**			**Total Real Return**		
	average	*stdev*	arit	geo	*stdev*	arit	geo	*stdev*	arit	geo	*stdev*
I equally-weight Cac 40	3.93%	1.38%	4.24%	2.52%	19.79%	8.16%	6.45%	20.07%	2.93%	0.97%	19.97%
II Cac 40	3.85%	1.41%	3.71%	2.21%	18.46%	7.56%	6.07%	18.72%	2.38%	0.61%	19.14%
Differance I-II	0.08%	*-0.03%*	0.53%	0.31%	*1.32%*	0.60%	0.38%	*1.35%*	0.55%	0.36%	*0.83%*

III Results

3.1 Nominal performance

Table 9 summarizes the price variations, dividend yields and total nominal return of the HCAC 40 from 1854 to 2006 and for various sub-periods (the choice of which we explain below). Over the whole period, total nominal return was 8.02 % (arithmetic mean), from which the dividend yield represented 3.84 % per year, almost as much as capital gains –price variations in the index – which attained 4.18 % per year on average. If we exclude the 1914-1950 "wars" period for the moment, total nominal return increased from 5.55 % before 1914 to 7.28 % from 1951 to 1982 and a record 15.98 % from 1983 to 2006.

Table 9, Major characteristics of the HCAC 40 returns (distinguishing price variation and dividend yield) for various periods. (in percentage).

	1854-2006	1854-1913	1914-2006	1951-1982	1983-2006
Price variation					
Arithmetic Mean	4.18	1.11	6.2	3.63	12.83
Standard Deviation	19.12	7.32	23.63	24.21	24.16
Dividend yield					
Arithmetic Mean	3.84	4.52	3.41	3.64	3.15
Standard Deviation	1.39	0.95	1.46	1.77	0.78
Total nominal return					
Arithmetic Mean	8.02	5.55	9.61	7.28	15.98
Standard Deviation	19.31	7.53	23.95	24.58	24.34

Over the period, the relative contributions of dividends and capital gains varied substantially. Their relative volatilities were also very different. Capital gains almost permanently increased, from a very low level of 1.11 % per year before 1914 to 2.8 % in the interwar period, 3.63 % from 1951 to 1982 and 12.83 % in the recent 1983-2006 period. It is not surprising, then, that dividends represented a decreasing proportion of total return. While dividend yields averaged 4.52 % before World War 1 (more than 80 % of total return), they decreased to 3.87 % in the interwar period, 3.64 % from 1951 to 1982 and 3.15 % from 1983 to 2006.

Unsurprisingly, prices were much more volatile than dividends with respective standard deviations of 19.12 % and 1.39 % for the whole period. The volatility of the pure-price index increased from a low 7.32 % before 1914 to 20.88 % in the interwar period and around 24 % after 1950.

World War 1 appears as a rupture in volatility series (Figure 5). After a long period of decreasing volatility from 1854 to 1914, it increased sharply and remained high throughout the 20th century. On average, standard deviation almost tripled from the 19th century to the 20th. A chi-squared test comparing the distribution of monthly variations for 1854-1913 and the same number of months after 1914 clearly rejects the hypothesis of identical distributions[32]. This much higher volatility could be interpreted as the sign of a high inflation risk, although its persistence in the most recent period suggests another explanation may be necessary.

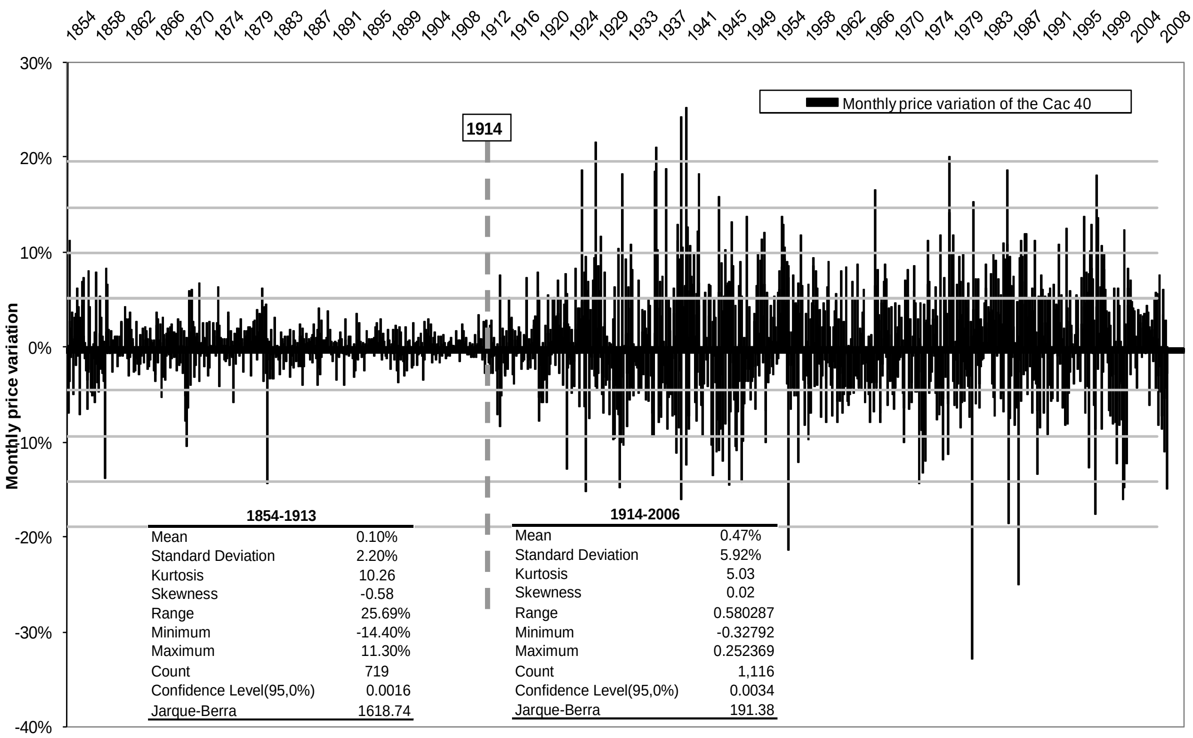


Figure 5, Monthly price variation of the HCAC 40 index. 1854-2006.

The volatility of dividends was much lower and stable, with a standard deviation below 2 % during all sub-periods. Actually, dividend smoothing was probably a standard practice in the short run, as can be seen in Figure 6, where most of the short run changes in

[32] This test does not suppose a Gaussian distribution (see below): we distribute the variations in classes by quarter of standard deviation, which allows us to compare the distributions directly.

dividend yield can be accounted for by variations in stock prices rather than by autonomous changes in dividends.

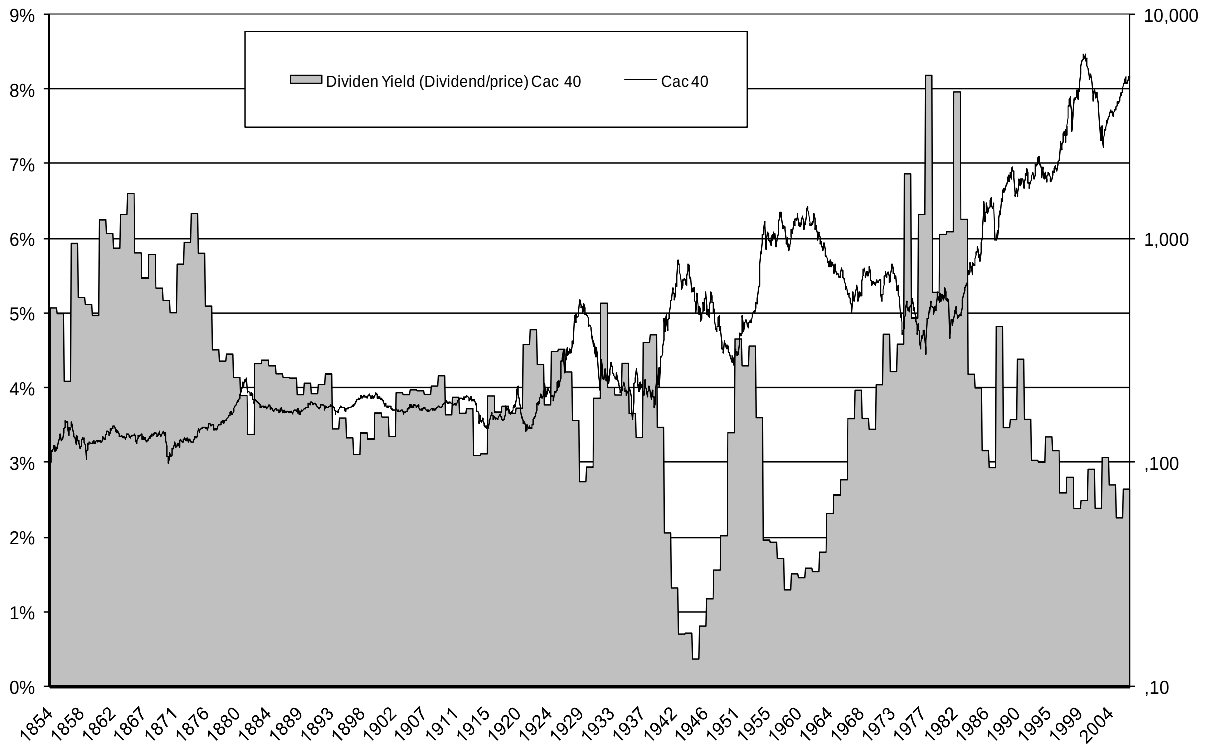


Figure 6, Dividend yield for HCAC 40 firms.

Overall, the decreasing importance of dividends is consistent with the change of dividend behavior that has been documented in various countries for the period around the First World War. It can be interpreted as a tax optimization choice, since in many countries (including France) the taxation of dividends increased substantially during that period compared to that of capital gains. It can also result from changes in corporate governance and investment strategies, especially the emergence of modern corporations in which shareholders were marginalized by managers and profits were increasingly reinvested[33].

Up to now, our results are more or less in line with the standard history of stock prices, in which the most significant changes are the acceleration of capital gains and the relative decrease of dividends in the 20th century, in relation to the emergence of general inflation in

[33] Berle and Means (1932) or Chandler (1977). Rutterford (2004) suggests the dividend was long the major information on stock value, hence high dividend yields as a proportion of total returns. Goetzmann (1993) observes the same pattern on various markets.

that period. What is most specific to France is the real performance, once that inflation is taken into account.

3.2 Real performance: wars or policy regime changes?

The real long-term performance of the HCAC 40 index (without dividends) was significantly *negative* from 1854 to 2006: with on average a 4.18 % increase, the HCAC 40 was far from the average inflation of 5.64 % (see figure 7 and table 10, section A). Real returns actually reflect mostly the impact of inflation: they were slightly positive (0.7 % per year) before 1914, negative from 1914 to 1982 (-7.4 % per year) and again positive since 1983 (10.42 % on average).

To our knowledge, a negative return for such a long period is unique to the French market. One may wonder whether the problems lie in the consumer price indices we used. We don’t think so, for a number of reasons. Firstly, French price indices were developed since the late 19th century by high-quality and up-to-date statisticians involved in international methodological discussions, so there is no reason for French indices to be more upward-biased than those of other countries (Desrosières, 1998). Secondly, contrary to stock market indices, they have been checked for consistency with other macroeconomic variables for decades (Lévy-Leboyer and Bourguignon, 1985 or Villa, 1993). Thirdly, biases could also be downward, since underestimates during periods of price controls (wars in particular, but for some products in France up to the 1980s) may not have been corrected in the later periods. Fourthly, the underestimation of quality changes, which is the most-argued reason for upward biases in consumer price indices, is likely to be more important in low inflation and service-dominated economies such as the French one in the recent period, precisely the only one during which the real performances of the stock market are high.

One may argue that a correct measure must include the reinvestment of dividends to appreciate the total return. On that account, the average total real return from 1854 to 2006 was only 3.05 %, far from the 8.3 % observed for US stocks (Siegel, 1994). Furthermore, this performance was not constant over time. A clear regime change appeared with World War One. From 1854 to 1913, the HCAC 40 holder who reinvested all his dividends earned a 5.39 % yearly real total return, slightly below the 5.58 % nominal one, when from 1914 to 2006, the nominal total return increased to 9.61 %, but real total return decreased to 1.53 % (and a negative –1,26 % in geometric mean). These period to period changes are all statistically highly significant, and the radical departure from 19th century metallic standards and price stability with the start of World War One makes it unnecessary to use technical tools to identify the watershed date. One must conclude that investment in French equities just protected wealth against inflation during that period, even when reinvesting all dividends, something which has been observed in other countries, but never for such a long period[34].

The literature has already highlighted the negative impact of the wars on the returns on equity investments (Dimson *et al.*, 2004), but has never found it as important and long-lasting as we do. In order to distinguish the immediate impact of the wars from more lasting impact on returns, sections F and H of table 10 measure the impact of both wars when including in the “war period” the years until GDP returned to its pre-war level (1922 after World War One, 1950 after World War Two). The total yearly returns of the HCAC 40 during these two war periods are particularly bad, below –10 % in both cases in real terms, in particular because of high average inflation rates (during World War Two, dividends were legally capped, which may have contributed to low returns). A broader view, in line with the characterization (by no less than Winston Churchill) of the whole 1914-1945 period as the “Second Thirty Years War” (Temin, 1993), suggests that we consider the entire 1914-1950 period as one of war and reconstruction, in which low returns were the price paid by wealth owners for the destruction and costs of the wars. That perspective fits well with our data, which show that the yearly real total return of the HCAC 40 was hardly positive during the 1923-1939 period (a consequence of some remaining inflation in the mid-1920s, of the Great Depression, and of renewed inflation in the run-up to the war from 1936 onward).

We could then consider that the “normal period” only resumed in 1951. Does this period represent a comeback to the sort of performances the French financial market provided before World War One? The answer to that question is not straightforward, as can be inferred from Figure 8. On the one hand, the 1951-2006 period considered as a whole presents very similar returns to those of the pre-1914 period (6.38 % yearly real total return between 1951 and 2006, compared to 5.39 %, see table 10), even if volatility remains much higher (24.64 % compared to 8.86 % before 1914 for standard deviation of real returns). On the other hand, this period is quite heterogeneous according to many cri

[34] The literature on the relationships between stock real returns and inflation is huge. It frequently finds some negative correlation for the short run, but not in the long run. See Boudoukh and Richardson (1993), Geske and Roll (1983), Fama (1981), Ely and Robinson (1989), Siegel (1994), Sharpe *et al.* (1999) or Ibbotson Associates (1997).

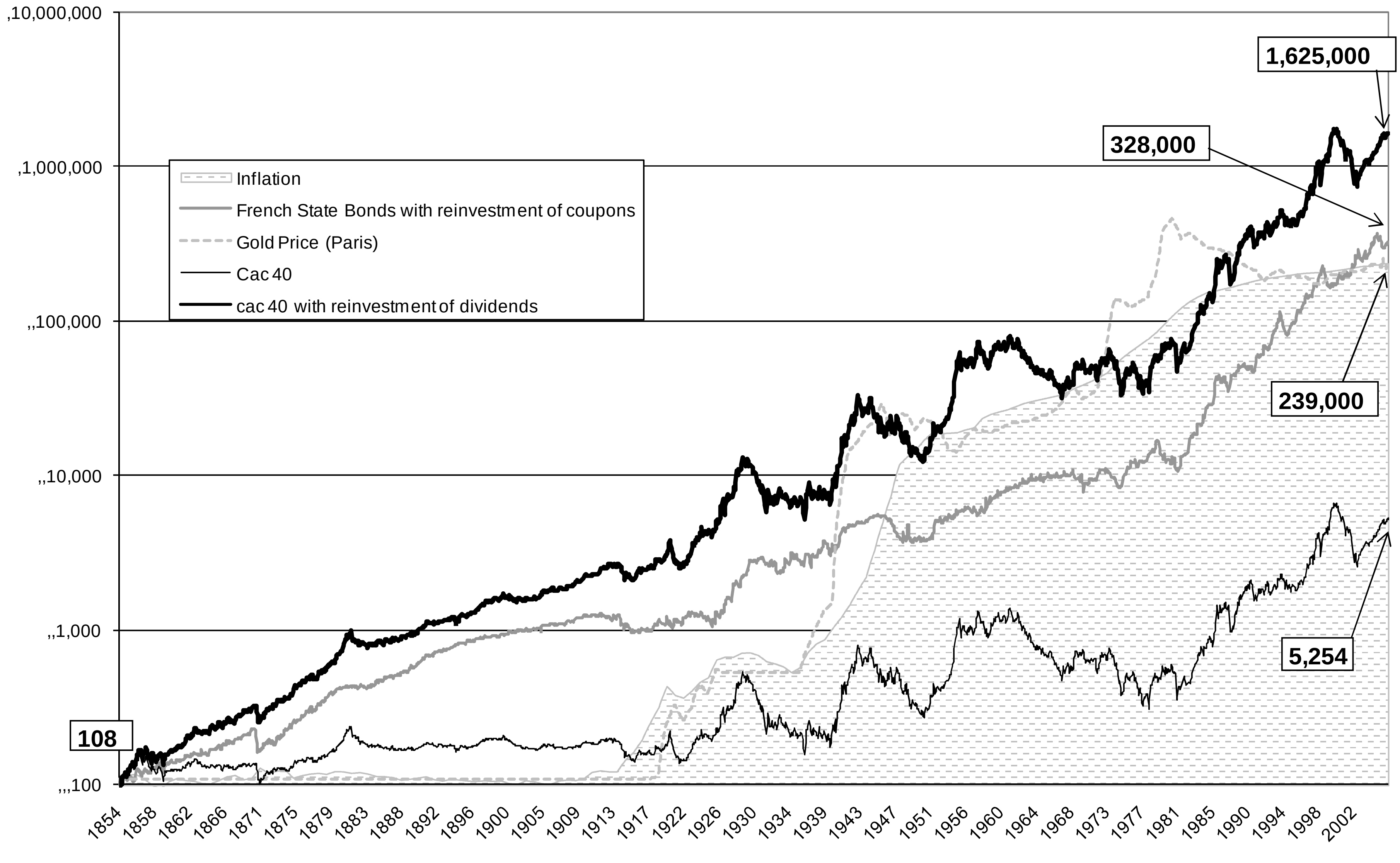


Figure 7, Long-term performance of investment strategies in various French assets. 1854-2006.

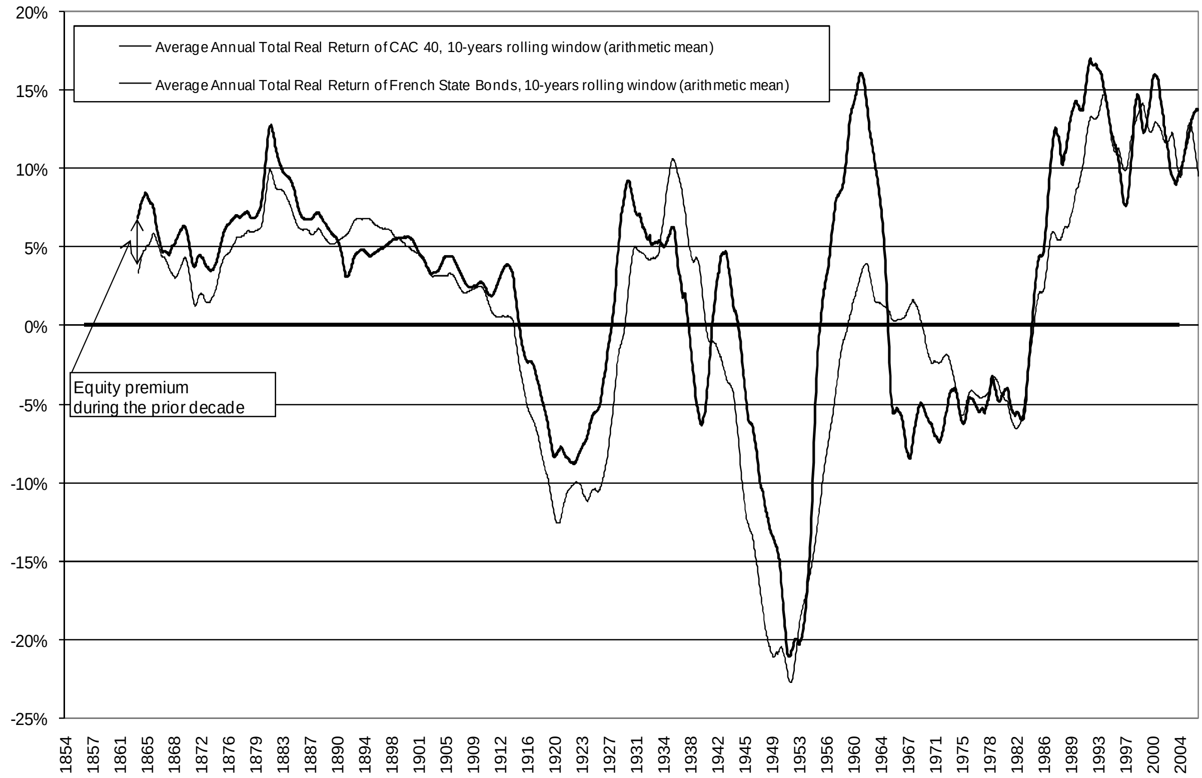


Figure 8, Average total real return of HCAC 40 and French government bonds. (10-years rolling window)

A first one – a major one for our subject – is inflation. If one wonders when the long inflationary experience that started in 1914 ended, two dates stand out as worth investigating. The first is 1958, when France established a new Republic, adopted a convertible currency under the Bretton-Woods system and implemented the stabilization policy that was considered necessary in order to do that (the Pinay-Rueff plan). The decade from 1959 was actually one of stable prices and a stable French currency anchored on the Gold Standard. But it may be considered a parenthesis, since inflation again rose above 5 % a year as soon as 1969. The second possible regime change is the “tournant de la rigueur” (move to a policy of “austerity”) under President Mitterrand, when Keynesian macroeconomic policies were abandoned and monetary stabilization made a priority (a move dated either from the second devaluation of June 1982 or, more frequently, from March 1983). From 1983 on, the inflation rate remained below 10 % by year. And the average inflation rate, which was as high as 15 % during the “Thirty Years War”, and still 6.5 % from 1950 to 1982, fell to only 2.5 % after 1983. This suggests that 1983 was the actual end of the long inflation episode.

Another reason for considering the 1983 change as important can be seen in Figures 1 and 8: the 1958 stabilization actually does not correspond to any marked change in the HCAC

40, which was increasing up until 1955 and started decreasing from 1962 until it reached three minimum values in August 1967 (468 points), February 1978 (307 points) and July 1981 (370 points). However, a clear switch to a period of sharply-rising stock prices can be observed in 1983. We then give in Table 10 (sections J, K, B and L) the values for long-term performances for the 1951-1982 period as well as for the 1951-2006 period, and for 1854-1913 and 1983-2006 for comparison. The real performance of the HCAC 40 changed from approximately 5 % per year before 1914 to null or slightly negative from 1951 to 1982, and to a positive 10.6 % from 1983 to 2006. That glorious final period brings the average yearly real returns during the second half of the 20th century to levels above those of the late 19th century.

Then, we may consider that the major reason for the low performance of the HCAC 40 index in the 20th century is the succession of two World Wars in the first half of the century. If we exclude these periods (as in section B of Table 10) the HCAC 40 performs reasonably well over the very long run, although not as well as the US stock market. This is also true if we consider only the second half of the 20th century. Nevertheless, it remains intriguing that this period includes two such different sub-periods. This suggests that not only the World Wars, but maybe also policy regime changes may have a role in explaining the long-term performances of the Paris stock market.

In summary, when the 19th century appears as a normal and comprehensible period from the point of view of contemporary stock markets, the 20th century proves more difficult to assess. Two different accounts of the 20th century are possible. The first considers the long war period as the only reason for low stock returns, and insists on the normal level of equity returns over the very long-term after 1950. The other, consistent with the "short 20th century" (1914-1982) view, considers that the period of exceptionally low real returns stopped only in 1983, a moment at which those who owned (or bought) stocks benefited from an exceptional increase in prices and returns, lasting up until recently. That view also claims that the recent period (since 1983) does not appear as a return to the 19th century: not only are overall real returns higher (which may result mostly from a shorter period, which incorporates little bear market yet), but volatility remains very high (actually slightly higher than in the "20th century") and dividends remain low.

3.3 Comparison with other investments

A well-known result of US long-term investment is the equity premium puzzle: in the long run, equities perform not only better than other investments, but the return they provide is higher than what their higher volatility requires as a compensation for risk. Although no explanation for this fact has found widespread acceptance, it has provoked much discussion; its validity outside the U.S. still requires detailed scrutiny using high quality data. In the French case, an equity premium also exists for the whole of our long period, but it remains low. Stocks are the best investment despite long periods of negative real returns since bonds and the money market perform even worse. As shown in Table 11, the equity premium compared to bonds was 1.75 % on average from 1854 to 2006, and was below 2.5 % during all sub-periods except World War Two and the most recent period.

Table 11, Equity premium compared to bonds or bills for various periods. (in percentage).

	Equity premium			
	stocks minus bonds		stocks minus bills	
	arit	*geo*	*arit*	*geo*
1854-2006	1.75%	0.96%	3.45%	1.98%
1854-1913	1.37%	1.34%	2.52%	2.25%
1914-1922	0.48%	0.69%	-3.49%	-3.46%
1923-1938	-1.27%	-1.63%	2.45%	1.12%
1939-1950	5.85%	3.24%	6.35%	2.80%
1951-1982	2.24%	0.37%	1.06%	-1.40%
1983-2006	1.65%	0.28%	9.29%	6.75%
1951-2006	1.93%	0.29%	4.72%	2.09%

This level of equity premium seems more consistent with standard financial theory than the levels found in the US. Figure 9 draws a risk line for the French financial market for various sub-periods and table 10 gives detailed data for all periods. Although the evidence is indicative rather than conclusive, given the limited number of separate points included, Figure 9 suggests that returns were to some extent related to risks, with no excessive risk premium for equities.

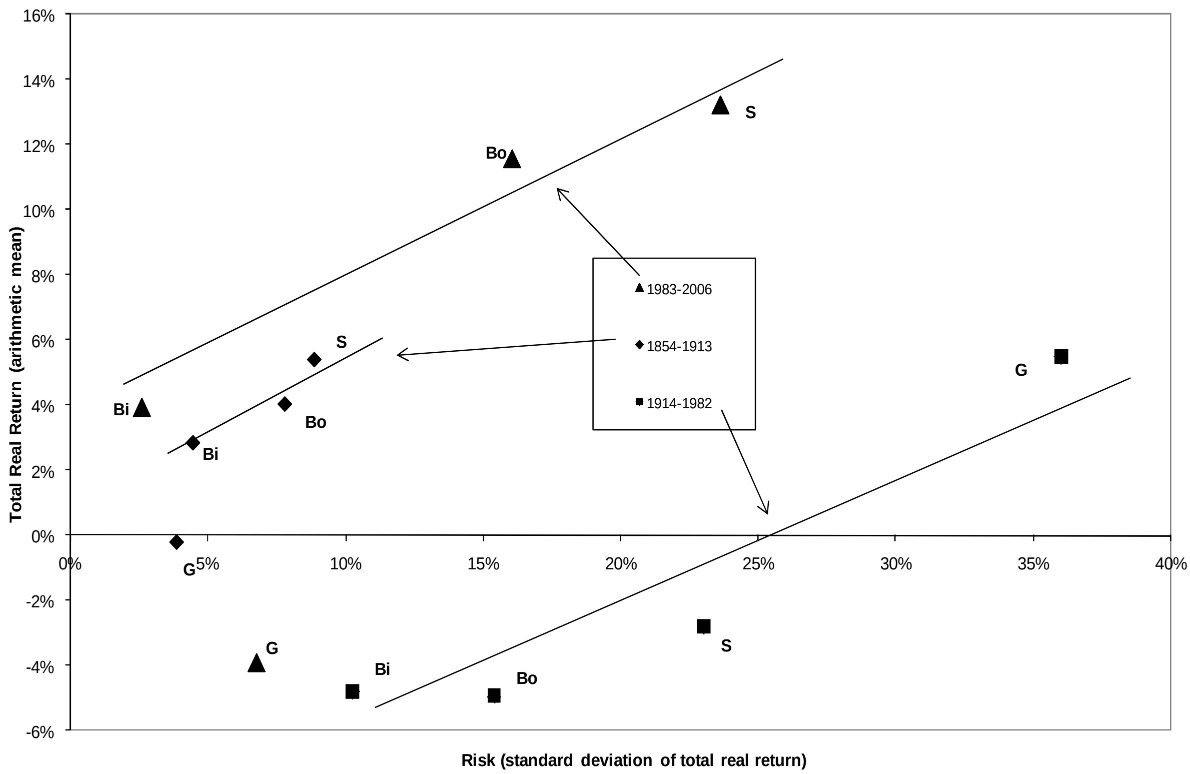


Figure 9. Risk-return line for the French financial market, over three periods. Note, S: stocks, Bo: Bonds, Bi: Bills, G: Gold. Sources: see bottom of Table 10.

Two points are striking. One is that the risk line moved a lot during the 1914-1982 period, compared to its position for the previous and subsequent periods. The second is the high risk and high return for investments in gold precisely from 1914 to 1982. In a period of unstable monetary regime, during which France was on the verge of hyperinflation at least once (at the end of World War Two), gold became a valeur refuge that was highly priced by French investors[35]. Holding gold allowed one to escape both taxation and monetary confiscation, and provided sufficient liquidity despite the legal risks. In particular, gold was internationally valued and then provided for international diversification when it was forbidden by exchange controls. This was not an absurd behavior, as has frequently been argued, since gold obtained the highest average return on that period despite paying no income. From the position of gold on the risk line, we can argue that an optimal French portfolio in keeping with the Markowitz definition should have included a significant proportion of gold from 1914 to 1982. This suggests French investors were rational in investing so much in gold, even if it may have been costly in terms of lost economic growth.

[35] Some of the prices for gold used here are measured on the black market, since at some periods there was no free market for gold in France. This may affect their reliability on the short run, and the volatility observed.

On the other hand, gold was an underperforming asset during periods of stable prices, even if recent events suggest it can still protect against some risks.

In summary, when stocks dominate gold (in stable periods) they also dominate bonds, while when gold beats stock (in inflationary periods) it also beats bonds. Then, the issue for French investors was not one of choosing over financial instruments but whether to invest in the (French) financial market or not.

Investments in real estate may have been even better than gold. Existing data suggest not only that the return on a flat bought and rented out in Paris was approximately as high as the return on gold, but also that the risk was much lower[36]. This may explain why real estate investment was so much favoured by the French as a protection against inflation. Nevertheless, these high performances may also result from a simple liquidity premium and a survivor bias, since the success of Paris as a major international city cannot be compared to that of many other French towns, not to mention rural areas whose population fell during the period. It may well be that although the owners of Parisian flats did well by renting and reselling them (with a negative period of rent constraint mostly limited to 1914-50), the result cannot be extended to other real-estate investments.

Our data also look consistent with the performances of other markets: the risk line for 1854-1913 drawn on Figure 10 suggests that returns in France were consistent with those for various financial assets on other markets. Jorion and Goetzmann (1999) suggested that the equity premium in the U.S. may be the result of a survivor bias at the level of the American market as a whole, compared to the global stock market, and that the U.S. actually diverged from most European countries after 1914, since they were much less affected by the two World Wars. Our data suggest that the U.S. market performance was already very high before 1914, but also that this was the normal price to be paid to those willing to participate in such a risky market compared to the French one[37], making its holding consistent with an optimal international allocation of capital (Le Bris, 2009 or chapter 8).

[36] Friggit (2007) build an index for Parisian real estate using a repeated sales methodology. Simonnet *et al.* (1998) collect stock prices of La Fourmi Immobilière, a firm who managed the same Parisian buildings on a pure-equity basis from 1905 to 1995.

[37] The US index used here is broader than ours, which may partly explain a higher return and volatility, but the difference is too big to be explained entirely by that fact.

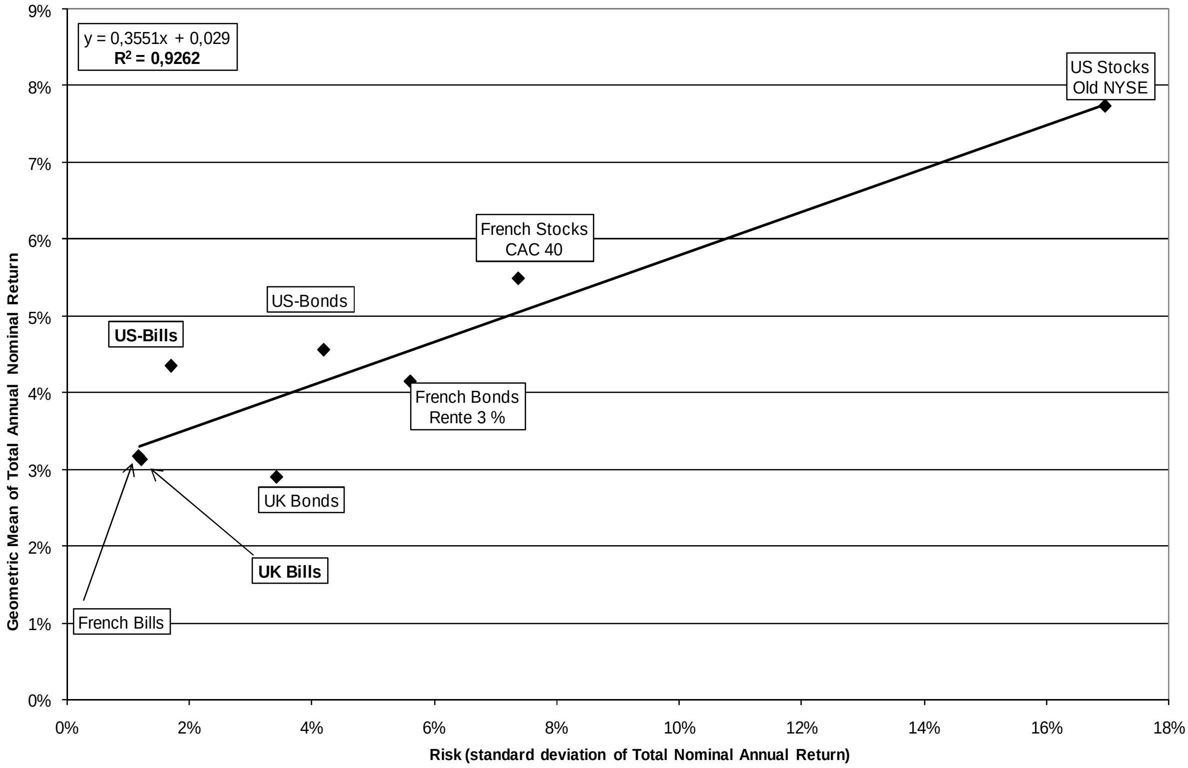


Figure 10, International risk-return line. 1854-1913. Sources: US Stocks: 1854-1870: monthly data, "Old NYSE" Goetzmann, Ibbotson, Peng (2000), 1871-2008: monthly data, Cowles-S&P according to Shiller version, available online: http://www.econ.yale.edu/~shiller/data.htm, US long-term rates: 1854-1871: New England selected interest rates, annual data interpolated, Homer & Sylla (1998), 1871-1913: monthly data, Schiller online, US Bills: 1854-1913: open market rate of discount, annual average interpolated, Homer & Sylla (1998), French Bills: 1854-1864: Banque de France's taux d'escompte, annual data interpolated, INSEE's Statistical Yearbooks, 1864-1913: taux du marché interbancaire, monthly data, NBER and Banque de France), UK Consols: 1854-1913: monthly data, Kloveland (1994), UK Bills: 1854-1913: open market rate of discount, annual average interpolated, Homer & Sylla (1998).

3.4 A long marginalized financial market

The poor performance of the French stock index for the "short 20th century" might result from inefficient pricing or from exogenous shocks on the French economy. We will argue in another article that the functioning of the French market was not qualitatively different from that of other markets. We will show below that the behavior of the index cannot be separated from the long decline in financial markets in 20th century France, itself a by-product of its economic and political history.

We consider that the singular trajectory of the HCAC 40 must be related to the structural changes in the French financial market during the 20th century. The first one is the impact of the wars. This is visible in the evolution of dividend payments (Figure 11), which fell after the First and even more after the Second World War (beyond the cap imposed during the war). It resulted partly from the negative impact of the wars on profits, and partly from inflation, which made nominal profits and dividends appear higher than their true level, and exposed them to high taxes. In the case of public utilities subject to government price regulation, inflation frequently led to price caps and to a reduction in profits (Hautcoeur and Grottard, 2001). As we already mentioned, the decrease in dividend yields may have resulted from an adaptation of firms to the rise in corporate and personal income taxes, a rise which was very sharp during and after World War One and was followed by a gradual decrease that only really started in 1960[38]. The 1914 level of overall dividend payments by the HCAC 40 firms was not surpassed until 1968.

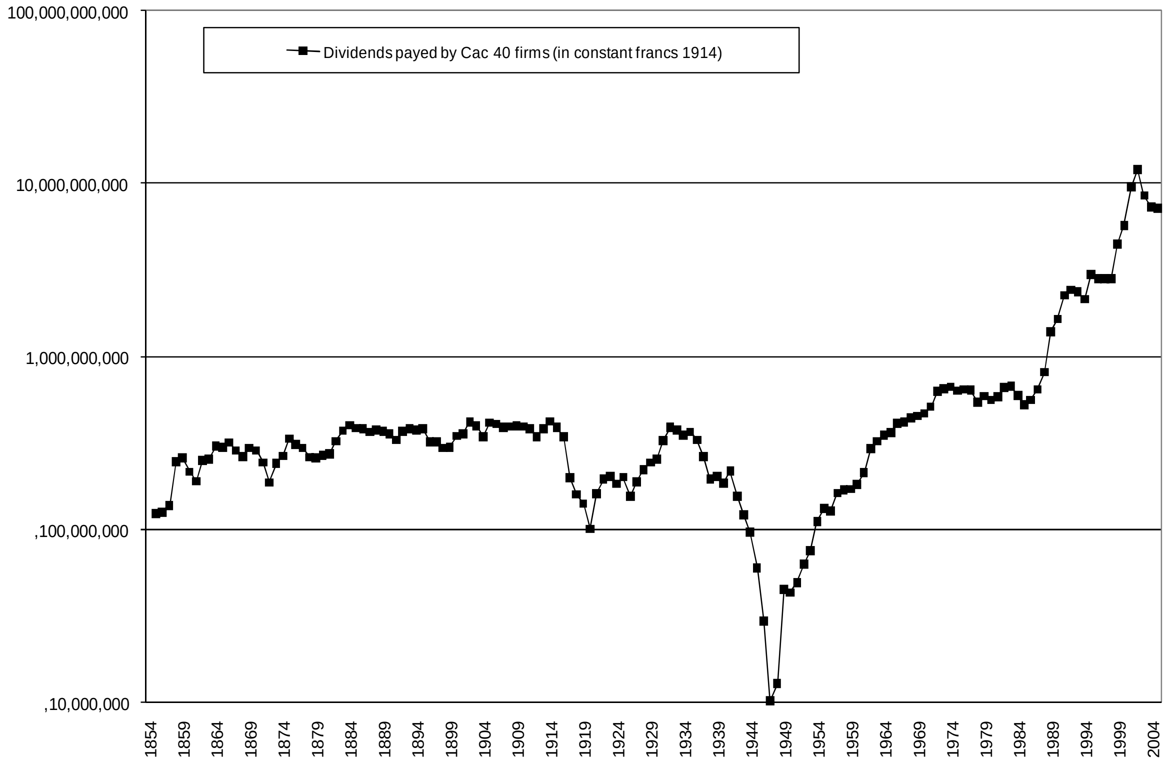


Figure 11, Dividends paid by HCAC 40 firms. 1854-2006.

The main explanation for this is not an overall stagnation of the economy or even of profits. It is the government interference in many firms, and especially the nationalization of many of the biggest corporations. The nationalized firms were certainly not always as profitable as they had been previously, as in the case of the railways, whose profits had been stagnating for years (partly because of regulation). Nevertheless, the nationalization of the

[38] On the creation of profit taxation in France and the problems in measuring its impact in an inflationary period, see Hautcoeur and Grottard (2001) and Piketty (2001).

arms industry and the railways (1937), and after World War Two that of the electricity, coal, gas, insurance and banking industries (including Bank of France), deprived the stock markets of many of their biggest listed securities. The last (short-lived) case was the 1982 nationalization of major industrial firms (Thomson, Saint-Gobain, Rhône-Poulenc, Pechiney-Ugine-Kuhlman, Usinor) and the remaining big banks (Indosuez, Paribas, CIC, Crédit du Nord, CCF, Rothschild). This explains the evolution of the ratio of HCAC 40 firms (and of total capitalization) to GDP (Figure 12).

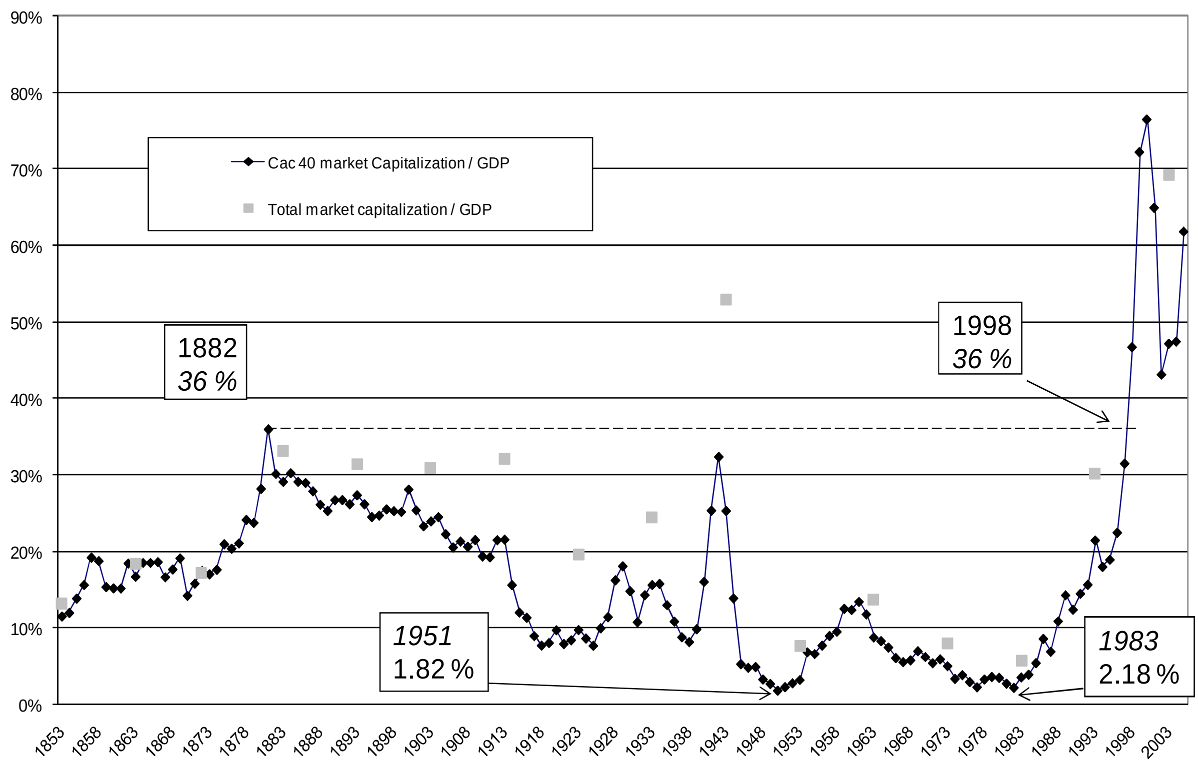


Figure 12, Ratio of the capitalization of HCAC 40 firms and the total capitalization of French listed firms to GDP.

In 1983, the ratio of HCAC 40 capitalization to GDP was minimal[39]. It rose sharply in the next two decades thanks to two radical moves: the privatization of almost all the government-owned manufacturing, financial and utilities firms, and the rise in the stock index. This rise was also largely the result of the regime change of 1983, by which the French government allowed the financial market to play a major role in the economy again. A substantial rise in profits, which was a condition for French firms to attract investors,

[39] Minima were reached in 1951 (1.82 %) and 1983 (2.18 %). The 1882 maximum of 36 % for the HCAC 40 was reached again in 1998.

followed, and French stock prices became well integrated with international markets (especially after the suppression of the last exchange controls in 1986). From 1983 onwards, then, the stock index again provides a measure that is relevant for the study of the French economy. This is confirmed by a simple measure: the most important sudden (month to month) variations in the HCAC 40 during our period (those above 3 standard deviations from the mean) correspond almost exclusively to political events during the "short 20th century", but almost never during the periods before 1914 or after 1983. From that last date, international financial crises replaced political news as the most influential factor on the stock market. Our data then confirms the intuition by Goetzmann (2004) that international and national politics can have a long-lasting impact on stock market performances.

IV Concluding Remarks

We propose a new index of French stock prices. Compared to previous indices, ours is much more consistent with modern stock index methodologies that aim to measure portfolio performances for the investor. Because they had different objectives, previous indices dramatically overestimated the return in stock prices. Adequately measured stock returns, as in our HCAC 40, present a radical regime change in 1914: because of a combination of the war's impact on profits and assets, of war inflation and of the rise of taxation (the impact of which was multiplied by inflation, since it was applied to nominal incomes), stock prices decreased sharply in real terms. The same phenomenon occurred during the Second World War. In between, the stock market caught up a little, just to be hit by the Great Depression. Soon, nationalization affected a large proportion of listed firms, so that the size of the stock market decreased sharply. Up until the next regime change, the stock index performed badly. At the same time, by and large, the economic function of the stock market was restricted to a small proportion of the French economy, in which most major corporations were state-owned. This was reversed in the 1980s, which explains the recent rise in the size of the stock market.

We consider this interpretation more consistent than the one according to which stock prices have risen in France almost as if no significant event had affected the country in the 20th century. More importantly, we wonder whether the same story – or a variation on it – may apply to many other European countries since the same destructive wars provided similar experiences of financial repression, taxation and inflation throughout Europe. Actually, the same methodological problems we have mentioned affected at least some foreign indices during some periods. For example, during the interwar period, most of them included only manufacturing firms, excluding financial services and utilities which weigh heavily in actual portfolios. In many cases, indices were also built without weighting by market capitalization (either without weighting or weighting by nominal capital, book value or transaction volumes). At least in some cases, these indices are still in use today when one looks at these periods (Table 12). As we have seen in the French case, this may mean that the performances of investment in some stock markets have been grossly overestimated.

More broadly, optimistic assessments of the long-term performances of stock investment must be tempered: equities clearly provided a better return than other financial assets on the very long run in France as elsewhere. However, the frequent extrapolation from Siegel's results on the U.S. market to the existence of a "Siegel's constant" of 6 to 7 % yearly total real return for such investments must be mitigated[40]. Equities provided no mysterious premium in France. The total real return on the HCAC 40 varied from –18 % to 13 %, depending on the period, with an average of only 1.17 % for the whole 1854-2006 period and, more comparably, of 5.5 % if one excludes the world wars. Even after World War Two, returns were negligible for a long time, up to the 1983 regime change. Policies hostile to stock markets, affecting their role in economic development, also affected the return on equities. If equities protected investors reasonably well against inflation outside the war periods, they protected them only modestly against political risks; this was true not only in the short but also in the long term. In the very long run, equities may still have been the best investment, but this was not the case for all generations of investors. If the 1914 to 1982 period was a parenthesis, it was a long one, and one that provides us with non-negligible experience; an experience which may also explain common elements in the attitude towards financial markets among the European countries that experienced it.

REFERENCES

Arbulu P. (1998), *Le marché parisien des actions au XIXème siècle : performance et efficience d'un marché émergent*, unpublished Ph.D. thesis, University of Orléans.

Arbulu P. (2007), « Le marché parisien des actions au XIXe siècle », in Gallais-Hamonno G. (ed.), *Le marché financier français au XIX^{ème} siècle, aspects quantitatifs*, Paris, Presses Universitaires de la Sorbonne.

[40] For example, see Smither and Wright (2000).

Barber B. and T. Odean (2000), "Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors", *Journal of Finance*, 55, p. 773-806.

Barça F. and M. Becht (eds), *The Control of Corporate Europe,* Oxford, 2001.

Barro R.J. (2006), "Rare Disasters and Assets Markets in the Twentieth Century", *The Quarterly Journal of Economics*, 121, p. 823-66.

Ben Raphael A., Kadan O. and A. Wohl (2008), "The Diminishing Liquidity Premium", *Working Paper*, NBER workshop on financial microstructures.

Berle A.A. and G. Means, (1932), *The Modern Corporation and Private Property,* New York.

Borodkin L. and A. Konovalova (2003), "Chaotic Dynamics of Share Prices at St. Petersburg Stock Market in the First Decade of the 20th century: Metal and Oil", *Working Paper,* XVth Conference of the International Association for History and Computing.

Boudoukh J. and M. Richardson (1993) "Stock Returns and Inflation: A Long-Horizon Perspective", *American Economic Review,* 83, p. 1346-1355.

Brown S.J., Goetzmann W.N. and S.A. Ross (1995), "Survival", *Journal of Finance*, 50, p. 853-73.

Chandler A.D. (1977), *The Visible Hand, The Managerial Revolution in American Business,* Cambridge.

Chandler A.D. (1990), *Scale and Scope, the Dynamics of Industrial Capitalism*, Cambridge.

Courtois A. (1855), *Des opérations de bourse*, Paris, Guillaumin.

Cowles A. A. and co-authors (1938), *Common-Stock Indexes*, Bloomington.

Daumard A. (ed.) (1973), *Les fortunes privées au XIXème siècle*, Paris, Mouton.

Desrosières A. (1998), *The Politics of Large Numbers. A History of Statistical Reasoning*, Cambridge, Ma., (first publication in French, Paris, 1993).

Dimson E. and P. Marsh (1983), "The Stability of UK Risk Measures and the Problem of Thin Trading" *Journal of Finance*, 38, p. 753-83.

Dimson E., Marsh P. and M. Staunton (2002), *Triumph of the Optimists: 101 Years of Global Investment Returns*, Princeton, Princeton University.

Dimson E., Marsh P. and M. Staunton (2004), "Irrational Optimism", *Financial Analysts Journal,* 60, p. 15-25.

Ely D.P. and K. J. Robinson (1989), "The Stock Market and Inflation: A Synthesis of the Theory and Evidence", *Economic Review,* Federal Reserve Bank of Dallas, p. 17-29.

Fama E. (1981), "Stocks returns, Real Activity, Inflation and Money", *The American Economic Review,* 71, p. 545-565.

Fama E. and K. R. French (1992), "The Cross-Section of Expected Stock Returns", *Journal of Finance*, 47, p. 427-65.

Fisher I. (1922), *The Making of Index Numbers. A Study of their Varieties, Tests, and Reliability*, New York.

Franks J., Mayer C. and S. Rossi (2009), "Ownership: Evolution and Regulation", *Review of Financial Studies*, 22, p. 4009-4056.

Frennberg P. and B. Hansson (1992), "Computation of a Monthly Index for Swedish Stocks Returns, 1919-1989" *Scandinavian Economic History*, 40, p. 3-27.

Friggit J. (2007), "Long-term (1800-2005) Investment in Gold, Bonds, Stocks and Housing in France – with Insights into the USA and the UK: a Few Regularities", *Working Paper,* ADEF.

Gallais-Hamonno G. and P. Arbulu (1995), « La rentabilité réelle des actifs boursiers de 1950 à 1992 », *Economie et statistique*, 281, p. 3-30.

Geske R. and R. Roll (1983), "The Fiscal and Monetary Linkage Between Stock Returns and Inflation", *Journal of Finance*, 38, p. 1-33.

Goetzmann W. (1993), "Patterns in Three Centuries of Stock Market Data", *Journal of Business*, 66, p. 249-270.

Goetzmann W. (2004), "Will History Rhyme? The Past as financial Future", *Working Paper*, Yale ICF, no. 04-19.

Goetzmann W., R. Ibbotson and C. Peng. "A New Historical Database for the NYSE 1815 to 1925: Performance and Predictability", *The Journal of Financial Markets*, 4, p. 1-32.

Hamon J. and B. Jacquillat (1992), *Le marché français des actions*, Paris, Dunod.

Hautcoeur P-C. (2006), "Why and How to Measure Stock Market Fluctuations? The Early History of Stock Market Indices, with Special Reference to the French Case ", *Working Paper*, Paris School of Economics, 2006.10.

Hautcoeur P-C. (ed.) (2007), *Le marché financier français au 19e siècle, Récit*, Paris, Presses Universitaires de la Sorbonne.

Hautcoeur P-C. and A. Riva (2007), "The Paris Financial Market in the 19th Century: An Efficient Multi-Polar Organization?", *Working Paper*, Paris School of Economics, 2007.31.

Hautcoeur P-C and M. Petit (2004), "The Development of the Paris Bourse in the Interwar Period What Old and New Stock Indices tell us", *Working Paper*, Delta,18.

Hautcoeur P-C. (1999), "Asymétries d'information, coûts de mandat et financement des entreprises françaises (1890-1936)", *Revue Economique*, 50, p. 1053-1087.

Hautcoeur P-C. and S. Grottard (2001), "Taxation of Corporate Profits, Inflation and Income Distribution in France, 1914-1926", *Working Paper*, Delta.

Ibbotson Associates (1997), "Annual Stock Return and Rates of Inflation, 1926-1996", *Stocks, Bonds, Bills and Inflation 1997 Yearbook*, Chicago, Ibbotson Associates.

Ibbotson R.R. and R. A. Sinquefield (1976), "Stocks, Bonds, Bills and Inflation: Simulations of the Future 1976-2000", *Journal of Business*, 49, 3, p. 11-47.

INSEE (1950), *Le mouvement économique en France de 1938 à 1948*, Paris, INSEE.

INSEE (1963), *Etudes Statistiques, Supplément trimestriel du Bulletin Mensuel de Statistique*, Paris, PUF.

Jorion P. and W. Goetzmann (1999). "Global Stock Market in the 20th Century", *The Journal of Finance*, 54, p. 953-80.

Laforest P. and P. Sallee (1969). "Le pouvoir d'achat des actions, des obligations et de l'or", *Economie et Statistiques*, 3, p. 3-12.

Leroy-Beaulieu P. (1906), *L'art de placer et gérer sa fortune*, Paris, Delagrave.

Lévy-Leboyer M. and F. Bourguignon (1985), *L'économie française au XIXe siècle*, Paris, Economica (Engl. trans. Cambridge, 1990).

Lizunov P.V. (2002), "Russian Securities in the Russian and European Stock Exchanges (end of the 19th - beginning of the 20th century)", in *Ekonomicheskaja istorija. Ezhegodnik (Economic History. Yearbook)*, (2001), Moscow, Rosspen.

Michalet C-A. (1968), *Les placements des épargnants français de 1815 à nos jours*, Paris, PUF.

Petit M. (2006), "Inventaire des séries de données historiques du projet Old Paris Stock Exchange 1919-1939", *Economies et Sociétés*, 40, p. 1089-1119.

Piketty T. (2001), *Les hauts revenus en France au XX^e siècle*, Paris, Economica.

Pollin E. (2007),"La Coulisse", in Gallais-Hamonno G. (ed.), *Le marché financier français au 19^e siècle, Aspects quantitatifs des acteurs et des instruments à la Bourse de Paris,* Paris, Presses Universitaires de la Sorbonne.

Rajan R. and L. Zingales (2003), "The Great Reversal: the Politics of Financial Development in the 20th Century", *Journal of Financial Economics*, 69, p. 5-50.

Rutterford J. (2004), "From Dividend Yield to Discounted Cash Flows: a History of U.K. and U.S. Equity Valuation Techniques", *Accounting, Business and Financial History*, 14, p. 115-149.

Sharpe W., Gordon A., and J. Bailey (1999), *Investments*, Upper Sade River NJ, Prentice Hall.

Siegel J. (1992), "The Equity Premium: Stock and Bond Returns since 1802", *Financial Analysts Journal*, 48, p. 28-38.

Siegel J. (1994), *Stocks for the Long Run: a Guide to Selecting Markets for Long-Term Growth*, New York, Irvine.

Simonnet F., Gallais-Hamonno A. and P. Arbulu (1998), "Un siècle de placement immobilier, l'exemple de La Fourmi Immobilière", *Journal de la Société de Statistique de Paris*, 139, p. 95-135.

Smither A. and S. Wright (2000), *Valuing Wall Street, Protecting Wealth in Turbulent Markets*, New-York, McGraw-Hill.

Société des Nations (1939), *Annuaire statistique de la société des nations,* Geneva.

Statman (1987), "How many stocks make a diversified portfolio", *Journal of Financial and Quantitative Analysis*, 22, p. 353-63.

Temin P. (1993), "The Transmission of the Great Depression", *Journal of Economic Perspectives*, 7, p. 87-102.

Villa P. (1993), *Une analyse macroéconomique de la France au XXe siècle*, Paris, CNRS.

Wilson J. and C. Jones (2002), "An Analysis of the S&P 500 Index and Cowles's Extensions: Price Indexes and Stock Returns, 1870–1999", *Journal of Business*, 75, p. 505-33.

Zola E. (1891), *L'Argent,* Paris.

Appendix 1, Sources for the index

Cote officielle (entire period)

Cote des valeurs en banque (1899-1913)

Journal des chemins de fer (1842-1940)

Journal des actionnaires (1852-1930)

Journal des finances (1869-today)

Cote Desfossés (1895-today)

La vie française (1945-today)

Journal du crédit public (1855-1934)

Agence économique et financière (Agefi) (1911-today)

Table 12, Methodology of the stock market indices published by the League of Nations. This table summarizes the main elements of the methods of the indices published under the title “indices of market value of industrial shares” by the League of Nations in its *Statistical Yearbooks* (the information here comes from the 1938 edition, pp. 249) in order to compare the evolutions of stock markets during the interwar period. In the last column, we tried to document whether these indices have been used, directly or indirectly, in Dimson & alii, *Triumph of the Optimists*.

Country	Compiled by	Components	Number of stocks	Method	Price	Used in DMS
Germany	Government authority	Mining and heavy industries Manufacturing industries	213	Arithmetic average weighted by amount of nominal capital of all German companies of each class on 31/12/1926	Monthly average of daily rates	Yes 1924 -1943
Austria	Institut für Conjunkturforschung	Building trades, Iron and metal Breweries, Paper Chemical, Textile Electricity, Mines Sugar, other industries	34	Simple arithmetic mean	15th or middle of month	NS
Belgium	Central Bank	Eight groups: Gas and electricity, Glass industry Metallurgy, Textiles and silk Collieries, Colonial industries Miscellaneous, Zinc, lead and mines	80	Group indices are calculated by simple arithmetic average General index is weighted according to the relative importance of each group (idem France)	Beginning of following month	Yes 1926 -1944
Canada	Government authority		68	Weight by amount of stocks outstanding. Account is taken of the issue of new shares and capital reconstruction	Monthly average of daily rates	No
Denmark	Government authority	?	21	Arithmetic average weighted by book capital of the different undertakings	Average of highest and lowest rates of month	Probably
Spain	Central Bank	Five groups: Food, Steel and metallurgy Electricity, Building industry Miscellaneous	35	Simple arithmetic average	?	?
Greece	Conseil Supérieur Economique	Tobacco, Chemical industry Mills	7	Geometric average of individual indices weighted by the number of transactions realized in the period I/1928 to XII/1929	?	NS

Italy	Prof. F. Guarneri	Ten groups: Mining / Chemical industries Metallurgy / Textiles Engineering / Electricity Motor-cars / Food industries Water supply / Sundry manufact.	74	Arithmetic average weighted by the capital of companies. Changes in capital and formation or suppression of companies re taken into account	Last week or end of month	No
Japan	Tokyo Stock Exchange	Three groups: Textile / Mines Manufacturing industries	64	?	Average of highest and lowest rates of month	Yes Before 1915
Norway	Government authority	All shares	8	Geometric mean weighted by the percentage of paid-up value of each share	15th or middle of month	Yes 1918 -1938
Netherlands	Government authority	Ten groups: Engineering / Chemical Shipbuilding / Oil and fats Electrical industry / Electric-light Textiles / Tobacco Miscellaneous / Food	51	Simple geometric mean but the list of shares account has been taken of the relative importance of various industries	Monthly average of rates taking one day in the week	Probably
Sweden	Affärsvärlden	Industrial and shipping shares	52	?	Last week or end of month	Yes 1919 -1938
Switzerland	Central Bank	All industrial companies	26	Nominal value of paid-up capital serving as base	Last week or end of month	?

Table 10, Returns for various investments in French assets for 1854 to 2006 and various sub-periods.

	Cac 40				French State Bonds**				Gold***		Bills****		Inflation
	Dividend Yield	Annual Price Variation	Total Nominal Return	Total Real Return*	Coupon Yield	Annual Price Variation	Total Nominal Return	Total Real Return	Annual Price Variation	Total Real Return	Interest Yield	Total Real Return	INSEE
A. from january 1854 to december 2006													
arit	3.84%	4.18%	8.02%	3.05%	5.22%	0.76%	5.98%	1.30%	7.47%	1.82%	4.36%	-0.40%	5.64%
geo		2.56%	6.42%	1.17%		0.21%	5.40%	0.21%	5.18%	-0.01%	4.33%	-0.81%	
stdev	1.39%	19.12%	19.31%	19.74%	2.76%	10.54%	11.23%	14.41%	30.29%	24.77%	2.88%	8.50%	10.46%
B. from january 1854 to december 2006 (without world wartimes, 1914-1922 and 1939-1950)													
arit	4.01%	4.25%	8.26%	5.53%	5.40%	1.38%	6.78%	4.19%	3.58%	0.72%	4.53%	1.94%	2.79%
geo		2.74%	6.78%	4.02%		0.83%	6.20%	3.46%	2.69%	0.05%	4.49%	1.82%	
stdev	1.31%	18.43%	18.56%	18.28%	2.62%	10.55%	11.25%	12.24%	15.67%	12.88%	3.00%	4.78%	5.41%
C. from january 1854 to december 1913													
arit	4.52%	1.11%	5.55%	5.35%	3.78%	0.36%	4.14%	3.98%	0.00%	-0.22%	3.05%	2.83%	0.38%
geo		0.84%	5.28%	5.00%		0.19%	3.97%	3.66%	0.00%	-0.30%	3.04%	2.75%	
stdev	0.95%	7.32%	7.53%	8.92%	0.73%	5.59%	5.78%	7.85%	0.00%	3.86%	1.23%	4.45%	3.93%
D. from january 1914 to december 1982													
arit	3.44%	3.56%	7.00%	-2.82%	5.57%	-1.27%	4.29%	-4.94%	17.00%	5.49%	4.68%	-4.81%	11.31%
geo		1.26%	4.70%	-5.35%		-1.88%	3.71%	-6.25%	12.45%	1.66%	4.64%	-5.41%	
stdev	1.54%	22.95%	23.30%	23.01%	2.36%	10.95%	11.13%	15.39%	42.92%	36.01%	2.92%	10.24%	12.95%
E. from january 1914 to december 2006													
arit	3.41%	6.20%	9.61%	1.53%	6.16%	0.99%	7.16%	-0.48%	12.34%	3.14%	5.23%	-2.51%	9.08%
geo		3.72%	7.14%	-1.26%		0.19%	6.32%	-2.02%	8.69%	0.17%	5.18%	-3.06%	
stdev	1.46%	23.63%	23.95%	24.22%	2.76%	12.80%	13.19%	16.64%	38.17%	31.62%	3.29%	9.75%	11.86%
F. from january 1914 to december 1922													
arit	3.73%	-2.00%	1.74%	-10.45%	4.61%	-4.17%	0.44%	-10.93%	14.26%	0.39%	5.03%	-6.96%	14.39%
geo		-2.78%	0.96%	-11.12%		-4.42%	0.17%	-11.82%	11.15%	-2.16%	5.03%	-7.66%	
stdev	0.50%	12.26%	12.44%	11.22%	0.64%	6.90%	7.35%	13.01%	29.96%	24.53%	0.64%	11.80%	13.27%
G. from january 1923 to december 1938													
arit	3.87%	2.80%	6.66%	1.70%	4.59%	2.51%	7.10%	2.97%	8.83%	3.52%	3.29%	-0.74%	5.02%
geo		0.73%	4.63%	0.05%		1.76%	6.34%	1.69%	7.89%	3.17%	3.28%	-1.07%	
stdev	0.63%	20.88%	21.08%	18.78%	0.95%	12.50%	12.82%	16.30%	14.99%	8.53%	1.65%	8.00%	9.87%
H. from january 1939 to december 1950													
arit	1.78%	7.20%	8.98%	-14.34%	3.62%	-1.74%	1.88%	-20.20%	43.72%	14.20%	1.80%	-20.69%	30.14%
geo		3.69%	5.35%	-18.47%		-2.47%	1.16%	-21.71%	28.16%	-0.81%	1.80%	-21.26%	
stdev	1.34%	28.79%	29.55%	27.95%	0.66%	12.09%	12.18%	15.35%	86.51%	76.59%	0.39%	9.42%	15.86%
J. from january 1951 to december 1982													
arit	3.64%	3.63%	7.28%	0.89%	7.08%	-2.14%	4.94%	-1.35%	11.98%	4.77%	6.73%	-0.17%	6.61%
geo		1.16%	4.81%	-1.62%		-2.71%	4.42%	-1.99%	9.28%	2.58%	6.67%	-0.21%	
stdev	1.77%	24.21%	24.58%	24.27%	2.68%	10.41%	10.49%	10.98%	27.70%	23.66%	3.52%	2.97%	3.99%
K. from january 1951 to december 2006													
arit	3.51%	7.80%	11.31%	6.38%	7.38%	1.93%	9.31%	4.45%	6.07%	0.91%	6.54%	1.66%	4.89%
geo		5.15%	8.68%	3.68%		1.02%	8.38%	3.40%	4.32%	-0.48%	6.49%	1.60%	
stdev	1.55%	24.51%	24.80%	24.64%	2.92%	13.59%	14.30%	14.84%	22.23%	18.82%	3.45%	3.49%	3.76%
L. from january 1983 (inflation < 10 %) to december 2006													
arit	3.15%	12.83%	15.98%	13.23%	7.43%	6.83%	14.27%	11.58%	-1.64%	-3.90%	6.03%	3.94%	2.41%
geo		10.12%	13.32%	10.66%		5.66%	13.03%	10.38%	-1.84%	-4.14%	5.99%	3.91%	
stdev	0.78%	24.16%	24.34%	23.60%	2.75%	15.56%	16.46%	16.04%	6.29%	6.75%	3.16%	2.59%	1.27%

arit: arithmetic mean ; geo: geometric mean ; stdev: standard-deviation

** A F-test bewteen stocks and bonds (total nominal return) can reject an equal variance for all periods whereas a T-test can't reject (5 % level) an equal mean for F,G,J,K,L*

*** Rente 3 %, 5% after 1950 and after 1970, taux obligations Etat à long terme (Caisse des Dépôts et Consignations)*

**** Gold Price in Paris, annual interpolate, (Banque de France and INSEE)*

***** before 1951 : Discount Rate Open Market Paris, monthly data, (NBER)*

annual data interpolate, taux de l'escompte Banque de France, (INSEE) only before 1863, 1914-1925, 1940-1951

1952-2008 : Taux Moyen du Marché monétaire, monthly data (Banque de France)

Appendix 2, Yearly values of our HCAC 40 price index and total return index

Date	Price Index	Total Return Index	Date	Price Index	Total Return Index	Date	Price Index	Total Return Index	Date	Price Index	Total Return Index
06/01/1854	108.88	108.88	06/01/1893	172.11	1,126.37	04/01/1932	211.88	5,902.42	07/01/1971	628.12	48,715.58
05/01/1855	114.01	119.60	05/01/1894	179.39	1,221.16	04/01/1933	250.96	7,314.45	05/01/1972	566.86	45,949.23
04/01/1856	126.51	138.66	04/01/1895	171.32	1,209.57	04/01/1934	244.04	7,400.37	03/01/1973	636.41	53,738.75
02/01/1857	139.58	158.53	03/01/1896	170.20	1,244.98	04/01/1935	216.10	6,854.24	02/01/1974	589.09	52,035.05
08/01/1858	132.48	160.63	08/01/1897	179.01	1,351.10	04/01/1936	208.27	6,902.53	08/01/1975	401.38	37,915.41
07/01/1859	124.26	158.82	07/01/1898	191.87	1,490.16	05/01/1937	237.04	8,119.71	02/01/1976	502.29	50,029.48
06/01/1860	121.69	163.65	06/01/1899	193.66	1,554.21	07/01/1938	216.76	7,691.22	07/01/1977	417.79	44,379.79
06/01/1861	123.28	173.78	05/01/1900	194.18	1,609.34	09/01/1939	219.50	8,143.89	06/01/1978	324.13	36,922.64
06/01/1862	127.00	189.86	04/01/1901	194.65	1,673.23	03/01/1940	244.66	9,483.83	05/01/1979	498.66	59,849.53
15/01/1862	141.90	223.77	04/01/1902	177.05	1,582.24	03/01/1941	351.56	13,979.58	04/01/1980	518.74	65,241.02
04/02/1864	130.64	218.78	02/01/1903	172.37	1,593.96	05/01/1942	529.77	21,374.61	02/01/1981	535.26	70,983.84
06/01/1865	131.24	233.93	09/01/1904	170.47	1,638.70	08/01/1943	805.56	32,838.92	08/01/1982	442.55	63,061.17
05/01/1866	132.50	251.72	06/01/1905	174.57	1,741.83	07/01/1944	657.33	27,028.48	06/01/1983	453.74	69,620.61
04/01/1867	132.20	265.86	05/01/1906	177.10	1,835.96	02/01/1945	575.78	23,870.50	05/01/1984	689.29	110,466.22
03/01/1868	124.50	264.81	04/01/1907	175.16	1,888.97	04/01/1946	458.14	19,083.94	03/01/1985	760.33	126,465.80
08/01/1869	133.76	299.68	03/01/1908	171.33	1,922.02	02/01/1947	579.27	24,297.73	02/01/1986	1,010.33	173,391.94
07/01/1870	134.37	317.50	08/01/1909	175.21	2,043.21	08/01/1948	466.19	19,812.78	09/01/1987	1,364.97	239,699.03
06/01/1871	99.58	250.68	07/01/1910	184.51	2,237.14	06/01/1949	408.40	17,685.07	01/01/1988	1,000.00	182,749.73
05/01/1872	116.72	306.15	07/01/1911	183.93	2,312.05	05/01/1950	335.28	14,893.46	01/01/1989	1,642.99	310,139.84
03/01/1873	123.79	342.13	05/01/1912	190.82	2,490.05	04/01/1951	273.35	12,648.10	01/01/1990	1,994.36	387,671.76
09/01/1874	126.08	368.72	03/01/1913	195.84	2,647.00	03/01/1952	381.25	18,250.54	01/01/1991	1,547.66	313,564.75
02/01/1875	130.07	404.05	02/01/1914	189.06	2,653.29	08/01/1953	417.29	20,795.61	01/01/1992	1,770.30	373,138.73
02/01/1876	143.07	467.94	02/01/1915	161.86	2,360.16	07/01/1954	493.77	25,611.91	01/01/1993	1,852.63	404,415.34
05/01/1877	145.56	499.91	07/01/1916	141.47	2,134.89	06/01/1955	1,046.37	55,284.76	01/01/1994	2,307.55	516,682.48
04/01/1878	146.49	526.15	05/01/1917	157.96	2,468.47	05/01/1956	987.07	53,259.57	01/01/1995	1,886.40	437,200.44
03/01/1879	153.45	574.20	04/01/1918	159.99	2,590.71	03/01/1957	997.66	54,937.52	01/01/1996	1,917.72	459,902.49
02/01/1880	164.65	641.78	03/01/1919	170.59	2,858.64	03/01/1958	1,123.45	62,790.05	01/01/1997	2,282.76	562,296.37
01/01/1881	194.93	787.09	02/01/1920	178.07	3,089.72	08/01/1959	1,011.77	57,440.66	01/01/1998	2,919.81	733,927.79
06/01/1882	238.81	996.43	07/01/1921	159.50	2,883.73	07/01/1960	1,267.19	72,799.47	01/01/1999	4,245.42	1,090,596.33
05/01/1883	190.15	827.07	06/01/1922	144.79	2,752.65	05/01/1961	1,157.89	67,574.13	01/01/2000	5,917.37	1,548,371.96
04/01/1884	175.02	796.86	05/01/1923	171.39	3,394.91	04/01/1962	1,195.43	70,885.77	01/01/2001	5,758.02	1,544,214.79
02/01/1885	176.35	837.85	04/01/1924	208.76	4,288.40	03/01/1963	1,050.71	63,380.47	01/01/2002	4,682.79	1,301,347.71
08/01/1886	172.65	856.55	02/01/1925	207.85	4,434.84	02/01/1964	839.80	51,808.99	01/01/2003	3,187.88	917,178.76
07/01/1887	172.66	891.86	08/01/1926	229.55	5,105.74	07/01/1965	753.57	47,674.30	01/01/2004	3,596.80	1,064,233.41
06/01/1888	169.39	912.32	07/01/1927	274.42	6,356.81	06/01/1966	697.40	45,394.46	01/01/2005	3,877.96	1,176,991.78
04/01/1889	168.89	946.94	05/01/1928	331.79	7,972.83	05/01/1967	559.87	37,603.94	06/01/2006	4,867.15	1,505,106.81
03/01/1890	171.83	1,000.79	04/01/1929	479.68	11,828.56	04/01/1968	527.73	36,779.64	05/01/2007	5,517.35	1,748,168.56
02/01/1891	181.98	1,100.58	03/01/1930	466.74	11,839.18	02/01/1969	597.09	43,177.44			
08/01/1892	178.94	1,125.49	03/01/1931	329.28	8,667.91	08/01/1970	715.95	53,394.12			

Chapitre 2, Comparaison des performances françaises et américaines « Long-term Stock Performances: What Lessons Can We Learn for Future Investments? »[41]

With Sandrine Tobelem[42]

Abstract: In this paper, we revisit the main conclusions found in the study of long-term stock price behavior. We rely on very accurate data: high quality monthly series for the US and French markets since 1871. By comparing modern performance measures, we find that not only does the equity premium differ in France and the US since the First World War and also performances are very volatile. It makes it difficult to find any long-term rules. We also compare the performance of classical optimized portfolios to a naive fixed allocation over different estimation windows and different investment horizons. We find that the estimation window does not affect performances whereas the investment horizon has crucial impact when building a portfolio.

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Keywords: stock return, equity premium, optimal portfolio, 19th century, 20th century.

JEL classification: G1, G12, N23, N24.

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In an attempt to study long-term stock price behavior, most authors focus on the biggest stock market in the world: the US market. Cowles (1939) conducted a thorough study of long-term US capital market behavior and recreates reliable return time series from 1871. The landmark study of Cowles is followed by the study of Schwert (1990) and especially the work of Siegel (1994) who evaluates the evolution of US stock prices since 1802. One of Siegel major results is to prove the existence of a “Siegel’s constant”: the total real equity return remains remarkably stable over the long run (6% to 7%).

However, the US studies suffers from a potential bias as identified by Brown *et al.* (1995). The US economy is the most successful over the long run, and extrapolating results obtained from the US market on other markets may prove fallacious. Several studies investigate other markets. For instance, Dimson and Marsh (2001) reconstitute a monthly UK index over the period (1950-2000). In their book, Dimson *et al.* (2002) collect total stock returns for 17 countries since 1900 (yearly revised, see Dimson *et al.*, 2010). According to these authors, huge differences exist on total real returns across countries (between 2.4 % for Belgium and 7.80 % for Sweden). However all the markets considered show positive performances during the 20th century.

A major shortfall in those studies is that the quality of the data collected is sometimes poor. Indeed, they are often a compilation of indices built *ad hoc* to evaluate macro-economic situations and do not effectively represent the return of an investment in stocks (see Le Bris and Hautcoeur, 2010 or chapter 1). In this study, we consider accurate measures of stock performances focusing on two markets with high quality data: the US (Cowles-S&P data, see Appendix A) and France where reliable data have been recently made available on a monthly basis since 1854 (Le Bris and Hautcoeur, 2010 or chapter 1).

It is interesting to compare the performances of the US market and another developed market that experienced a radically different situation during the 20th century. France is a good candidate as it suffered dire economic consequences following the two World Wars and implemented interventionist and socialist policies, whereas the US have been left relatively unscathed. The respective share of the US and French markets in the world total market value followed an inverse path. For the US market (which remained the first market capitalization during the whole 20th century), the share has doubled from 1900 to 2000 (from 22 % to 46 %), whereas it was divided by two for the French market (8 % in 1900 against 4 % in 2000), sliding from the third to the fourth position (Dimson *et al.*, 2002). The French case helps us balancing the results found in the US market.

Using several performance measures, we investigate the differences of the long-term stock returns in the US and French markets. Our results bring strong evidence to confirm the US survival bias: the US market has outperformed significantly the French market since 1914 only. Furthermore, the international correlation has dramatically increased over time. We also find that the performance measures are highly unstable and volatile over time for the txo countries. We can, therefore, outline periods of relatively high stock market performances against periods when capital market are much more risky, with lower returns. As a consequence we find that it is difficult to use one single long-term performance measure to estimate future returns.

However, long-term data can be used for asset management purposes. We test the performance of portfolio allocations between stocks and bonds over the long run both in the US and French market. We compare the naive constant allocation to a dynamic allocation when optimal equity weight is computed with varying estimation windows and varying investment horizons. We find that in the US as well as in France, the optimized portfolios outperform the naive allocation. In addition, we show that the estimation window does not affect performances whereas the investment horizon has crucial impact when building a portfolio.

The paper is organized as follows: we first present the US and French monthly time series used for our study. Then, we describe the distinct four periods we consider, based on an inflation rate criterion between 1870 to 2007. Thirdly, we present our results of performances measures which provide a strong evidence of the long-term higher US market out performances against the French one. Finally, we study several portfolio performances when the estimation window or the investment horizon varies.

I Presentation of the data

Throughout this paper, we use the historical time series for the US index (HS&P for Historical S&P) and the French index (HCAC 40). For the US index, we consider two different time series: the Cowles index (1871-1924) and the S&P index (1925 to present), according to the Shiller version (Shiller, 2000). These two series suffer some bias as demonstrated respectively by Goetzmann *et al.* (2001) for Cowles data and Wilson and Jones (2002) for the S&P. But the differences with adjusted or new series remain small and therefore we choose to rely on the Shiller version of Cowles-S&P since it is the most commonly used. For French stocks, we use the new high quality series made available over the period 1854-1988 (Le Bris and Hautcoeur, 2010 or chapter 1).

The French stock index (HCAC 40) is historically reconstituted as the monthly index of the 40 most prominent shares found among French firms, ranked by market capitalization. The index is weighted by these capitalizations and components are adjusted at the beginning of each year, thus avoiding survivor's bias. For the period 1988-2007, we use the current Euronext CAC 40. Today, the CAC 40 represents about 70 % of the total French market value whereas it represented 90 % in the middle of the 19th century. We use monthly price series and annual dividend series for both US and French indexes. For a detail of the risk free rates, long-term rates and inflation rates used in our study, please refer to the Appendix A.

We assume that the investor suffers local inflation (we consider that inflation is a non hedgeable risk). Therefore we focus on nominal total excess returns (*i.e.* not adjusted for local inflation). Compare to the US, the French inflation is consistently higher. However, the French inflation rate is so high over the long period considered that it overshadows completely the real excess returns of the HCAC 40 index. We display, in Figure 1, the time series of nominal total excess returns (price returns plus dividend rate minus risk free rate) illustrated by an investment of 1 in January 1871. Note that for this study we always consider geometric returns since we are looking at long-term performances. Even if we consider nominal returns, we use the inflation rate as a criterion to define the time periods we consider.

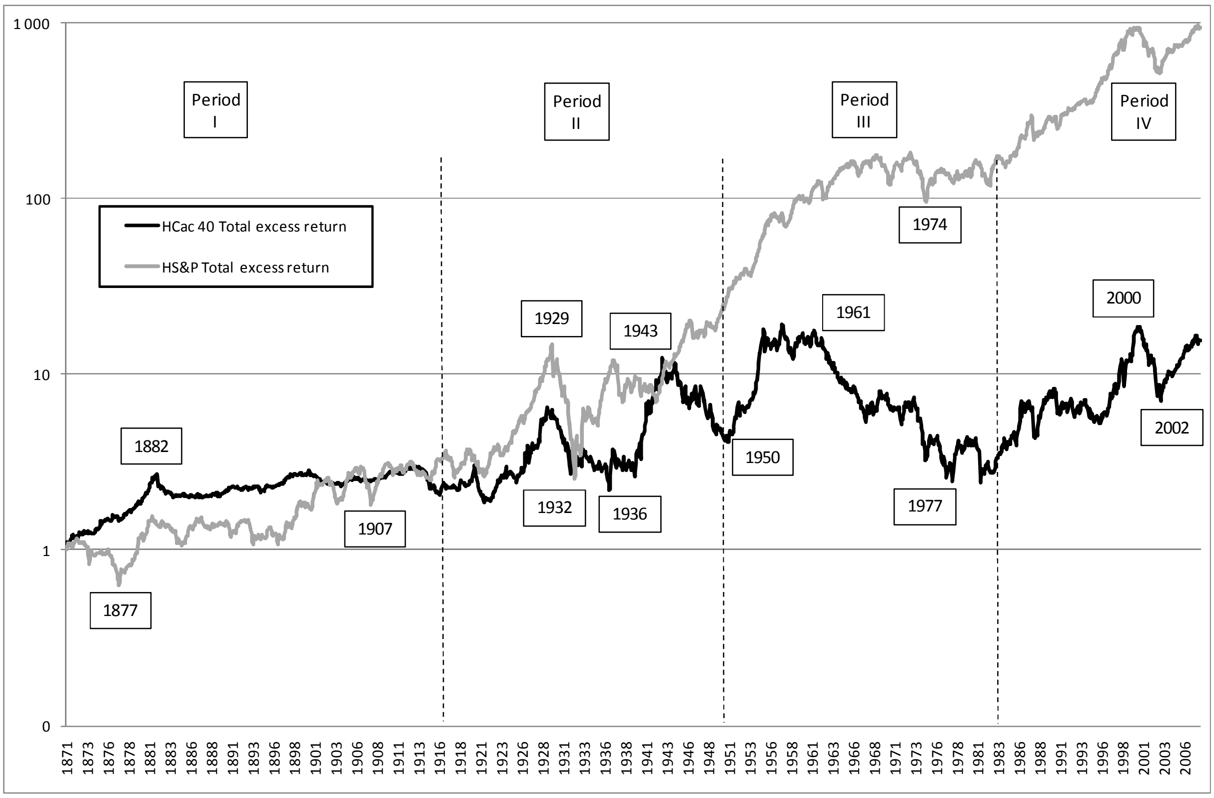

Figure 1, HCAC 40 and HS&P total excess returns. 1871-2007. This figure displays the total excess return obtained on US and French stock market with a common basis of 1 in January 1871

II Periods selection

We need an historical periodization to perform an analysis of the index return time series over the long run. The overall period 1871 to 2007 is sliced in coherent sub-periods. We use the inflation rate as a criterion. Indeed, conventional wisdom suggests that nominal stock returns should be relatively high when inflation is high and vice-versa, since stocks represent claims on real assets which value should increase with inflation. Therefore, even if some studies show there is no discernible relationship between stock performances and inflation rate (Ibbotson Associates, 1997, or Sharpe *et al.*, 1999), we can still assume that inflation affects real stock returns. We distinguish four major inflation periods:

1. *Gold Standard period*: The first period we consider runs from 1871 to 1916. This first era corresponds to the Gold Standard. The US dollar is on the Gold Standard since 1879. The value in gold of the French franc is constant since 1802. Currency rates are stable over this period and inflation is virtually inexistent. For a few years a strong inflation is recorded but it results from a fundamental increase in prices and not of an artificial monetary creation

as during the period starting in 1917.[43] War inflation starts in 1915 in France with an inflation rate of 19 %, but only in 1917 in the US (18 %). Without taking into account these two inflationary years (1915 and 1916), over the pure Gold standard period, the average inflation rate is 0.50 % in France and 0.58 % in the US[44].

2. *War inflation period*: The second period runs from 1917 to 1950. Starting in 1917 with the emergence of high war inflation, it ends in 1950 when the French GDP recovers its pre-war level (1939). This period covers the two World Wars where major monetary disorders and the Great Depression affect both French and US equity markets (with stronger effects on French stocks as France is more severely affected by the wars). This period can be described as the first part of the “Great reversal” of Rajan and Zingales (2003) or the “Second Thirty Years War” (Temin, 1993). The role of financial markets in the economy decreases and wars and reconstruction spending affect the stock returns. During this period, the average annual inflation rate is 3.53 % in US and 11.53 % in France with picks of more than 10 % for 10 years in the US and 29 years in France.

3. *Growth inflation period*: The third period runs from 1951 to 1983. Despite the Cold War with the USSR and overseas wars (Indochina and Algeria wars for France and Korea and Vietnam wars for the US), it is a period of relative peace. This period experiences stable economic growth. However, inflation is fairly important especially due to the stagflation of the seventies (with two digit inflation rates: the French average inflation rate over the period is 6.84 %, whereas the US average inflation rate is 4.50 %).

4. *Moderate Inflation Period*: The fourth period runs from 1983 to 2007. At the beginning of the 80s, both France and the US adopt monetarist policies. The French inflation rate falls to an average of 2.5 % and the US one decreases to 3.1 %. The main difference with the prior period is the absence of high inflation annual rate: the higher rate in the US is 5.4 % (1990) and 9.62 % in France (1983). It is the best period for the financial market, both, in US and France.

[43] The years 1862, 1863, 1864 in the US and 1854, 1860, 1871 and 1910 in France record an inflation of more than 10 %.
[44] Including 1915 and 1916, the inflation rate in France increase to 1.15 %.

III Long-term stock performances: the Great Instability

In the remaining of the paper, when we refer to *returns* (*r*), *we only consider the total excess returns* (price returns plus dividend rates minus risk free rate). First, using accurate performances measures on high quality data, we confirm the “survival bias of the US economy” hypothesis made by Brown *et al.* (1995), since the US equity premium is clearly higher than the French one; but only since 1914. We also show that the equity premium is not the only point of divergence between the French and US index performances, as the French index seems more risky and instable than the US one.

1.1 Performance measures tested

We consider the following performance measures computed on the series of the HCAC 40 and HS&P nominal total excess returns (geometric price returns[45] plus dividend rate minus risk free rate), denoted r.

Value At Risk (*VaR*): this measure represents the 5 %-percentile of the investment return distribution. It is an indicator widely used in risk management. This measure represents the risk of an investment: 5 % of the times, the investor can lose more than the VaR. The VaR is based on the investment empirical distribution. It is easy to compute and to interpret: 95 % of the returns should be greater than the VaR (which represents a negative return):

$$VaR = \operatorname{argmax} P(r \leq x) \leq 5\%$$

Conditional Value At Risk (*CVaR*): represents the expected value of the 5 % percentile of the index return distribution. It is also a risk measure widely used by practitioners that is more precise than the VaR because it gives an idea of the average loss expected in 5 % of the worst investment returns:

$$CVaR = E(r / r \leq VaR)$$

Sharpe Ratio (*Sharpe*): represents the ratio of the mean excess return of an investment over the standard deviation of its returns. This is the most famous risk measure used in

[45] Continuously coumpounded.

finance. It effectively indicates the average expected geometric excess return of an investment per unit of risk:

$$Sharpe = \frac{E(r)}{\sigma(r)}$$

Sortino Ratio (*Sortino*): represents the ratio of the mean geometric excess return of an investment over the standard deviation of its negative returns. It is an adjusted Sharpe ratio: the idea here is that only downside risk matters to the investor (*i.e.* the variations of the negative returns) and therefore the standard deviation of the returns is replaced by the standard deviation of the truncated distribution of the returns (only taking into account negative returns):

$$Sortino = \frac{E(r)}{\sigma(r / r < 0)}$$

Gain Loss Ratio (*GainLoss*): is the ratio of total positive returns over the *sum* of the total absolute returns.[46] It gives an idea of the proportion of gains against losses when investing in a strategy:

$$GainLoss = \frac{\sum 1_{r>0}}{\sum 1_{r<0} + \sum 1_{r>0}}$$

Winner Loser Ratio (*WinLose*): similar to the Gain Loss ratio, it is the ratio of the *number* of total positive returns over the total number of returns observed. Also called the "Hit Ratio", it tells the proportion of times when the investment is profitable:

$$WinLose = \frac{\sum r > 0}{\sum | r |}$$

Certain Equivalent Ratio (*CER*): corresponds to the equivalent risk free return of the index return (the index return minus the investor risk aversion multiplied by the index return standard deviation). This measure is more theoretical as it is difficult to parameterize the risk aversion (see DeMiguel *et al.*, 2009):

[46] See Ledoit and Bernardo (2001).

$CER = E(r) - \lambda\sigma^2(r)$, where λ stands for the investor risk aversion parameter.[47]

The VaR and the CVaR represent a loss in percentage. The Sharpe and Sortino represent an average return per unit of risk. The GainLoss and WinLose ratios have the advantage to be independent of assumptions made on the return distribution. For empirical estimates of those performance measures, we consider a rolling window of 120 observations (10 years) across the whole period 1871 to 2007.

3.2 Inequality of French and US excess returns

We display in Table 1 some basic statistics computed for the whole period considered (1871-2007) and the details per sub-period. The mean excess return, or risk premium, is higher for the last three periods both in the US and France. The French risk premium (2.00 % over the whole period considered) is more volatile than the US one. Since 1914, the US risk, measured in terms of the returns standard deviation, is also lower than the French risk. Also, over the long run, the French premium is about half the US one. These results are consistent with the hypothesis made by Brown *et al.* (1995) about the US survival bias.

Nevertheless, we also observe a higher US premium before the First World War but the T-test shows that this difference is not significant. As expected, the excess returns of the two markets differ deeply during the second period (1917-1950). We can still observe a “Great Divergence” between the US and French stock markets during the two last period 1951-1982 and 1983-2007 where both the US and France experience a stable and strong economic growth. Indeed, even if the risk premium of the US and French markets converge towards an average of 7 %, the French risk is twice as big as the US one. But the difference on the average excess return becomes non significant (according to the T-Test) during the last period. As a consequence, these comparisons across time and markets show that it seems to be a very optimistic hypothesis to use only the long-term US equity premium to anticipate future returns.

[47] Here we take $\lambda = 0.5$.

Table 1, Descriptive statistics for HCAC 40 and HS&P excess returns. This table presents several classical statistics for excess returns French and US stocks. F-test is the test of an equal variance. T-test is a paired test for the equal mean adjusted for heteroskedasticity.

	1871-2007		1871-1916		1916-1950		1951-1982		1983-2007	
	HCAC 40	HS&P	HCAC 40	HS&P	HCAC 40	HS&P	HCAC 40	HS&P	HCAC 40	HS&P
Mean (annualized)	2.00%	5.01%	1.76%	2.76%	1.78%	6.04%	-1.20%	5.29%	6.87%	7.42%
Standard deviation (annualized)	17.33%	14.11%	6.48%	11.07%	21.68%	20.22%	19.88%	11.81%	20.55%	11.44%
Kurtosis	6.98	21.28	11.46	3.63	4.64	19.13	6.17	4.28	4.60	5.44
p-value kurtosis=3	*0.09%*	*0.00%*	*0.06%*	*9.38%*	*2.13%*	*0.02%*	*0.62%*	*3.61%*	*2.97%*	*1.32%*
Skewness	0.04	0.68	-0.87	-0.08	0.61	1.07	-0.38	-0.49	-0.49	-0.65
p-value skewness=0	*60.40%*	*0.77%*	*1.42%*	*50.90%*	*3.72%*	*1.25%*	*9.44%*	*5.94%*	*7.44%*	*4.48%*
Minimum	-33.55%	-26.45%	-14.43%	-10.91%	-15.99%	-26.45%	-33.55%	-11.95%	-25.42%	-12.75%
Maximum	25.27%	50.77%	7.53%	10.81%	25.27%	50.77%	19.97%	11.15%	18.28%	11.13%
Number of observations	1643	1643	551	551	408	408	384	384	300	300
Jarque-Berra	1083	23005	1712	10	71	4500	169	42	44	95
Jarque-Berra p-value	*0.00%*	*0.00%*	*0.00%*	*0.74%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*
F-Test p-value	*0.00%*		*0.00%*		*7.88%*		*0.00%*		*0.00%*	
T-Test p-value	*0.00%*		*6.90%*		*0.00%*		*0.00%*		*68.77%*	

As commonly found, the distribution of the French and US index returns are not normally distributed, both present fat tails (Kurtosis higher than three) and are most of the time (except during the second and the overall period both in France and in the US) are negatively skewed. Combining these two statistics, the Jarque-Berra test rejects the normality for all the periods in the two countries except during the first one in the US. We analyze deeper this non normality since his consequence is important on tools used to control the risk in asset management.

In Table 2, we display the percentage of returns per period that exceed in absolute terms the VaR and CVaR computed on a rolling window of 120 prior months (10 years). We observe that there are at least twice as many returns outside the 5% VaR as theoretically assumed (about 10 % instead of 5 % of the returns) across all periods and for the two markets. This confirms the non normality of asset returns and especially the fat tailed aspect of their distribution. We also see that almost 5 % of the returns are lower than the 5 % CVaR; this means that whereas the CVaR should indicate the average of loss for the 5 % worst cases, we observe about 5 % of all returns are below it. It is interesting to note that the percentage of returns outside VaR is remarkably stable over time and across markets (around 10 % for both the HCAC 40 and HS&P).

Table 2, Returns outside VaR and CVaR (in percent of cases). This table shows the percentage of returns that exceed the VaR (at 5 % and thus provide an illustration of the non-normality of the distribution) and the percentage of returns below the CVaR.

	1871-2007	1871-1916	1917-1950	1951-1982	1983-2007
			VaR		
HCAC 40	12.18	11.43	15.68	9.12	12.00
HS&P	11.18	10.48	10.21	10.99	13.67
			CVaR		
HCAC 40	4.24	4.29	6.65	2.41	3.00
HS&P	3.84	2.62	4.51	3.75	4.67

3.3 Divergence of the performance measures.

In order to get deeper in the investigation of the differences between French and US index, we use several performances measures presented in 3.1. Since it is the performance measure most used by practitioners and one of the most consistent from an academic point of view, we first focus on the Sharpe ratio. Figure 2 shows the Sharpe ratios measured on each market (on a 10-years rolling window). The Sharpe ratios are instable across time and the US one is constantly higher including during the last period. In terms of Sharpe (or Sortino) the US performance is three times the French one over the whole period. However, before 1914, the performances of the two indexes appear quite similar.

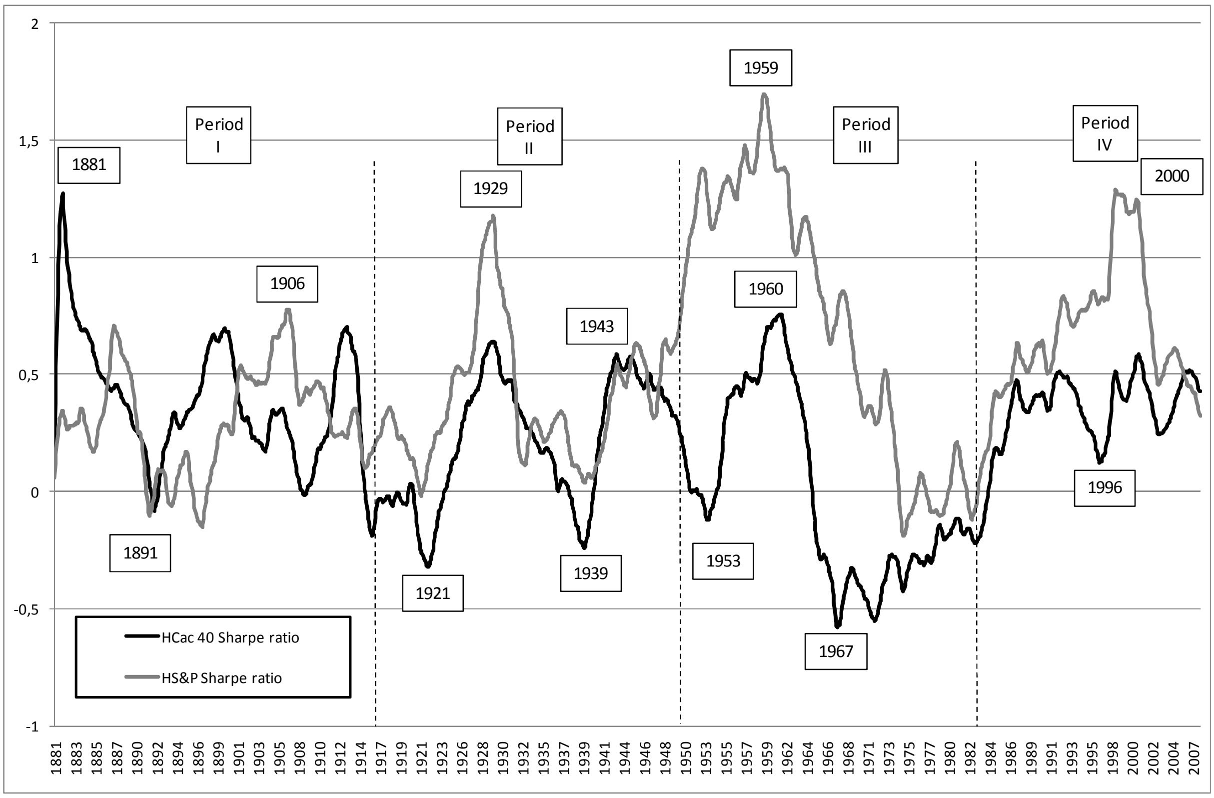

Figure 2, Sharpe ratios on US and French markets. This figure shows the Sharpe ratio measured on a 10-years rolling window on each market.

We test the hypotheses of an equal Sharpe ratio between France and US thanks to the test proposed by Jobson and Korkie (1981). The test statistic can be formulated as:

$$Z = \frac{\sigma_{US}(\mu_F - r_f) - \sigma_F(\mu_{US} - r_f)}{\sqrt{\theta}}$$

where μ_{US} and μ_F are the mean returns of each market, r_f is the risk-free rate and where θ is calculated as follow:

$$\theta = \frac{1}{T}\left[2\sigma_{US}^2\sigma_F^2 - 2\sigma_{US}\sigma_F\sigma_{USF} + 0.5\mu_{US}^2\sigma_F^2 + 0.5\mu_F^2\sigma_{US}^2 - \frac{\mu_{US}\mu_F}{2\sigma_{US}\sigma_F}(\sigma_{USF}^2 + \sigma_{US}^2\sigma_F^2)\right]$$

where *T* is the number of months and $\sigma_{US}, \sigma_F, \sigma_{USF}$ are the standard deviation of US and French excess returns and the covariance between them. The statistic *Z* is approximately normaly distributed with a zero mean and a unit standard deviation.[48]

This test rejects an equal Sharpe ratio for all the periods except during the first one (p-value of 36.08 %). This result is consistent with the non reject of an equal mean for the excess

[48] We know that the assumption of normal distribution of this test is not respected.

return on this first period (T-Test in table 1). An equal Sharpe ratio is also highly consistent with the international free market of capital observed before the First World War. During this era of first globalization, it is normal to find an equal price for the risk (what is measured by the Sharpe ratio) on different places (see chapter 8 for the international risk line before 1914).

Table 3, Test of the equality of Sharpe ratios between US and France market. This table shows the result of the statistic of Jobson and Korkie (1981) and the p-value associated with.

	1871-2007	1871-1916	1916-1950	1951-1982	1983-2007
Jobson & Korkie statistic	6.83531224	-0.35632436	3.09744476	6.86683741	3.68128707
p-value	*0.00%*	*36.08%*	*0.10%*	*0.00%*	*0.01%*

We compute in Table 4 the average HCAC 40 and HS&P performance measures and their standard deviation per period. All others measures behave more or less like the Sharpe ratios. The last period is always the most favorable of all history. Using any measure, the US market provides better performances than the French one. The HCAC 40 performance is especially poor during the third period 1951-1983 (negative Sharpe and Sortino ratios). The long-term cost of post-war reconstruction and hostile policies toward stock markets have probably significantly undermined the French capital market performance. However, during the last period 1983-2007, the HS&P still outperforms significantly the HCAC 40 performance (Sortino of 0.94 against 0.48), so the cost of wars and reconstruction is probably not the sole element to explain the US and French market performance divergence since 1914.

This diagnostic is the opposite during the first period where the performances of the French market are higher than those of the US one. This confirm the prior observations of probable equal excess return and equal Sharpe ratio between the two markets before the First World War. The three following periods also confirm that the two markets never converge again despite peace and economic growth.

As a conclusion, we can say that across the whole period, the HS&P performance measures are less volatile than the HCAC 40 one. Since the First World War, the French market significantly lags behind the US market, in terms of absolute performance as well as in terms of stability. For both indexes, we can see that the last period 1983-2007 is the most stable (the standard deviation of the Sortino is only half its mean value for both the HCAC and HS&P) as well as the best performing period (Sortino of almost 1 for the HS&P and 0.5

for the HCAC). However, the HS&P performance remains stronger than the French one since 1916.

Table 4, Mean and standard deviation of HCAC 40 and HS&P performance measures. This table shows several performances measures (mean and standard-deviation) across our four periods on French and US markets.

	1871-2007		1871-1916		1917-1950		1951-1982		1983-2007	
	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std
					HCAC 40					
VaR	6.49	3.67	2.57	0.55	8.20	2.77	9.12	1.60	9.11	1.11
CVaR	9.34	5.34	3.90	1.31	10.70	2.85	12.13	2.62	15.59	2.38
Sharpe	0.13	0.33	0.35	0.29	0.12	0.26	-0.13	0.39	0.23	0.17
Sortino	0.17	0.50	0.46	0.39	0.20	0.43	-0.26	0.62	0.30	0.23
GainLoss	49.01	15.07	56.78	5.60	52.23	4.90	47.81	7.01	54.37	3.18
WinLose	49.07	15.18	57.91	5.27	50.96	5.10	47.04	5.86	55.84	3.29
CER	-0.02	0.01	0.01	0.00	-0.02	0.01	-0.03	0.01	-0.03	0.00
					HS&P					
VaR	5.65	3.04	5.01	0.72	8.67	3.75	5.37	1.20	4.98	1.26
CVaR	8.25	4.26	7.00	0.85	12.46	5.25	7.60	1.58	8.23	1.37
Sharpe	0.41	0.42	0.25	0.22	0.34	0.32	0.65	0.59	0.61	0.30
Sortino	0.58	0.61	0.41	0.39	0.44	0.42	0.91	0.89	0.81	0.47
GainLoss	53.75	16.63	54.57	3.98	56.35	5.70	60.90	9.84	61.54	5.59
WinLose	53.53	16.00	53.55	4.01	60.11	4.64	60.58	6.97	56.93	2.65
CER	-0.01	0.01	-0.01	0.00	-0.02	0.01	-0.01	0.01	-0.01	0.00

For potential diversification benefit, it is interesting to look at the correlation of the performance measures to see how the HCAC and HS&P performances evolve together. In Table 5, we display the correlation between HCAC and HS&P performance measures across our four periods. We can see that the correlation dramatically increases overtime reducing the interest of the international diversification. We have to note that the low correlation observed during the first period is not in contradiction with prior observations of similar performances at this time. Indeed, two markets can be integrated and then provide similar long-term performances but, in the same time, being no correlated (see chapter 8).

Table 5, Correlation of performance measure. This table presents the correlation coefficient between French and US performances measures used for our four periods.

	1871-1916	1917-1950	1951-1982	1983-2007
VaR	-3.32	19.89	7.72	21.49
CVaR	0.42	6.62	10.46	30.89
Sharpe	8.03	18.63	19.80	44.42
Sortino	6.54	15.29	16.69	49.89
GainLoss	8.40	19.65	19.57	42.57
WinLose	10.43	8.82	15.60	14.14
CER	7.31	25.23	15.86	41.52

IV What can we learn from the past for asset allocation?

We have highlighted the potential weaknesses to extrapolate conclusions made by observing a single long-term market performance to other markets. We discuss in the following section what lessons for the asset allocation problem, if any, can be learned from historical long-term time series. Let us consider an investor investing in only two domestic assets: the stock index and long-term government bonds. How can the analysis of past time series help allocate the investor's wealth?

We test the benefit of using mean-variance optimizations based on past returns to build a portfolio. We compare the performance of a naive static portfolio with the performance of a dynamically optimized portfolio. We also consider different estimation windows. In a first section, we consider a monthly holding period for portfolio allocations estimated over different estimation windows. In a second section, we consider portfolio allocation with varying holding periods. We show that the optimal asset allocation is highly dependant on the investment horizon, as the relative risk of stocks and bonds is not stable through different holding period horizons.

4.1 Does optimal allocation beats the 20-80 allocation over the long run?

Markowitz (1952) demonstrates theoretically that diversification improves the performance of financial asset portfolios. We used our data to test if the optimization between stocks and bonds really provides better returns than a naïve allocation and to find what is the best prior period (how many months) to use in order to measure asset characteristics. Each month we build three portfolios (minimum variance, maximum Sharpe and a naïve 20 %-80 % constant allocation) according to different estimation windows (prior 5, 10, 20, 30 and 50 years) to compute the asset return, risk and covariance used to build optimal allocations.[49] For all these estimation windows, we consider a monthly re-allocation (*i.e.*, every month the investor uses the past monthly data over the estimation window considered to re-compute the asset allocation weights).

Then we measure the performances of these portfolios during the following month. Table 6 provides the equity allocation in the portfolio mix and average performances of these different portfolios according to the estimation window used.

First, in terms of risk and performances, the impact of changing the estimation window is fairly comparable across the two markets. The risk measures (VaR, CVaR and CER) remain stable across the different observation windows, the HCAC 40 being consistently more risky than the HS&P. The performance measures (Sharpe or Sortino) are also very similar, whatever the observation window considered. As a consequence a long period of observation does not seem necessary to build the optimal allocation between stocks and bonds. Second, the optimization provides higher performances than a naïve allocation. If the gain is not so evident according to Hit and WinLose ratios, there is no ambiguity in terms of Sharpe, or Sortino at least using estimations windows below 30 years.

More curiously, the portfolio build to provide the minimum variance (according to the prior data on several estimation windows) consistently beats (during the following month) those designed for a maximum Sharpe and of course the 20 %-80 % allocation for the US market only. It is less risky in terms of VaR and CVaR than the two other portfolios, but also performs better in terms of Sharpe and Sortino ratios.

This stability of risk and performances of the three portfolios across the different estimation windows implies changes in the optimal weight of stocks. The allocation in equity decreases with the estimation window for the minimum risk portfolio both in the French and the US market (from more than 20 % to around 10 %). On the contrary, the part of equity increases for the HCAC 40 maximum Sharpe portfolio (from around 60 % to 90 %), whereas it remains very stable at around 40 % for the HS&P. This is due to the high inflation rate in France that inflates the nominal index return. Here we only considered a monthly investment

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[49] We consider at least 5 years equivalent to 60 data points, because an estimation based on a smaller sample would not be reliable.

horizon, the allocation being updated every month. In the next section, we show how the investment horizon also impacts significantly the optimal asset allocation.

Table 6, Optimal and naive portfolios statistics. This table shows the allocation between stocks and bonds indicated by the minimum variance and maximum Sharpe portfolios build according to prior statistics on different windows between 5 and 50 years. These portfolios are rebalanced each month. The next month, we measure the performances of these portfolios and compare it to a naïve constant allocation respecting 80 % in bonds and 20 % in stocks. This comparison is done on US and French markets.

	HCAC 40					HS&P				
	Estimation window									
Number of prior years	5	10	20	30	50	5	10	20	30	50
Number of observations	60	120	240	360	600	60	120	240	360	600
	Average equity allocation (in %)									
Minimum variance	25.30	22.90	20.50	18.50	14.10	21.30	20.20	18.40	15.70	11.10
Maximum Sharpe	58.40	50.00	66.00	74.50	89.00	43.30	38.60	46.00	38.20	37.60
20/80	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
	Average results during the following motnh									
	VaR (in %)									
Minimum variance	3.70	3.70	3.80	3.80	3.90	2.20	2.40	2.50	2.60	2.70
Maximum Sharpe	5.60	5.90	5.90	6.30	6.50	4.00	3.80	3.60	4.00	4.50
20/80	3.90	3.90	3.90	3.90	3.90	2.90	2.90	2.90	2.90	2.90
	CVaR (in %)									
Minimum variance	5.70	5.90	5.90	6.00	6.00	3.70	3.80	3.90	4.10	4.40
Maximum Sharpe	8.20	8.80	8.90	9.40	9.60	7.20	6.70	6.40	6.70	6.90
20/80	6.00	6.00	6.00	6.00	6.00	4.90	4.90	4.90	4.90	4.90
	Sharpe ratio									
Minimum variance	0.80	0.70	0.70	0.70	0.60	1.70	1.40	1.30	1.10	0.80
Maximum Sharpe	0.80	0.70	1.00	0.90	1.00	1.00	0.70	0.90	0.50	0.60
20/80	0.60	0.60	0.60	0.60	0.60	1.20	1.20	1.20	1.20	1.20
	Sortino ratio									
Minimum variance	1.00	0.90	0.90	0.90	0.80	1.90	1.70	1.50	1.30	1.00
Maximum Sharpe	1.20	0.90	1.40	1.40	1.40	1.20	0.90	1.00	0.60	0.90
20/80	0.90	0.90	0.90	0.90	0.90	1.40	1.40	1.40	1.40	1.40
	Hit ratio (in %)									
Minimum variance	60.00	59.60	59.70	59.60	59.70	69.40	69.20	68.50	67.80	67.30
Maximum Sharpe	58.40	58.20	59.00	57.70	57.60	64.50	62.50	63.40	60.70	60.10
20/80	60.00	60.00	60.00	60.00	60.00	66.60	66.60	66.60	66.60	66.60
	WinLose ratio (in %)									
Minimum variance	52.90	52.80	52.40	52.40	52.10	52.50	51.30	50.80	50.50	49.30
Maximum Sharpe	51.60	51.40	51.80	52.50	52.60	48.50	50.30	50.10	50.10	49.60
20/80	51.80	51.80	51.80	51.80	51.80	49.20	49.20	49.20	49.20	49.20
	CER (Bps/month)									
Minimum variance	-85.00	-88.00	-90.00	-91.00	-92.00	-37.00	-40.00	-44.00	-48.00	-55.00
Maximum Sharpe	-148.00	-152.00	-151.00	-161.00	-166.00	-112.00	-107.00	-87.00	-101.00	-111.00
20/80	-91.00	-91.00	-91.00	-91.00	-91.00	-61.00	-61.00	-61.00	-61.00	-61.00

4.2 The impact of the investment horizon on portfolio allocation

In this section, we test the *real returns* (nominal returns adjusted for inflation) of long-term investments in both stocks and bonds in France and the US. If we reject the hypothesis of *iid* (independent identically distributed) returns, the horizon of investment does matter for the optimal assets allocation. This point is crucial for long-term investors. Indeed, long-term investors measure their investments on periods greater than one year. Typically, individuals make investment choices in stocks and bonds to prepare retirement, which means long holding periods via pension funds or life insurance companies (see Gallais-Hamonno *et al.*, 2001).

In the US case, stock returns seem to mean revert when the holding period increases (Campbell and Viceira, 2002). The level of risk for stock decreases from 18 % to 14 % between a one year and a 25 years holding period: the risk on the real total real return of holding stocks decreases when the holding period rises. Although Goetzmann *et al.* (2001) find that the US stock return reversion varies over time between 1815 and 1925: "(...) the overall mean-reversion evidence is marginal, but it is occasionally significant over sub-periods. The fact that it is not consistent over time may simply mean the periodicity of reversion changes, making forecasts for the U.S. market difficult." This observation is confirmed for other countries by Jorion (2003), who finds that "there is no evidence of long-term mean reversion in the expanded data sample" (drawn from 30 different countries). "Downside risk is not reduced as the horizon lengthens." Reversely, bond returns present a mean aversion (Campbell and Viceira, 2002).

We use our monthly dataset from 1871 to 2007 to compute realized real returns over different long-term holding periods. For an holding period of *n* years, the annual geometric average of change in total real wealth is measured each rolling month as:

$$\left(\frac{\mathrm{P_t}}{\mathrm{P_{t-n}}} / \frac{\mathrm{i_t}}{\mathrm{i_{t-n}}}\right)^{\frac{1}{n}} - 1$$

where P_t stands for either the bond or stock index value plus dividend or coupon (supposed free of tax) at time t and i_t stands for the consumer price index at time *t*.We adjust the annual standard deviation by $\sqrt{n}$ to be able to compare the risk of the different holding horizon returns.[50]

Our data show a large difference between France and the US. As shown in Figure 3, the risk of bond returns presents a short-lived increase both in France and the US but with a higher absolute level in France. After about twenty holding years, this mean aversion disappears and the risk decreases slowly in both markets. For stock returns, the story is totally different. In France, after a short mean aversion (weak compared to those observed on French

[50] Indeed, what is important for a long-term investor is not the annualized return but the cumulative return at the end of the holding period: it is not the same to lose 5 % for one single year or each year during 20 years.

bonds), the level of risk is stable without any mean reversion. This stability of the risk on French stock return is consistent with the hypothesis of market efficiency: the past returns cannot help to forecast future returns. Across US and French data, a common major result is that after about nine years, the risk on stock is below the risk on bonds.

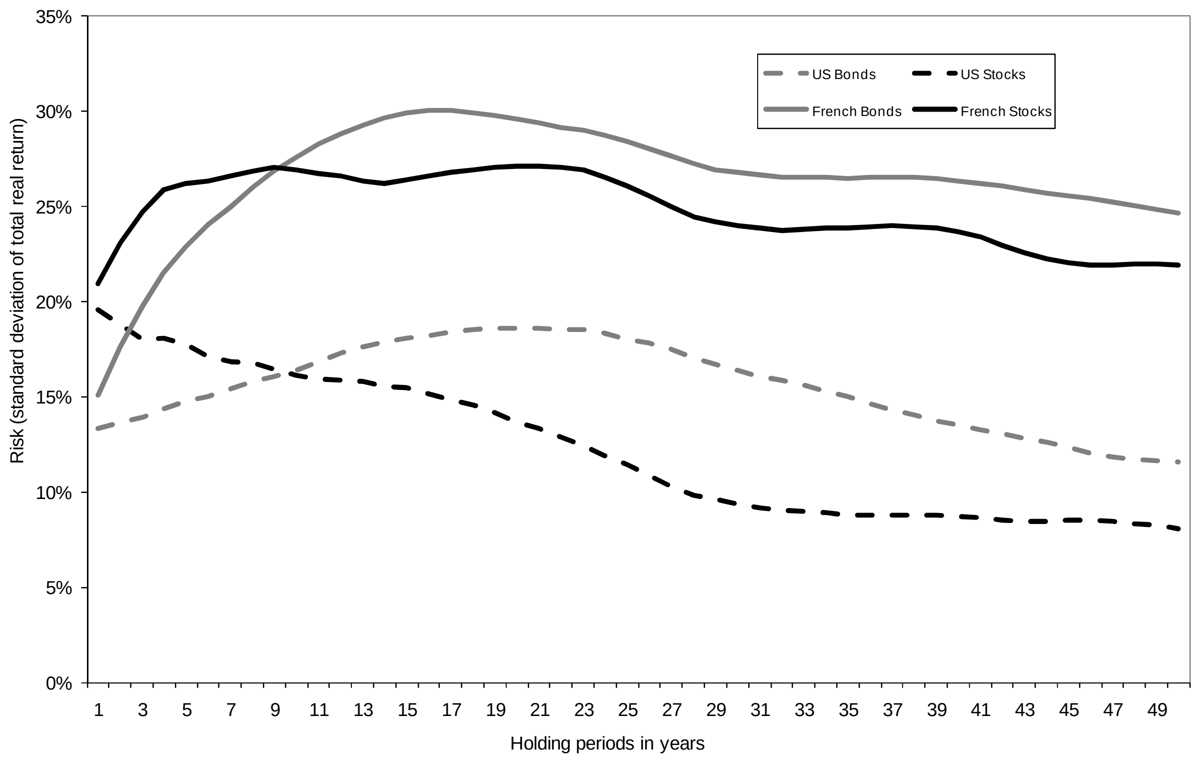
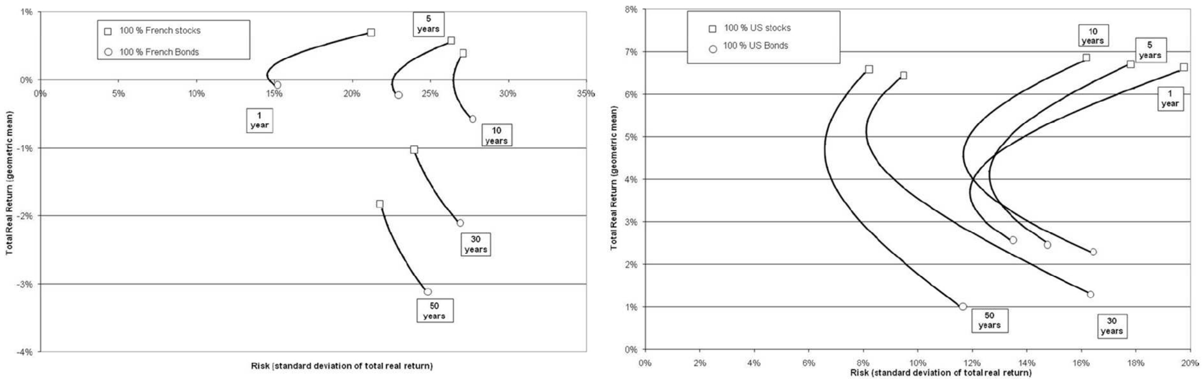


Figure 3, Standard deviation with respect to investment horizon. This Figure shows the risk of holding bonds or stocks according to the investment horizon. These measures are done on both French and US markets.

These changes in the relative risk level lead to changes in the optimal allocation (in a "Markowitz" sense) between stocks and bonds with respect to the investment horizon. Figures 4 and 5 show the result of combinations of stocks and bonds for 1, 5, 10, 30 and 50 years in France and the US respectively. The point on top of each curve represents a portfolio only invested in stocks and the lower point represents the portfolio only invested in bonds. All possible combinations of these two assets are on the curve (the efficient frontier). Whatever the risk aversion of an investor, he has to hold at least the proportion of stocks in the minimum risk portfolio. Over a one year horizon, the minimum weight to invest in stocks (minimum risk portfolio) is 27 % in the US and 21 % in France. For a 30 year investment, these proportions rise to 75 % in the US and 100 % in the France. Building an allocation based on the risk measured on a one year horizon, whereas the investment horizon is effectively a few decades (*e.g.* a retirement plan) leads to a non optimal allocation between stocks and bonds. As a result, the final accumulated wealth can be dramatically low compared to what it could be thanks to an optimization realized over the correct horizon.[51]



Figures 4 and 5, French and US portfolios with varying investment horizons. On each of these figures we show all the possible combinations between stocks and bonds if short sales are not authorized according to several holding periods from 1 to 50 years. Whatever is the risk aversion of the investor, he need to hold at least the part of stocks indicated by the minimum risk portfolio (the point on the extreme left of each curve).

Another strong difference between France and the US is the curvature of the efficient frontiers for different holding periods. In the US case for all holding periods, the curvature is very large indicating a weak correlation between stocks and bond returns. At the opposite, in the French case after a ten years holding period, the curve seems to be a straight line. This low curvature indicates a high level of correlation between asset returns. Yang *et al.* (2009) explore time-varying patterns of stock bond correlations over macroeconomic conditions in the US and the UK in the past 150 years. They demonstrate that higher stock-bond correlations tend to follow higher inflation rates.

Figure 6 shows the correlation between the bond and stock returns for each holding period between one and 50 years. In the US case, the correlation coefficient gradually decreases, to become even negative over longer investment horizons[52]. In the French case, this coefficient rises quickly before stabilizing at a very high level (about 0.95). This high correlation leads to a reduced appeal of bonds for long-term holding periods since French bonds present altogether higher risk and a lower return. Inflation may explain this high

[51] These results are highly important for long-term investor typically managers of retirement plans.
[52] As pointed out by Ilmanen (2003): correlations become even more negative during deflationary recessions, equity weakness, and high-volatility flight to quality periods.

correlation in France: for long-term holding periods, returns are in all cases affected by strong inflation. The effect of inflation on stock-bond correlation (but at a weaker level) is verified on US markets over a shorter period of time by Li (2002) or Ilmanen (2003).

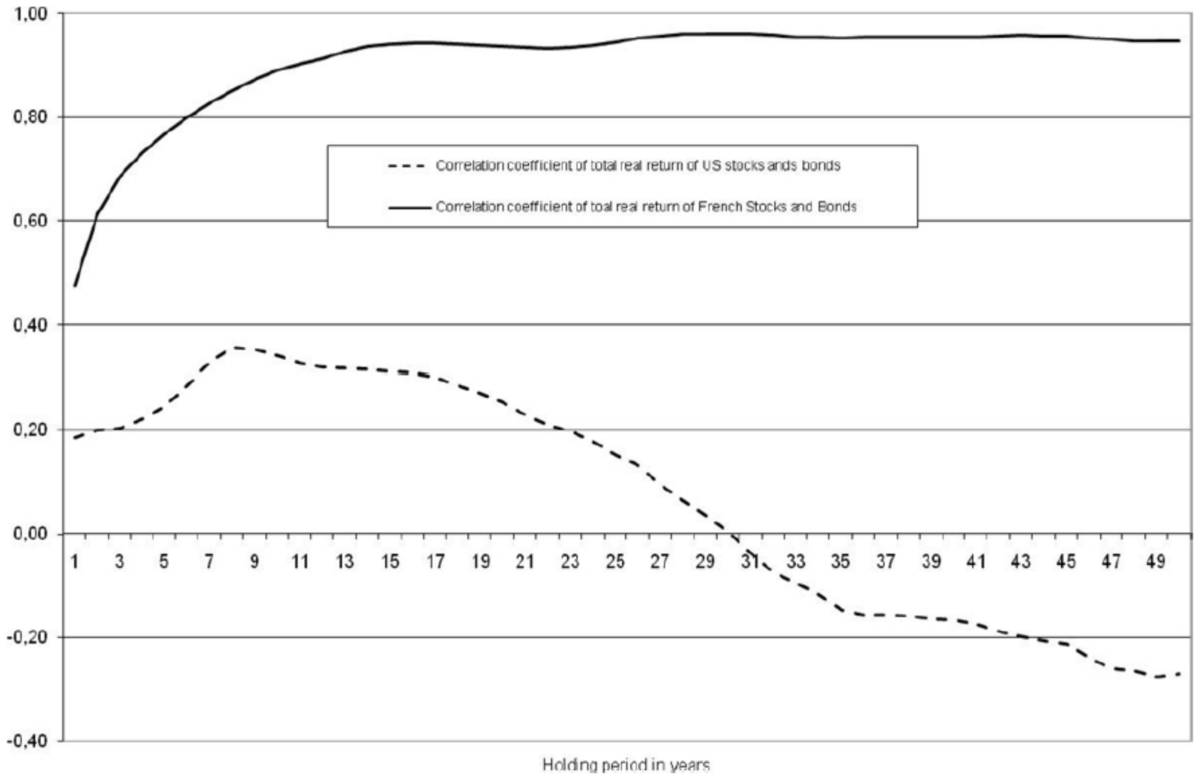


Figure 6, Bond and Index correlations in France and the US. This figure shows the correlation between stock and bonds real returns according to the holding period between 1 to 50 years. These correlations are measured on both French and US markets.

V Conclusion

Most empirical knowledge on performance of financial investments is derived from the behavior of the most successful market: the US one. US observations are used to test theoretical analysis and anticipate portfolio returns. Because of wars and defeat, reconstruction costs, socialist policies and inflation, France is a good market to consider for balancing US results. Both French and US stock performances are unstable over time. However, French stock returns appear less appealing than US stock returns: they are lower and more volatile. The US and France performances appear very close before 1917 but with the First World War, the two markets dramatically diverged and never converged again. And even if a higher correlation of the US and French markets performances is measured during the last most stable period (1983 to 2007), the US market still greatly outperforms the French market.

If the investor has no choice for geographical diversification (the last foreign exchange controls date back to the 1980s in France) the stock market still outperforms the risk free rate and often government bonds. In both markets however, the investment horizon matters for the asset allocation problem. We computed some classical portfolio allocations: the minimum variance portfolio and the maximum Sharpe portfolio, over the period 1871-2007, with varying estimation windows. We showed that minimum variance portfolios built optimally (in the sense of Markowitz) based on past returns lead to a better performance than a blind allocation (the 20 %-80 % allocation). Considering different estimation windows, we showed that the risk and performances of the different portfolios tested remain stable. We also considered portfolio allocations with varying holding periods. We showed that the optimal asset allocation is highly dependant on the investment horizon, as the relative risk of stocks and bonds is not stable through different holding period horizons.

If the investor wants to benefit from the diversification effect, he must keep in mind that all capital markets are not going to behave as the US market behaved historically (with an geometric average equity premium of 4.95 % per year). A remaining question is whether the US are going to sustain their lead on the financial markets? Which other markets are going to behave as the historical US one in the future? Without any answer to this question, investors can probably expect stock performances to be somewhere between the US and French markets historical performances.

REFERENCES

Brown S., Goetzmann W.N. and S.A. Ross (1995), “Survival”, *Journal of Finance*, 50, p. 853–873.

Campbel J.Y., and M.M. Viceira (2002), *Strategic Asset Allocation: Portfolio Choice for Long-term Investors*, New York, Oxford University Press.

DeMiguel V., Garlappi L. and R. Uppal (2009), “Optimal versus Naïve Diversification: How Inneficient is the 1/N Portfolio Strategy?”, *Review of Financial Study*, 22, p. 2303-2330.

Dimson E. and P. Marsh (2001), “U.K. Financial Market Returns, 1955-2000”, *Journal of Business*, 74, p. 1-31.

Dimson E., Marsh P. and M. Staunton (2002), *Triumph of the Optimists: 101 Years of Global Investment Returns*, NJ, Princeton University Press.

Dimson E., Marsh P., M. Staunton and J. Wilmot (2010), *Credit Suisse Credit Suisse Global Investment Returns Yearbook 2010*, Crédit Suisse, London.

Gallais-Hamonno G., Arbulu P., Cotreuil de Belmont I. and L. Monsigny (2001), « Que peuvent attendre les salariés d'une retraite par capitalisation? Premiers résultats sur la période 1950-1997”, *Bankers Markets & Investors*, 52.

Goetzmann W., Ibbotson R.G. and L. Peng (2001), “A new historical database for the NYSE 1815 to 1925: Performance andpredictability”, *Journal of Financial Markets*, 4, p. 1-32.

Goetzmann W., L. Lingfeld and G. Rouwenhorst (2005), “Long-Term Global Market Correlations”, *Journal of Business*, 78, p. 1-38.

Ibbotson Associates (1997), *Stocks, Bonds, Bills and Inflation, 1997 Yearbook*, Chicago, Ibbotson Associates.

Ilmanen A. (2003), “Stock-Bond Correlations”, *The Journal of Fixed Income*, 13, p. 55-66.

Jobson J.D. and B.M. Korkie (1981), “Performance Hypothesis Testing with the Sharpe and Treynor Measures”, *Journal of Finance,* 36, p. 889-908.

Jorion P. and W. Goetzmann (1999), “Global Stock Market in the 20th Century”, *Journal of Finance*, 54, p. 953-980.

Jorion P. (2003), “The Long-Term Risks of Global Stock Markets”, *Financial Management*, 32, p. 5-26.

Bernardo A., O. Ledoit (2001), “Gain, Loss and Asset Pricing”, *Journal of Political Economy*, 108, p. 144-172.

Li L., *Macroeconomic Factors and the Correlation of Stock and Bond Returns*, *Working Paper*, Yale ICF, 2002.

Rajan R. and L. Zingales (2003), “The Great Reversal: the Politics of Financial Development in the 20th Century”, *Journal of Financial Economics*, 69, p. 5-50.

Schwert W. (1990), “Indexes of US Stock Prices from 1802 to 1987”, *Journal of Business*, 63, p. 399-426.

Sharpe W. (1994), “The Sharpe Ratio”, *Journal of Portfolio Management*, 21, p. 49-58.

Shiller R. (2000), *Irrational Exuberance*, Princeton, Princeton University Press.

Siegel J. (1994), *Stocks for the Long Run: a Guide to Selecting Markets for Long-Term Growth*, New York, Irvin.

Sortino F. and L. Price (1994), “Performance measurement in a downside risk framework”, *Journal of Investing*, 3, p. 59-65.

Temin P. (1993), “The Transmission of the Great Depression”, *Journal of Economic Perspectives*, 7, p. 87-102.

Wilson J. W. and C. Jones (1997), “Long-term Returns and Risk for Bonds”, *Journal of Portfolio Management*, 23, p. 15-28.

Wilson J. W. and C. Jones (2002), “An Analysis of the S&P 500 Index and Cowles’s Extensions: Price Indexes and Stock Returns, 1870–1999”, *Journal of Business*, 75, p. 505-33.

Yang Jian Z. Y. and Z. Wang (2009), “The Stock–Bond Correlation and Macroeconomic Conditions: One and a half Centuries of Evidence”, *Journal of Banking & Finance*, 33, p. 670-680.

Appendix A:

US Stocks:
1871-2008: monthly data, Cowles-S&P according to the Shiller version, available online at http://www.econ.yale.edu/ shiller/data.htm.
US long-term rates:
1871-1913: monthly data, according to the Schiller version.
US Bills:
1871-1934: annual interpolated from Homer S. and R. Sylla (1998), *A History of interest rates*. New Brunswick, Rutgers University Press.
1935-2008: monthly data of 3-months Treasury Bill Secondary market, board of governors from FED.
US inflation:
1871-1912: Historical Statistics of the United States (1975), Bicentennial Edition.
1913-2008: US Bureau of Labor.
French stocks:
1854-1988: historical CAC 40, monthly data, from Le Bris and Hautcoeur (2010), “A Challenge to Triumphant Optimists? A Blue Chips Index for the Paris Stock-Exchange (1854-2007)”, *Financial History Review*, 27, p. 141-183.
1988-2008: CAC 40, monthly data, NYSE-Euronext.
French long-term rate:
1871-1969: monthly data, Rente 3 % then Rente 5 % from author.
1970-2008: monthly data, average state bonds from Caisse des Dépôts et Consignations.
French Bills:
1871-1951: monthly data, Paris Open Market from NBER except 1914-1925 and 1940-1951: annual interpolated of discount rate of the Banque de France from INSEE.
1952-2008: monthly data, money market rate from the Banque de France.
French inflation:
1871-1913: consumer price index from Lévy-Leboyer M. and F. Bourguignon (1985). *L’Économie Française au XIXème siècle, analyse macroéconomique*. Paris, Économica.
1914-2008: consumer price index from INSEE

Whenever monthly data are not available, we apply a linear interpolation to provide monthly values.

Bond total return computation: we can use the rate of perpetual or long-term bonds to measure the total return of a bond investment. More formally we have: *r*, the annual total return between *t* and *t+1*, *P* is the price of the bond, *C* is the amount of the coupon and *T* is the rate of the perpetual bond (*C/P*):

$$r = \frac{P_{t+1}}{P_t} - 1 + T_t$$

In the case of a perpetual bond, we have $P = \frac{C}{T}$. Thus:

$$r = \frac{\frac{C}{T_{t+1}}}{\frac{C}{T_t}} - 1 + T_t$$

Since $\frac{\frac{a}{b}}{\frac{a}{c}} = \frac{c}{b}$, we have, *r*, the total return of the bond as: $r = \frac{T_t}{T_{t+1}} - 1 + T_t$

Chapitre 3, Les guerres sont-elles une explication ? « The French Stock Market in War. »[53]

Abstract: Stock return depends on how the war is financed. The Franco-Prussian war was financed only by regular debt thus stocks reflected only situations of real activity. World Wars were both partially financed by short-term debt but differ on freedom of capital markets. Monetary creation in a closed economy as during WWII leads to an increase of prices of real assets. War also affects characteristics of the market. The Franco-Prussian war caused a durable high interest rate, WWI changed the amplitude of stock movements and WWII affected the components of markets. After World Wars, the importance of stock markets in the economy decreased.

Keywords: Paris Stock exchange, war, stock return, rare event, 19th century, 20th century.

JEL classification: G1, G12, N23, N24.

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War, followed by defeat, is probably the worst event which can impact the stock market. Barro (2006) proposes an explanation for the equity premium puzzle using the probability of disaster such as war. Currents conflicts raise several issues of interest. Fernandez (2008) looks at the volatility change due to war in Irak. Rigobon and Sack (2005) find an important war risk premium in US assets just before the beginning of the war in Irak. Franck and Krausz (2008) measure the impact of institutional reforms and wars on the Tel-Aviv Stock Exchange. There have been a number of recent studies with particular focus on the developments around World War II. Frey and Kucher (2000) analyse war situations using foreign government bond prices at the Zurich stock exchange. Oosterlinck (2003) compares prices of Vichy bonds with pre-war French bonds to measure the legitimacy of Vichy France. Brown and Burdekin (2002) study German bonds traded in London. Occhino *et al.* (2007) show how occupied France financed its own exploitation. Oosterlinck (2004) paper describes the market microstructure, the changes in market organization during the Occupation. Marseille (2000) finds that, in France, several industries, like construction firms, have a better performance than the market in average.

Most of these studies use market prices to understand war. This paper focuses on wars to understand the French stock market and his long-term trends. Confident stock market data exists since 1871 for the United States thanks to the precursor work of Alfred Cowles (1939), recently completed by Siegel (1994) or Goetzmann *et al.* (2000) for 1815-1871 period. The very specific economic history of the United States, a winner one, leads to an investigation into other countries. Dimson *et al.* (2002) compile a large panel of stock indices but without the quality of US data. They found that in Europe too, despite wars, stocks performed well in the 20th century. A major shortfall in those studies is that the quality of the data collected can be poor. Indeed, they are often a compilation of old indices built by statistic administrations to gauge macro-economic situation and not the effective return of an investment in stocks (see Le Bris and Hautcoeur, 2010 or chapter 1).

This study uses a new homogeneous high quality stock index for the French stock market from 1854 to 1998 (Le Bris and Hautcoeur, 2010 or chapter 1). Using this index and components of it, we focus on the stock market during wars and the long-term impact of the conflicts. France suffers three wars on its own national territory: one clear defeat (1870), one very difficult victory (WWI) and one defeat with a pseudo-victory (WWII). This paper seeks to measure the impact of war on stock market development and to understand this impact looking at the way the war is financed. We observe that war affects not only stocks prices but the regime of the stock market: a high interest rate after 1871, the end of monetary stability with WWI and the partial nationalisation of the market after WWII. Consequently, the role of the stock market in the economy decreased after the two World Wars.

I Stock returns in war

1.1 Data

Basically, the "HCAC 40" is a monthly index of the 40 most prominent shares among French firms, ranked (each year) by market capitalisation, thus avoiding survivor's bias.[54] The index is weighted by these capitalisations. 40 firms are few compared to the number of quoted stocks but these 40 represent a major part of the total market capitalisation. Today, the Euronext's CAC 40 represents about 70 % of the French market capitalization. It was the same or even better during war periods. The distribution of the firm's size is not linear. As demonstrated by Malevergne *et al.* (2009) in many economic cases, the market capitalization follows a power law. Focusing on the forty first firms, the first one has a weighting of 12.73 % on average from 1854 to 2007 and only 0.69 for the 40th firm. The top ten represent more than 60 % whereas the final ten, less than 8 %. Other assets are used to compare stock performances. Data on bonds prices also come from Le Bris and Hautcoeur (2010). Black market prices of gold and currencies during the WWII are from Vigreux (1948). Data for GDP come from Lévy-Leboyer and Bourguignon (1985) and INSEE (1951).

1.2 Three wars, three different reactions

Stock market prices present similar movements prior to war declarations: prices are stable. The market seems to not expect serious negative consequences from the wars. Starting from 18 months before the declaration of war, prices decrease about 10 % before WWI and WWII and stay perfectly stable during the same period before the Franco-Prussian war. Once the war starts, variations differ strongly. After the defeat, stock prices fall 20 % in 1871. At the beginning of WWI, stock prices fall about 15 %. It is a very different scenario for WWII.

[54] During WWII most of prices used are those quoted in Lyon since this market is the most active, see Oosterlinck (2004).

Two months after the declaration of war, during the "drôle de guerre" and after the armistice, stock prices rise very quickly, with a weak impact from the military defeat. This rise in nominal prices during WWII is very homogeneous until January 1943. During 41 months between the declaration of war and January 1943, only ten months are negative whereas it is about half in normal period. Since the declaration of war, prices are multiplied by 4. After that date, the trend is reversed but the coefficient is always 2.5 at the end of the war.

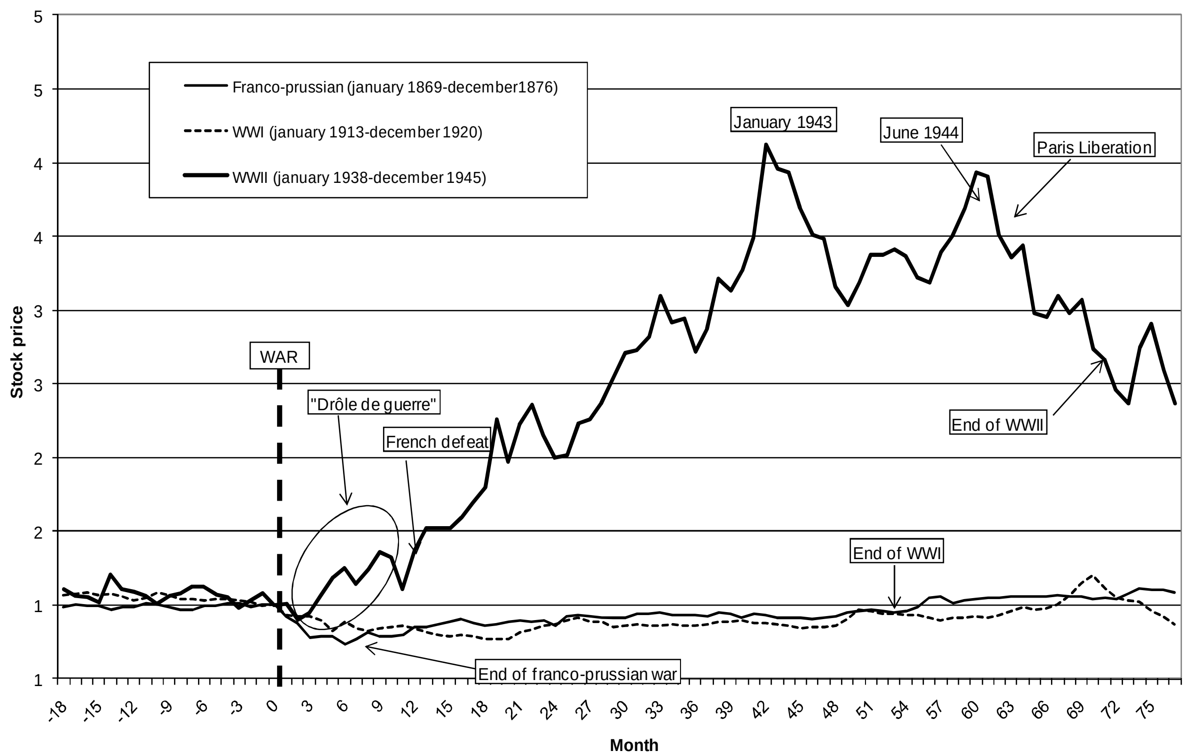


Figure 1, Price reaction of the HCAC 40 during wars. This shows stock prices during the three international wars with one common basis of one at the start of the conflict.

1.3 Nominal and real prices

Nominal and real prices are definitively different. These stocks prices are those quoted in the stock market: they are nominal. With the value of the French franc falling, the real performance is not the same. It is reasonable to assume that investors are more concerned with real performances than with nominal ones. In the next table, only the capital value is measured; the total return of a stock holder is different since a dividend exists. Dividends or coupons are not used since their yield impact is very weak when price variations are so large.

In order to measure all the “war effect”, it is necessary to look at the resulting situation a few years after the war until GDP recovered up to pre-war level (1922 after WWI, 1950 after WWII). The years immediately following the end of the war must be included in the analysis of its effects. To understand stock performances, state bond and gold prices are also presented here.

Three wars, two near total losses. The Franco-Prussian war causes a 40 % loss for both stocks and bonds. Nominal and real performances are similar since inflation does not really exist. One year after, the loss in the value of stocks is only 20 % but 30 % for bonds. At the end of WWI, the decrease in value is about 65 % for stocks and more than 70 % for bonds. Two years after, it is worse: 75 % for stocks and 80 % for bonds. WWII is different with a nominal increase but a dramatic real performance. On the top of stock prices, the real performance is + 75 % but at the end of the war, the real variation is – 40 % and – 70 % for bonds. A few years after, in January 1949, the loss is more or less complete with – 88 % for stocks and – 95 % for bonds since in 1946, 1947 and 1948 the inflation rate is above 50 % each year.

During these two last wars, gold achieves very attractive performances. Two years after the end of WWI, gold holders have the same real value as prior the war. The highest value of stocks in January 1943 of + 75 % pales in comparison to the + 500 % achieved by gold! At the end of WWII, gold keeps a 400 % increase and still a 20 % increase in January 1949.

Table 1, Nominal and real prices during and after wars. This table shows the prices in nominal and real terms each year during the wars and until the GDP recovered up to the pre-war level. Stock prices, French government bonds and gold are also presented.

PRICES IN WAR						
	Stocks		**Rente 3 %**		**Gold**	
	Nominal	*Real*	*Nominal*	*Real*	*Nominal*	*Real*
Franco-Prussian war						
January 1870	100	100	100	100	100	100
January 1871	74,11	**63,68**	69,84	**60,02**	100	85,93
January 1872	88,53	81,56	75,79	70,29	100	92,74
WWI						
january 1914	100	100	100	100	100	100
january 1915	85,61	71,94	84,62	71,11	100,00	84,03
january 1916	74,83	55,84	74,82	55,84	100,00	74,63
january 1917	83,55	52,22	72,77	45,48	100,00	62,50
january 1918	84,62	40,88	68,66	33,17	100,00	48,31
january 1919	90,23	**34,84**	72,24	**27,89**	105,00	**40,54**
january 1920	94,18	26,38	69,72	19,53	225,00	63,03
january 1921	84,36	**27,04**	68,31	**21,89**	304,00	**97,44**
WWII						
january 1939	100	100	100	100	100	100
january 1940	111,46	93,91	90,44	76,20	112,08	94,43
january 1941	160,17	115,07	102,35	73,53	575,10	413,17
january 1942	241,36	144,33	113,08	67,62	1 082,45	647,30
january 1943	**367,00**	**176,72**	114,96	55,35	1 237,14	595,72
january 1944	299,47	117,98	113,61	44,76	1 514,69	596,72
january 1945	262,32	**69,66**	117,89	**31,31**	1 676,73	**445,27**
january 1946	208,72	36,33	116,07	20,20	2 193,88	381,89
january 1947	263,91	30,79	105,34	12,29	1 371,43	160,02
january 1948	212,39	15,62	78,01	5,74	1 906,12	140,14
january 1949	186,06	**12,09**	73,31	**4,76**	1 857,14	**120,65**

II The performance of stocks depends on how the war is financed

These different price reactions during these wars can be explained by the method used to finance each conflict. The main cost of the Franco-Prussian war is an indemnity of 5 billion francs financed by standard debt (Emprunts Thiers). 2 billion of Rente 5 % are first issued (June 21, 1871) with an actuarial rate of 6.5 % whereas the current rate was only 5.8 % (Vaslin, 2007). A second issue of 3 billion is launched (July, 15, 1872) with an actuarial rate of 6.32 % against only 5.59 % on the bond market (Vaslin, 2007). This premium causes a huge success: the bid is 43.86 billion. The French state sell for only 3.5 billion coming from Germany (471 million), Belgium (396), UK (334) or Netherlands (83) (Marion, 1926). These large issues do not destabilize the French financial market. 5 billion francs of new debt is just equal to the market capitalisation of the HCAC 40 in January 1871. The comparison with the stock market capitalisation is used to represent the size of these amounts. Thus, the “financial cost" of the war is only about 100 % of the market capitalisation. This new debt causes a fall in bonds prices but financial stability is maintained.

For WWI, it is very different: it is the birth of inflation. War needs money. Just before 1914, the new public debt is non-existent. The beginning of the war is financed by short-term debt (1/3 from the *Banque de France*) but from 1916, long-term bonds issues are massive. Between 1915 and 1924, new "Rente" is about 45 billion franc-or. It is nearly double of all issues during the preceding century. Between 1798 and 1914, total new "Rente" is only 26.3 billion francs in nominal value (Vaslin, 2007). Starting from 31 billion francs before the war, the amount of the long-term public debt is 114 in 1920. The impact on bonds is direct because of the increase in interest rate. Massive issues of long-term public debt should have a negative impact on stock prices since it is an alternative choice for savers and a higher cost of debt for firms.

But the main effect comes from monetary creations (advances from the *Banque de France* and "*Bons de la Défense Nationale*" during WWI too[55]) which causes a non-anticipated inflation whose impact is very strong. The Banque de France and the Banque d'Algérie create new money to provide francs to the government. This amount is 25.9 billion francs at the end of the war. But the main source of money comes from issues of short-term debt. Her value is about 2 billion in 1913 and increases to 83 billion francs in 1920. To serve as a basis of comparison, the market value of the HCAC 40 in January 1914 was only 12 billion. All this new money without any new wealth in the economy leads to inflation of prices of goods. Perhaps this kind of war inflation is never anticipated since, for savers, it is a period of heavy losses each time.

Conventional wisdom suggests that nominal stock returns should be relatively high when inflation is high and vice-versa, since stocks represent claims on real assets that should increase value with inflation. From 1926 to 1996, in the United States, with a weak inflation compared to France, there is no discernable relationship between stock performances and inflation rate[56]. "Accordingly, stocks are not good hedges against inflation rate" (Sharpe *et al.*, 1999). It is worse in France with high war inflation. Stock prices never follow inflation.

[55] Eichengreen (1990) shows a strong correlation between inflation and monetary growth (M1 which includes "Bons de la Défense nationale issued in the early 1920s were sufficiently liquid to serve as close substitute for money") among 12 countries over the period 1921-1927.
[56] Correlation coefficient between stock returns and inflation rate is -0,01 (Ibbotson Associates, 1997). Various studies find the same absence of relation in the short-term at least.

During WWI, the majority of the rules of the free market keep safe. Since the start of the war, a law[57]prohibits issue of new securities without special authorization reinforced in May 1916. Moreover, all public issuers can stop their payments on existing securities (decree 30 August 1914). At the end of the war, a pure free market cannot exist since capital export or securities import are regulated. But, export of capital is not totally impossible, foreign securities can be bought at the bourse and holding of gold is not forbidden. The French government only rent or buy foreign securities[58] to pay for importations in dollars and stock prices adjust without any constraint, real values decrease quickly.

WWI and WWII differ in the level of capital freedom explaining the rise of stock prices during the second world conflict. During WWII, all assets are controlled: frontiers are closed to export money. Money can only buy national assets. It is the famous “circuit”. Consequently, there is a boom for stock prices due to a lot of new money created in the country. With the “mobilisation générale”, 25 billion from the *Banque de France* is made available for the government.[59] Another convention[60] sees 20 billion more being offered by the Banque. This amount is nearly the value of all stocks listed (in January 1939, the market capitalisation of the HCAC 40 is only 42 billion). In February 1940, 20 billion is spent by the government; on May 9th, only 21.6 billion is spent but after the defeat (10th June), this figure rises to 36 billion. This advance rises to 57.7 billion on the 1st August after a new convention between the government and the *Banque de France*.

German occupation causes an unbelievable creation of new money. The armistice convention of the 22nd June 1940 sets an occupation indemnity of 400 million francs a day, to be paid by the French government. In May 1941[61], this amount decreases to 300 million a day but rises to 500 million in winter 1942[62] when the south of France becomes occupied too. As a result, together with some additional various expenditures (Italian indemnity, maintenance of military bases), the French government transfers 80 billion in 1940, 130 billion in 1941, 124 billion in 1942, 220 billion in 1943 et 142 billion in 1944 (Sédillot, 1945). The total

[57] 1 June 1914.
[58] Pennsylvania 3 % and Chicago Milwaukee 4 % are bought at issue price by the French government in June 1915 since US banks propose a loan on 80 % of the value of these bonds. After, it is Central Pacific 4 % and New-York New-Haven 4 %. After 5th May 1916, securities are rented by the state, compensated by a dividend/coupon majoration of 25 %. A certificate of rent can be exchanged on the market but few transactions are listed.
[59] Convention, 29 September 1938.
[60] 29 February 1940.
[61] 11 May 1941.
[62]11 November 1942.

amount is about 700 billion. A new kind of advance from the Banque de France is used to pay German troops: “frais d’entretien des troupes d’occupation”. The total of this new money is about 426 billion francs compared to 40 billion which is the market capitalisation of the HCAC 40 in January 1939. With only the 1940 transfer amount, Germany can buy all the stocks in the HCAC 40 two times over, and 17 times over (700/40) with all the francs transferred during the war.

Table 2, Money issue by the Banque de France to pay German Occupation. Data are from Sédillot (1945).

Loans for "frais d'entretien des troupes d'occupation" by Banque de France (in billion)				
Convention date	*Law of*	*Published in J.O*	*increase by*	*Total*
25 August 1940	25 August 1940	13 September 1940	50	50
29 October 1940	29 October 1940	01 November 1940	15	65
12 December 1940	16 December 1940	17 December 1940	8	73
30 December 1940	31 December 1940	20 January 1941	12	85
20 February 1941	22 February 1941	22 March 1941	15	100
30 April 1941	03 May 1941	06 July 1941	4	104
10 May 1941	30 May 1941	06 June 1941	4	108
11 June 1941	11 June 1941	24 June 1941	10	118
11 September 1941	21 September 1941	23 September 1941	12	130
27 November 1941	09 December 1941	12 December 1941	12	142
26 December 1941	31 December 1941	08 February 1942	8	150
05 March 1942	26 March 1942	05 April 1942	10	160
30 April 1942	04 May 1942	05 May 1942	9	169
11 June 1942	12 June 1942	13 June 1942	12	181
17 September 1942	28 September 1942	01 October 1942	15	196
19 November 1942	04 December 1942	06 December 1942	15	211
21 January 1943	12 February 1943	17 February 1943	20	231
31 March 1943	08 April 1943	10 April 1943	30	261
08 July 1943	10 July 1943	08 August 1943	30	291
30 September 1943	30 September 1943	14 October 1943	30	321
16 December 1943	20 December 1943	05 January 1944	30	351
23 March 1944	30 March 1944	06 April 1944	30	381
17 May 1944	08 June 1944	16 June 1944	30	411
20 July 1944	*notpublished*		15	426

This new money, without any new wealth being generated in the French economy, causes price adjustment (inflation) despite the fact that most of the prices are controlled. People flee the franc for hard assets. It is a flight for real assets and a boom for stocks. Stocks with real value (real estate or retail stores with many real estate properties, like *Au Printemps*) provide the best performances (Marseille, 2000). In January 1943, stocks prices are 4 times more than in 1939. Stock prices start to fall in 1943 when the end of this exceptional situation seems to be on the horizon. In January, the first big German defeat in Stalingrad takes place and also the fusion between the Giraud and Leclerc armies in Tunisia.

This effect of the monetary creation also leads to a huge rise of all real assets. Real estate prices increase despite a new administrative authorization before any transaction[63]. Stamps, carpets, jewelry or books experienced a massive boom (Sédillot, 1945). Thanks to hedonic methods, Oosterlinck (2009) build an art index based on 3,000 canvasses sold during the war in Drouot, the main French auction house. General movements are similar to those of the stock market but stronger with a peak in January 1943 indicating six time pre-war prices.

Figure 2 exhibits the prices of gold, currencies, stocks and the amount of banknotes as an indicator of the monetary creation. We notice that stock increase is very weak compare to prices of gold or foreign currencies (black market). It is probably a liquidity premium (gold or currencies can be used to pay anything anytime, unlike stocks) and a security premium (stocks and firms can support political restriction, not gold or currencies). Moreover, with the end of the war, assets other than stocks continue to grow whereas stock prices remain stable despite the pursuit of the inflation. War caused spectacular price variations but changed the nature of the market too.

[63] Law, 16 November 1940.

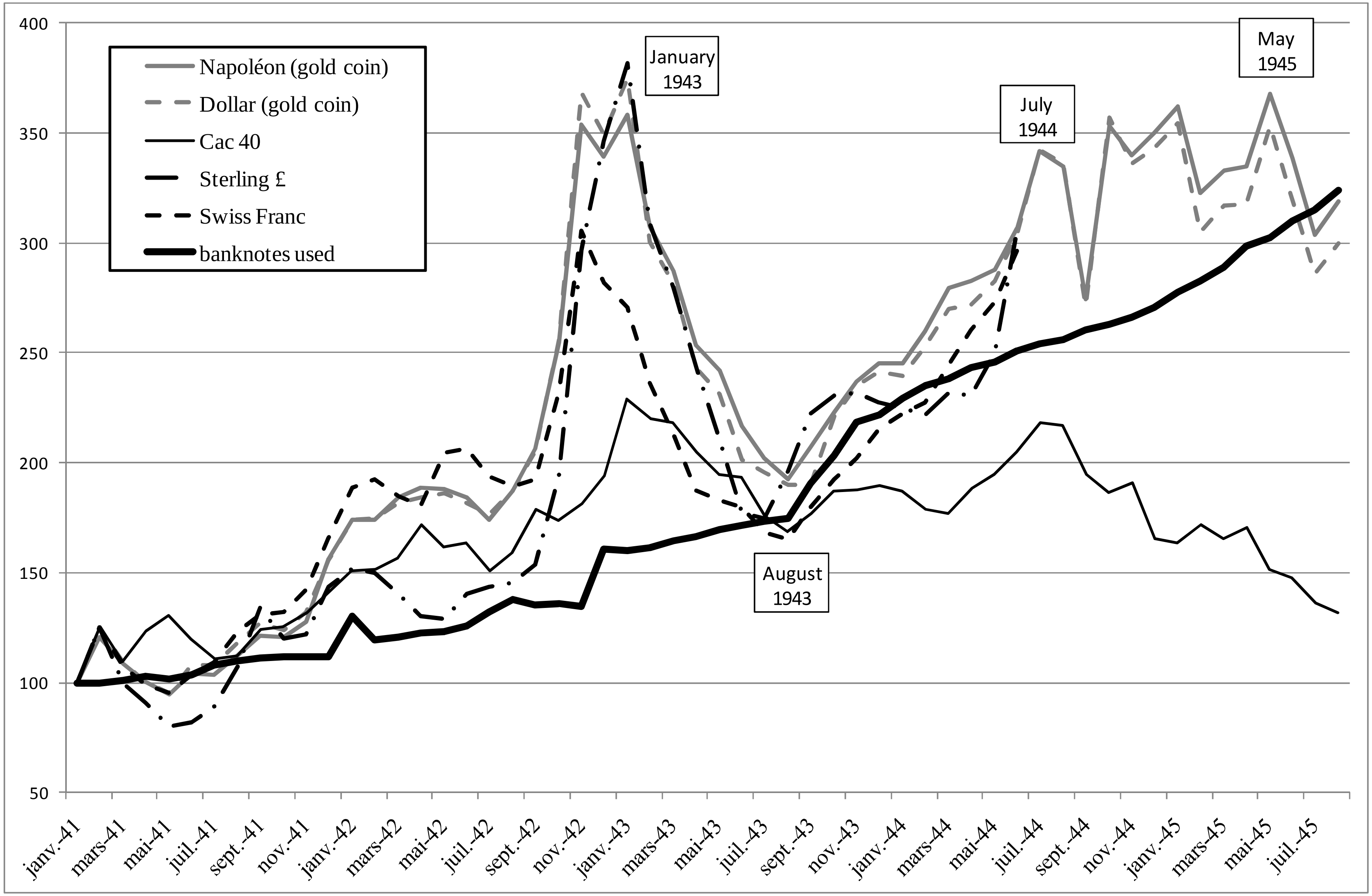


Figure 2, Prices of French stocks, gold, strong currency and bank notes used during the WWII. This Figure shows prices in current francs with a common basis of 100 in January 1941. Except stocks, all prices are from the black market (Vigreux, 1948)

III Structural changes after wars

3.1 Franco-Prussian war increases interest rates for years

In order to pay the indemnity to the Prussians, two big issues (2 and 3 billion) of debt take place leading to a high level for the interest rate. This 5 billion franc of debt is about 20 % of the French GDP (Occhino *et al.*, 2007). After this major transaction, the interest rate decreases more slowly than after previous interest rate peaks in 1830, 1848 or 1852 (see Appendix A). A new progressive wave of saving can probably explain this gradual decrease in interest rate. The second issue of three billion is the most significant of the whole century; it is sold with a 6.32 % rate (Vaslin, 2007). Prior maximum of interest rate (above 5.5 %) experienced with revolutions of 1830 and 1848 was short-lived (see Appendix A). At the opposite, with the French-Prussian war, the rate experiences a slow decrease probably due to the huge amount of debt issued to pay the tribute.

This slow decrease is accompanied by a symmetric increase for stock prices. This increase is very regular and large with 8.28 per annum % in geometric mean between January 1871 and January 1882. While a financial crisis affects international markets in 1873, the French one is not concerned since all weak business had been settled with the French defeat two years ago (Juglar, 1889). A decrease in interest rate causes a mechanic growth in stock price since bonds investment is less attractive, the discount rate decreases and an indirect effect with the fall in the cost of debt for firms. So a relationship exists probably between this progressive decrease in interest rate and the growth of stock prices. This gradual increase of the stock market prices ends with the “crash of the Union Générale” in January 1882 (Bouvier, 1960).

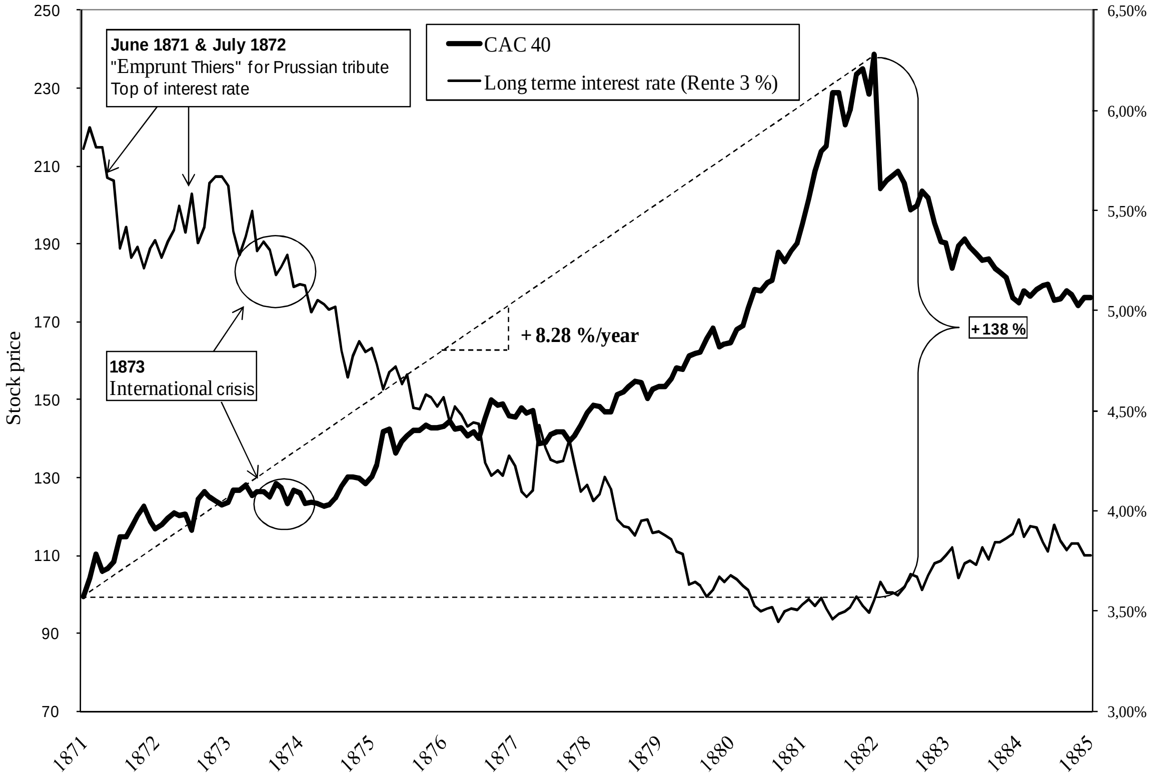


Figure 3, Stock prices and interest rates (Rente 3 %). 1871-1885. This figure shows that the slow homogeneous decrease in interest rates is accompanied by a symmetric rise in stock prices until the crash of January 1882.

3.2 WWI affects the distribution of stocks variations

From WWI, the amplitude of price movements increases. Mean and standard deviation are 1.13 % (annualized) and 7.66 % (annualized) before 1914 but 3.81 % and 19.88 % after WWI. F-test and T-test clearly reject equality of mean and standard deviation (see Table 3). Of course the real economic situation is more volatile after 1914 but this probably cannot explain all this variation in price movement. The end of the franc-or provides a new source of risk: monetary value. This regime change is clear on the next graph. All monthly price variations of the HCAC 40 since 1854 are shown.

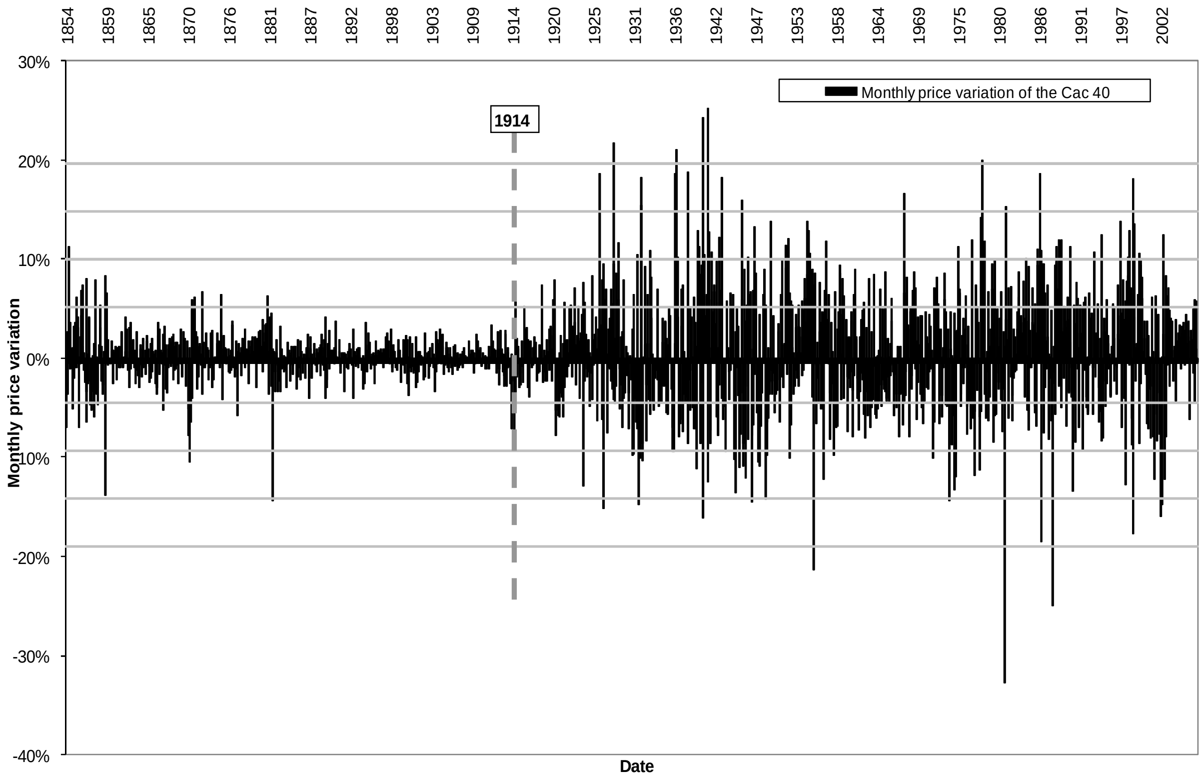


Figure 4, Monthly price variation of the HCAC 40. 1854-2007. This figure shows each month the stock price variation.

Table 3, Descriptive statistics before and after 1914. This table shows several statistics with tests of equal mean, equal standard deviation and normality. F-test is the test of an equal variance. T-test is the test for the equal mean adjusted for heteroskedasticity.

	1854-1913	*1914-1973*
Mean (annualized)	1.13%	3.81%
Standard deviation (annualized)	7.66%	19.88%
Kurstosis	10.17	4.63
Skewness	-0.59	0.44
Range (non annualized)	25.69%	43.84%
Minimum (non annualized)	-14.40%	-21.40%
Maximum (non annualized)	11.30%	25.24%
Count	720	720
Confidence Level	0.0016	0.0042
Jarque-Berra	1581.46	102.62
T-Test (p-value)	0.08%	
F-Test (p-value)	0.00%	

One may imagine it is only the magnitude of price variation which increases. Actually the distribution rules change too. It is not a Gaussian one before or after 1914 since the "Jarque-Berra" test is too high. A Khi² test makes a comparison possible between the nature of price variation distribution before and after 1914. Two version of this test are realized according to constant or different bins. First, price variations are ranked by a quarter of standard deviation before and after 1914 (48 bins). Second, prices variations are ranked according to identical bins of 1 % between -26% to + 26 % (53 bins). These bin ranges make a comparison possible between the distribution rule before and after the war. An identical distribution can be rejected by these khi² tests. Thus the distribution is not Gaussian and is different before and after 1914.

Table 4, Khi² test of similar distribution before and after WWI. This table shows the result of two different khi² tests (with different and constant bins) to reject one identical distributions of monthly stock returns before and after 1914.

Khi² tests		
	1854-1913	**1914-1973**
Mean	**0.10%**	**0.34%**
Standard-deviation	2.20%	5.72%
With différent bin		
Maximal Bin	13.32%	34.64%
Minimal Bin	-13.12%	-33.96%
khi 2	133	
p-value	*0.00%*	
With similar bin		
Maximal Bin	26.00%	26.00%
Minimal Bin	-26.00%	-26.00%
khi 2	1811	
p-value	*0.00%*	

A second long-term effect of WWI is the end of most of the public utilities firms as main blue chips in the stock market. A well-known explanation is the high taxation level after war whose impact is multiplied by inflation since the tax rate is applied on nominal apparent profits (see Hautcoeur, 2001). Inflation also stringy affects firms with fixed sale prices. In 1914, 37 % of the market capitalization have activities with fixed income. All concession firms (electricity, water, railways) have contracts with political authorities: they can't choose their selling price. Inflation increases costs for these firms but sale prices are fixed by contracts. These firms cannot perform in the same manner. The rise of their prices with stable revenues leads these firms to failure or at least a large decrease of their profits. Ten years after the start of the war, less than 15 % of the market capitalisation is composed by firms with "fixed sale prices".

Table 5, HCAC 40 in 1914 and 1924 with fixed sale prices firms. Components of the HCAC 40 in 1914 and 1924 with in bold firms with limited capacity to adjust their sales prices.

HCAC 40 in 1914 with constant sale price (in bold)

RANK	Firm	Weight	RANK	Firm	Weight
1	Canal maritime de Suez	9.22%	21	Banque de l'Indo-Chine	1.24%
2	**Paris Lyon Méditérannée**	**8.50%**	22	Crédit Industriel et Commercial	1.18%
3	**Nord**	**7.46%**	23	Mines de Vicoigne et Noeux SC	1.12%
4	Banque de France	7.05%	**24**	**Cie Parisienne de distibution d'électricité**	**1.02%**
5	Crédit Lyonnais	6.96%	25	Banque de l'Union Parisienne	1.00%
6	Société Générale	6.79%	26	Penarroya	0.92%
7	**Orléans**	**6.60%**	27	Mines de Béthune SC	0.88%
8	**Est**	**4.43%**	28	Banque hypothécaire franco-argentine	0.82%
9	Mines de Lens SC	3.75%	29	Forges et Aciéries de la marined'Homécourt	0.81%
10	Comptoir Nationale d'Escompte	3.50%	30	Nouvelles Galeries	0.81%
11	Crédit Foncier de France	2.93%	31	sté Centrale des banques de Province N	0.75%
12	Mines de Courrières	2.45%	32	Mokta-el-hadid	0.74%
13	**Midi**	**2.34%**	33	Boléo	0.73%
14	**Ouest**	**2.24%**	34	Procédé Thomson-Houston	0.71%
15	Banque de Paris et des Pays-Bas	2.05%	35	Mines de Dourges SC	0.70%
16	Schneider et cie	1.69%	**36**	**Sté d'Electricité de Paris**	**0.63%**
17	**Metropolitain Paris**	**1.46%**	**37**	**Cie Gale des Omnibus de Paris**	**0.63%**
18	**Cie Gale des Eaux**	**1.40%**	38	Sté Marseillaise de Crédit Industriel	0.62%
19	Phosphates de Gafsa	1.38%	39	Crédit Mobilier	0.62%
20	Banque de l'Algérie	1.26%	40	Paris-France	0.62%
	TOTAL FIXED SALE PRICES	**36.70%**			

HCAC 40 in 1924 with constant sale prices (in bold)

RANK	Firm	Weight	RANK	Firm	Weight
1	Canal maritime de Suez	9.74%	21	Raffinerie Say	1.79%
2	Banque de France	6.10%	22	Mines d'Aniche	1.78%
3	Saint Gobain	4.56%	23	Mines de Marles	1.77%
4	Mines de Lens SC	4.08%	24	Banque Nationale de Crédit	1.73%
5	**Paris Lyon Méditérannée**	**3.89%**	25	Soie artificielle d'Izieux	1.67%
6	Crédit Foncier de France	3.81%	26	Procédés Thomson-Houston	1.64%
7	Crédit Lyonnais	3.60%	27	Penarroya	1.58%
8	Brasseries Argentine Quilmès	3.58%	28	Phosphates de Gafsa	1.55%
9	Mines de Courrières	3.23%	29	Comptoir Lyon-Allemand	1.53%
10	Société Générale	3.20%	30	Au Bon Marché	1.52%
11	Ouenza	3.04%	**31**	**Cie Parisienne de distibution d'électricité**	**1.47%**
12	**Nord**	**3.03%**	32	Produits chimiques d'Alais et Camargue	1.40%
13	Banque de Paris et des Pays-Bas	2.88%	33	Etb Kuhlmann	1.31%
14	**Orléans**	**2.63%**	**34**	**Union d'électricité**	**1.30%**
15	Banque de l'Indo-Chine	2.44%	35	Banque de l'Union Parisienne	1.26%
16	Charbonnages du Tonkin	2.43%	36	Banque hypothécaire franco-argentine	1.21%
17	Mines d'Anzin	2.25%	37	Compagnie Algérienne	1.21%
18	**Est**	**2.25%**	38	Forges et Aciéries de Huta-Bankowa	1.20%
19	Comptoir Nationale d'Escompte	2.16%	39	Banque de l'Algérie	1.19%
20	Mines de Vicoigne et Noeux SC	1.82%	40	Houilles de Blanzy	1.15%
	TOTAL FIXE SALE PRICES	**14.56%**			

3.3 WWII affects the components of the French stock market

WWII has an impact on the components of the stock market. Nationalisations of the Libération can be considered as a result of the war. This policy was in the program of the

"Conseil National de la Résistance".[64] At the very least, the war accelerates this movement. Several industries are nationalised: banking (4 big companies only), energy (electricity, coal, gas), insurance (not present in the HCAC 40 since this industry is not enough concentrated). From the 1939 HCAC 40, 28 % is nationalised. It is the first time that a big part of the market artificially disappears; the nationalisation of the railways in 1936 represented only 5.88 % of the 1936 HCAC 40.

Table 6, HCAC 40 in 1939 with firms nationalised after WWII. This table shows the components of the HCAC 40 in January 1939 with, in bold, firms which which will be nationalized after the Liberation.

HCAC 40 in 1939 with firms nationalized (in bold)

RANK	Firm	Weight	RANK	Firm	Weight
1	Canal maritime de Suez	18.65%	**21**	**Mines de Lens SC**	**1.65%**
2	Brasseries Argentine Quilmès	5.78%	22	Electro-Chimie d'Ugine	1.61%
3	Crédit Foncier de France	5.61%	23	Compteurs à gaz	1.59%
4	Rhône Poulenc	4.05%	**24**	**Union d'électricité**	**1.58%**
5	Air Liquide	3.65%	25	Française des Pétroles	1.45%
6	**Banque de France**	**3.65%**	26	Hts fourneauxde Pont à Mousson	1.37%
7	**Crédit Lyonnais**	**3.23%**	27	Charbonnages du Tonkin	1.35%
8	Le Nickel	2.89%	28	Terres Rouges	1.33%
9	Saint Gobain	2.86%	**29**	**Mines de Courrières**	**1.30%**
10	**Sté Lyonnaise des Eaux et d'Eclairage***	**2.64%**	30	Orléans	1.19%
11	Banque de l'Indo-Chine	2.48%	31	Forges et Aciéries du Nord et de l'Est	1.17%
12	**Société Générale**	**2.46%**	**32**	**Mines de Marles**	**1.16%**
13	**Cie Parisienne de distibution d'électricité**	**3.09%**	33	Nord	1.15%
14	Produits chimiques d'Alais et Camargue	2.23%	**34**	**Force motrice La Truyère**	**1.15%**
15	Etb Kuhlmann	2.02%	**35**	**Cie de Béthune**	**1.14%**
16	Kali Ste Thérèse	2.00%	**36**	**Energie electrique du littoral medit**	**1.13%**
17	Banque de Paris et des Pays-Bas	1.87%	37	Cie Gale d'Electricité	1.12%
18	Raffinerie Say	1.78%	**38**	**Houilles de Blanzy**	**1.09%**
19	Paris Lyon Méditérannée	1.72%	**39**	**Sarre et Moselle**	**1.08%**
20	**Comptoir Nationale d'Escompte**	**1.69%**	40	Port du Rosario	1.05%

** water part is not nationalized*

TOTAL NATIONALIZED **28.05%**

WWII changes the nature of the stock market. The diversification of the index decreases since specific industries disappear. For example, the banking industry which had played a major role in the stock market since 1854 became a minor player. Before WWII, the value of the banking industry (without the *Banque de France*) is always above 2 % of the GDP but after nationalisations it is only about 0.1 %. After a few decades a new quoted bank industry appears. These "new" banks develops new markets to finance real estate (Union du Crédit pour le Bâtiment), consumption loans (Cetelem) or business (Indosuez) since classical

[64] 15 March 1944 : « *le retour à la nation de tous les grands moyens de production monopolisés fruits du travail commun, des sources d'énergie, des richesses du sous-sol, des compagnies d'assurance et des grandes banques* ».

activities was legally freezed. For example, it is forbidden to open new agencies until 1966. It is interesting to note that men writing nationalization laws were aware of this problem. In the case of the insurance nationalization law, it is mentioned that we need “to maintain a free industry strong to be able to adapt to inedits insurance business.”[65] Despite these new banks, privatisations of major French banks (Société Générale and BNP) during the 1980s are necessary to restore the listed bank industry its place in the economy.

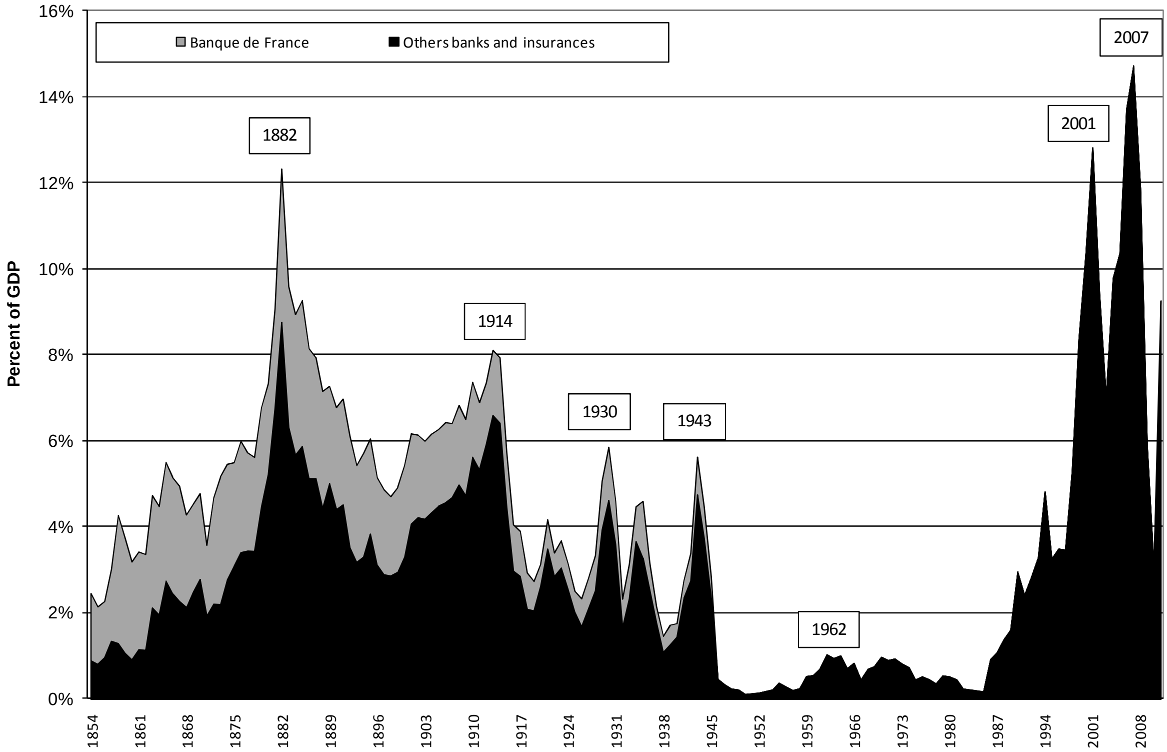


Figure 5, Market capitalization of the bank industry compared to GDP. 1854-2010. This figure shows the market capitalization of the bank industry measured at the beginning of each year in terms of % of the GDP. The Banque de France is added to the classical banks. GDP data come from Lévy-Leboyer and Bourguignon (1985) before 1914 and then from INSEE.

IV The role of the French stock market decreases after the World Wars

Two world wars lead to dramatic performances for stock markets. As indicated in table 1, the real performance of an investment in stocks in 1914 is a loss of 73 % in 1921. This weakened market capitalization suffers a fall of 88 % with WWII (table 1). The amount of the indemnity for nationalized stock-holder is probably under estimated; as an illustration

[65] Law, 25 April 1946.

foreign stock holder of gaz/electricity firms beneficiated of a more generous compensation: about triple with currency guarantee on capital and interest and an amortization on 7 years instead of 50 years[66]. Moreover, nationalizations are paid in new specific state-guarantee bonds issues between 1945 and 1946. During each year, 1946, 1947 and 1948, the inflation rate is above 50 %. For a fixed rate bond, three years with 50 % of inflation lead to a real loss of 90 %. As a result, a large part of the pre-war market value have disappeared in 1950.

This destruction of market value causes a fall in the role of the stock exchange in the economy. The ratio of the capitalisation of the 40 biggest stocks to French GDP was 22 % in January 1914. This ratio is only 7.71 % in January 1919. The 1914 level was only reached again in 1994. Market capitalisation on GDP falls again after the WWII from 8.16 % to less than 2 %. For each war, the changes are mainly the consequences of political choices: nationalisation after WWII and fixed selling prices with high taxation after WWI. Thus, World Wars are clearly the source of the first phase of the “Great Reversal” of the role of the market in the economy (Rajan and Zingales, 2003). At the opposite, and despite maintaining the same persons in charge of the privatized firms (MacLean, 2008), the privatisation of the 1981 authorize the market to play again the same economic role as before 1914.

[66] As a result, in 1950, ex-stockholder received one third of the annual payment whereas they hold only 7 % of the capital (Schaufelbuehl, 2009)

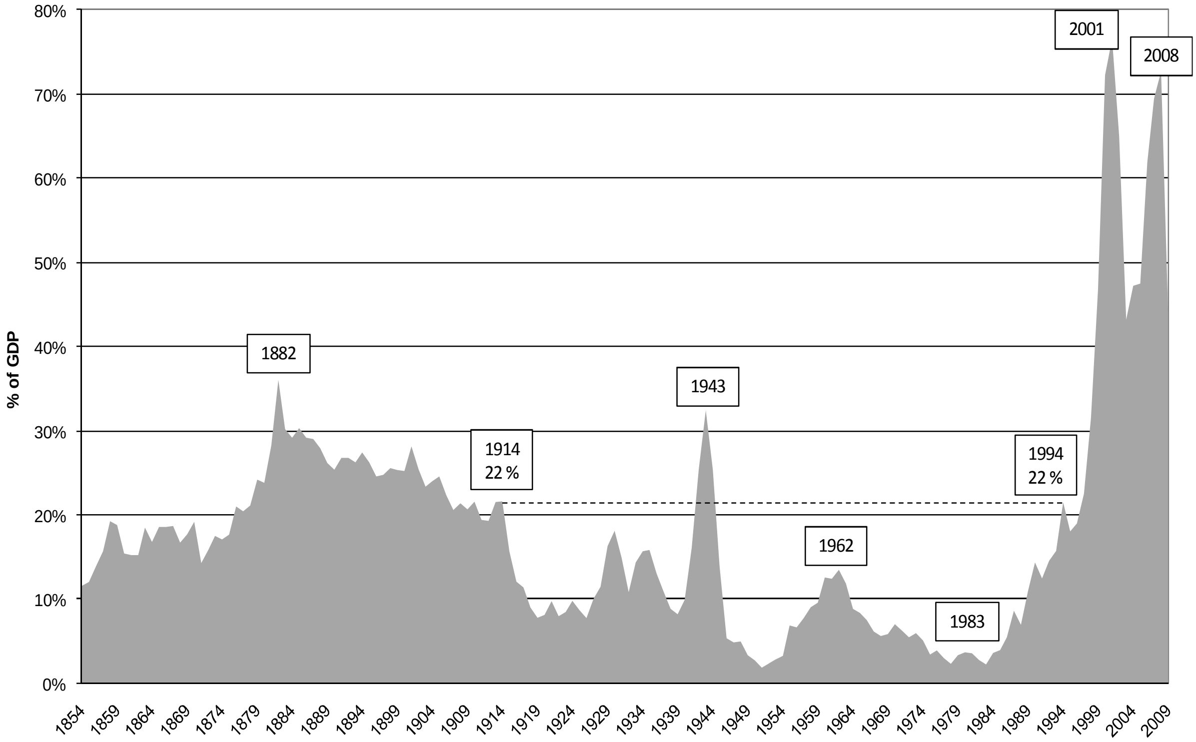


Figure 6, Stock market capitalisation on GDP. 1854-2010. This figure shows the ratio market capitalization of the HCAC 40 on the GDP measured at the beginning of each year. GDP data come from Lévy-Leboyer and Bourguignon (1985) before 1914 and then from INSEE.

These changes in the ratio market capitalization on GDP fit well with what is observed on dividends paid by French firms. The market capitalisation is the value of firms. The value of one firm is the present value of all future profits of the firm. The Franco-Prussian war is free of any long-term effect on dividends. After WWI, the worst year is 1919 with only 100 million francs of dividends paid. At the end of the 1920s, the level of pre-war dividends paid is almost regained. The impact of WWII is clearly stronger since dividends paid fall to only 10 millions in 1946 and 1947. The level of dividends of 1914 is reach again only in 1965 whereas the GDP has been multiplied by 3.5; at this date the amount of dividends paid is close to what it was in 1883. A last comparison is the market value in constant francs: 11 billion in 1883 and only 1.5 in 1950. Clearly, the role of the market has declined considerably with the effect of the two world wars.

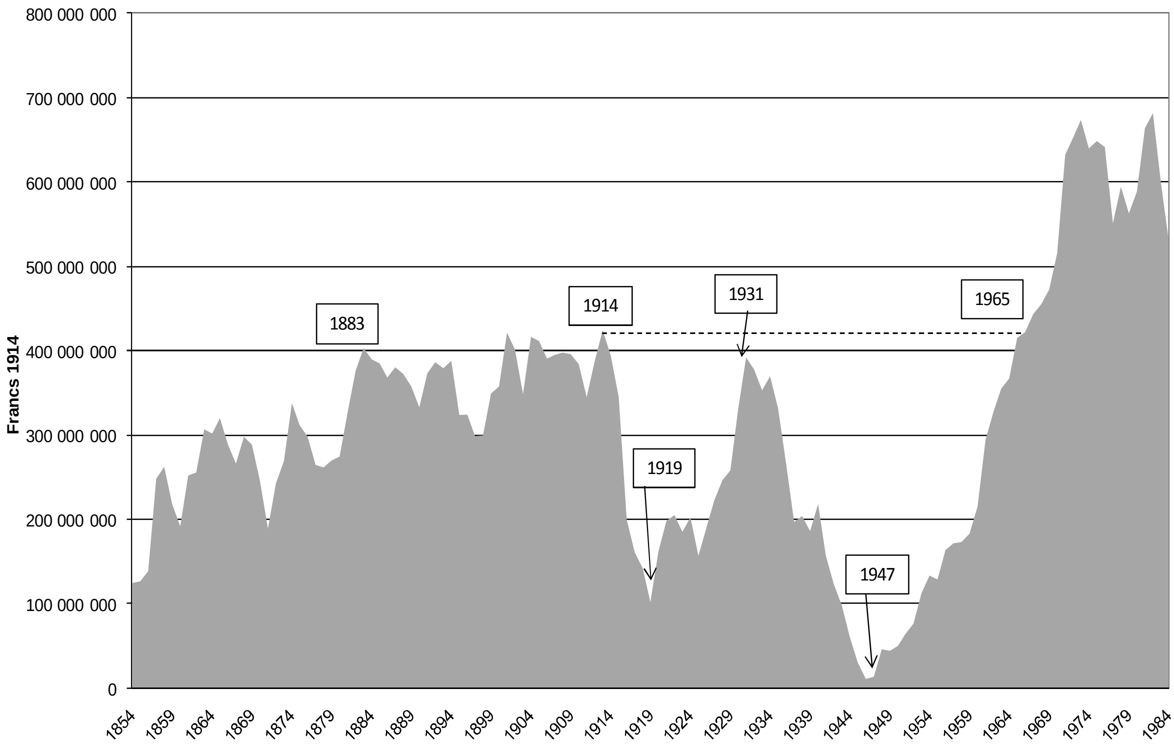


Figure 7, Dividends paid by HCAC 40 firms in constant francs (1914). 1855-1984. This figure shows the amount of dividends paid by firms in the HCAC 40 each year in constant value. The constant value is the franc 1914 thanks to data from INSEE.

V Conclusion

Wars have a clear effect on stock prices. This effect depends on the way the war is financed. The two World Wars lead to dramatic loss for stock holder. But conflicts affect not only stock market through direct effect on performances. Each war caused structural changes in the French stock market. The Franco-Prussian war rises the interest rate followed by a gradual decrease leading to a symmetric gradual increase of stock prices until the crash of January 1882. The First World War causes a structural change in the stock price distribution characterized by a large increase of the magnitude of movements. Moreover, the end of the stability of prices entails the end of the most of the public utilities firms. The Second World War is ended with the nationalization of several industries meaning a less diversified stock market paying a minored role into the French economy.

The major result of the two World Wars is a decrease of the role of the market in the French economy. From this point of view, the period begining with the WWI is closed only at the beginning of the 1990s which is consistent with the short historical 20th century. It will be interesting to study the case of others belligerents.

REFERENCES

Barro R. (2006), “Rare Disasters and Asset Markets in the Twentieth Century”, *Quarterly Journal of Economics*, 121, p. 823-866.

Brown W. and R. Burdekin (1999). “German Debt traded in London during World War II”, *Working Paper*, Clarement College, 1999-19.

Bouvier J. (1960). *Le krach de l’Union Générale, 1878-1885*, Paris, PUF.

Cowles A. and Associates (1939). *Common-stocks Indexes*. Bloomington, Principia Press.

Dimson E, Marsh P. and M. Staunton. (2002). *Triumph of the Optimists: 101 Years of Global Investment Returns.* Princeton, Princeton University Press.

Eichengreen B. (1990). *Elusive stability*, Cambridge, Cambridge University Press.

Fernandez V. (2008). “The War on Terror and its Impact on the Long-Term Volatility of Financial Markets”. *International Review of Financial Analysis*, 17, p. 1-26.

Frey B. And M. Kucher (2001). “Wars and Markets. How Bonds Value Reflect the Second World War ?”, *Economica*, 68, p. 317-333.

Frey B. and M. Kucher (2000), “History as Reflected in Capital Markets: the Case of World War II”, *The Journal of Economic History*, p. 468-496.

Goetzmann W.N., Ibbotson R.G. and L. Peng (2000), “A New Historical Database for the NYSE 1815 to 1925: Performance and Predictability”, *Journal of Financial Markets*, 4, p. 1-32.

Hautcoeur P.-C. and S. Grottard (2001), “*Taxation of Corporate Profits, Inflation and Income Distribution in France, 1914-1926”*, *Working Paper*, DELTA.

Ibbotson Associates (1997), *Stocks, Bonds, Bills and Inflation 1997 Yearbook*, Chicago, Ibbotson.

INSEE (1951), *Annuaire Statistique de la France*, Paris, INSEE.

Juglar C. (1889), Des *crises commerciales et de leur retour périodique*, Paris, Picard.

Le Bris D. and P-C Hautcoeur (2010), “A Challenge to Triumphant Optimists? A Blue Chips Index for the Paris Stock Exchange (1854-2007)”, *Financial History Review*, 17, p. 141-183.

Lévy-Leboyer M. and F. Bourguignon (1985). *L’Économie Française au XIXème siècle, analyse macroéconomique*, Paris, Économica.

Malevergne Y., Santa-Clara P. and D. Sornette (2009), « *Professor Zipf goes to Wall Street*.” *Working Paper*, NBER, 15295.

MacLean M. (2008), “New Rules - Old Games? Social Capital and Privatization in France, 1986-1998.” *Business History*, 50, p. 795-810.

Marion M. (1926), *Ce qu’il faut connaître des crises financières de notre histoire*, Paris, Boivin.

Marseille J. (2000), « La Bourse sous l’occupation. » in O. Dard *et al.* (eds.) *L’occupation, l’Etat français et les entreprises*. Paris, ADHE.

Marseille J. (2005), *Empire colonial et capitalisme français : histoire d’un divorce*, Paris, Albin Michel.

Michalet C-A (1968), *Les placements des épargnants français de 1815 à nos jours*, Paris, PUF.

Occhino F., Oosterlinck K. and E. White (2007), “How occupied France financed its Own Exploitation during WW2.” *American Economic Review*, 97, p. 295-299.

Oosterlinck K. (2004), "*Market Microstructure and Nazi Influence on the Paris Stock Exchange during WWII.*", *Working Paper*, CEB, 04/26.

Oosterlinck K. (2003), "The Bond Market and the Legitimacy of Vichy France." *Explorations in Economic History,* 40, p. 326-344.

Oosterlinck K. (2009), "The Price of Degenerate Art.", *Working Paper*, CEB, 09-031.

Rajan R.R. and L. Zingales (2003), "The Great Reversal: the Politics of Financial Development in the 20th Century." *Journal of Financial Economics*, 69, p. 5-50.

Rigobon R. and B. Sack (2005), "The Effects of War Risk on US Financial Markets." *Journal of Banking & Finance*, 29, p. 1769-1789.

Sauvy A. (1984), *Histoire économique de la France entre les deux guerres*, Paris, Economica.

Schaufelbuehl J.M. (2009), *La France et la Suisse ou la force du petit*, Paris, Presses de Sciences-Po.

Sédillot R. (1945), *Le franc enchaîné, histoire de la monnaie française pendant la guerre et l'Occupation*, Paris, Sirey.

Sharpe W., Alexander G. and J. Bailey (1999), *Investments*, Upper Sade River NJ, Prentice Hall.

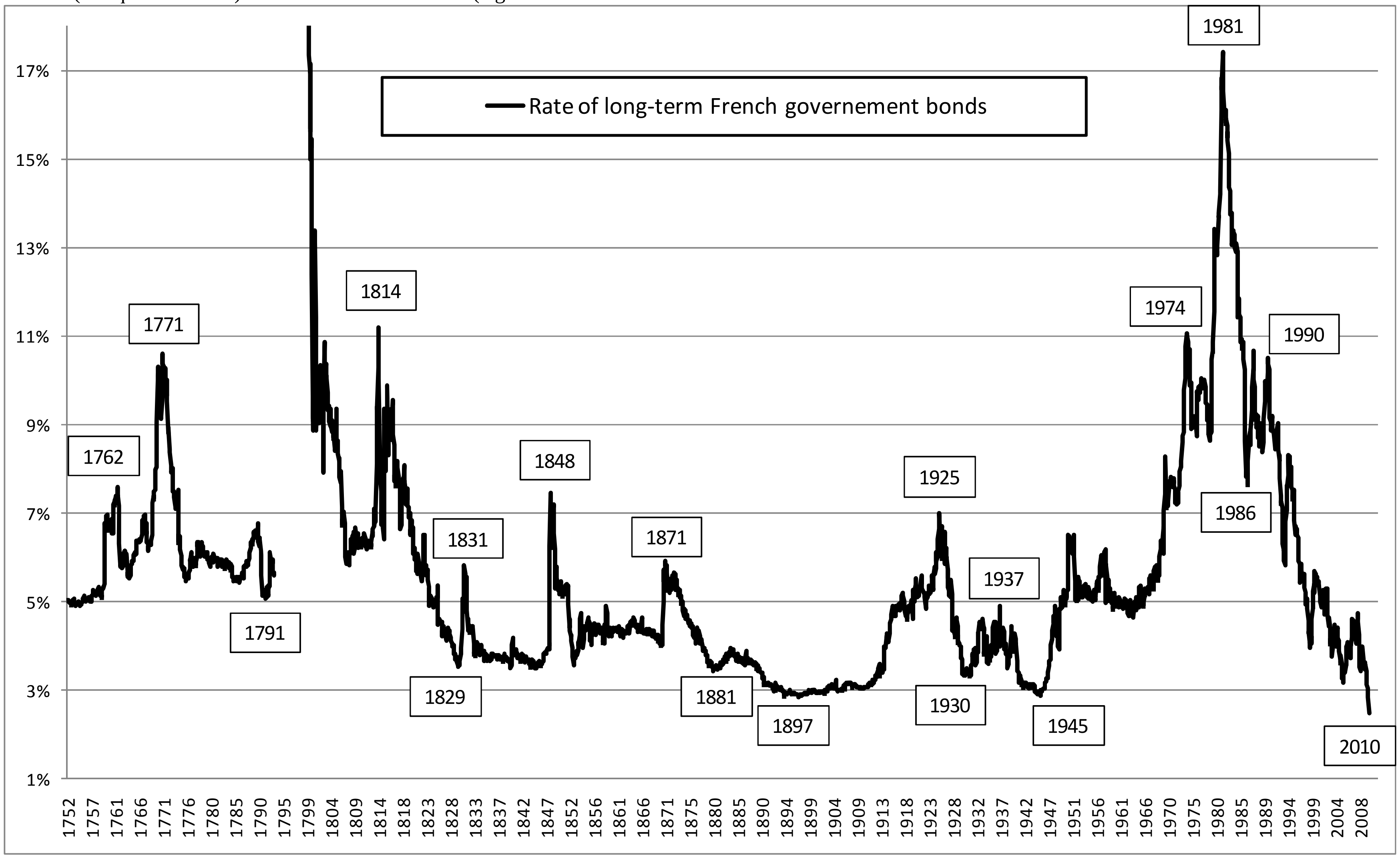
Siegel J. (1994), *Stock for the Long Run: a Guide to Selecting Markets for Long-Term Growth*, New York, Irvin.

Vaslin J-M, (2007). « Le siècle d'or de la Rente française. » in Gallais-Hamonno G. (dir.), *Le marché financier français au XIXème siècle*, Paris, Publications de la Sorbonne.

Villa P., *Séries macro-économiques historiques,* Retrieved from http://www.cepii.fr/francgraph/bdd/villa/mode.htm).

Vigreux P. (1948), « Le marché des changes. », *Revue d'Economie Politique*, 57, p. 1047-1072.

Appendix A, Interest rates of long-term government bonds. 1752-2010. This figure present a very long-term measure of the rate observed on the French long-term bonds thanks to a compilation of several studies. We have to note that before 1960, these rates comes from perpetual bonds and only 10-years bonds after. 1752-1797: Emprunt d'Octobre (Velde in Sylla), 1798-1824: Rente 5 % (Vaslin), 1825-1852: Rente 3 % (Courtois), 1853-1950: Rente 3 % (Le Bris), 1951-1969: Rente 5 % (Le Bris), 1970-2006: Emp. Etat LT (Banque de France) 2007-2010: OAT TEC 10 (Agence France Trésor



Partie II LA DOMINATION DES ENTREPRISES DE SERVICES MALGRE LES CHOCS

La première partie a montré que, depuis 1914, les actions françaises ont offert une performance bien inférieure à celles des Etats-Unis et que les guerres expliquent une large part de ce décalage. Toutefois, la persistance de faibles rentabilités entre la Libération et le début des années 1980 laisse envisager d'autres facteurs négatifs. Les politiques menées pourraient être responsables. Ou des krachs financiers s'ils ne trouvent pas leurs origines dans les guerres ou la politique. L'un comme l'autre constituent des chocs potentiellement capables de contribuer à l'explication de la sous-performance française. La seconde partie investigue ces pistes et conclut en montrant que dans ce tumulte, les entreprises de services constituent un étonnant élément de stabilité.

Comme attendu, le facteur politique provoque un certain nombre de chocs sur le marché que le chapitre 4 étudie de manière systématique selon le critère gauche-droite. Les séries mensuelles de rentabilité sont rapprochées de la série des 157 gouvernements qui se succèdent depuis 1871 ; c'est-à-dire depuis que de véritables alternances sont possibles au niveau national. Le risque politique a un prix certain que le marché valorise. Ainsi, lors de chaque changement de gouvernement, le cours des actions progresse nettement quelle que soit la couleur du nouveau pouvoir. En revanche sur le long terme, la gauche offre une nette surperformance qui ne correspond pas à la rémunération d'un risque supplémentaire. Un contexte macro-économique plus favorable à la gauche explique une partie de l'écart mais il faut accepter l'hypothèse d'un marché suffisamment efficient pour anticiper trois mois à l'avance les alternances pour réduire à presque rien l'avantage de la gauche. En effet, une grande part de la surperformance de la gauche se concentre durant les trois mois précédents l'arrivée de la droite et inversement. Le facteur politique est donc délicat à appréhender et s'il peut contribuer à expliquer la sous-performance française c'est selon un critère autre que la distinction gauche-droite.

Une autre source de chocs est analysée dans le chapitre 5 qui se consacre aux krachs. Les krachs identifiés par les pires variations mensuelles présentent de lourdes incohérences historiques. De nombreux mois sont repérés comme krachs alors que l'histoire ne les avait pas retenu come tels. A l'inverse, des évènements dramatiques pour les marchés comme la Première Guerre Mondiale ne figurent pas parmi les records de baisse. C'est l'énigme « big moves without big news and big news without big moves ». Les pires variations mensuelles apparaissent concentrées durant les périodes de forte volatilité préalable. Une nouvelle méthode de mesure des krachs est proposée. Elle tient compte de la volatilité antérieure pour mesurer chaque variation mensuelle, non en pourcentage brut, mais en nombre d'écart-types de la précédente période. Les krachs qu'elle identifie, et ceux qui sont exclus, deviennent alors parfaitement cohérents avec l'histoire. Cette méthode est robuste à la durée sur laquelle est calculée la volatilité de la précédente période et la volatilité est aussi instable au niveau des actions individuelles qu'à celui de l'indice agrégé HCAC 40. Cette méthode est également appliquée avec des résultats aussi probants sur d'autres marchés que les actions françaises.

Malgré ces soubresauts, les entreprises de services dominent la cote de manière quasi-continue. Le chapitre 6 étudie le poids des différents secteurs économiques en termes de capitalisation boursière. Contrairement à une idée reçue, le XIX$^{\text{ème}}$ siècle n'apparaît pas, sous cet angle, comme une période industrielle. Dès l'origine ce sont les entreprises de services qui composent la majeure partie de la capitalisation boursière. Les entreprises industrielles ne dominent que pour une courte durée au lendemain de la Seconde Guerre Mondiale alors que plusieurs branches des services ont été nationalisées et que nombre d'entreprises de services publics ont été laminé par l'inflation. Parmi les entreprises de services qui dominent sur le long terme, les banques présentent une étonnante stabilité. Selon cette approche, la valorisation des banques à la veille de la récente crise n'avait rien d'exceptionnel. Par ailleurs, il n'apparaît aucune corrélation entre croissance économique et poids des entreprises industrielles dans la capitalisation.

Chapitre 4, Les surprenantes conséquences de la couleur politique des gouvernements « Actionnaires, gouvernements et efficience. »[67]

Résumé : Entre janvier 1871 et décembre 2008, le cours des actions progresse, en moyenne, trois fois plus vite les mois où un nouveau gouvernement s'installe. Si le marché salue tous les nouveaux gouvernements, sur le long terme, la rentabilité réelle des actions françaises est de 4,40 % sous la gauche contre 0,11 % sous la droite. Cette différence provient à la fois d'une meilleure rentabilité des actions sous la gauche et d'une plus forte inflation sous la droite. Cette différence, qui se vérifie également sur l' « excess return », n'a qu'une faible chance d'être le fruit du hasard et n'est pas une compensation pour un risque supérieur sous la gauche. Sous la gauche, la part non-anticipée de la rentabilité est positive alors qu'elle est négative sous la droite. Mais un contexte macro-économique plus favorable sous la gauche explique 40 % de la différence. En acceptant l'hypothèse d'un marché suffisamment efficient pour anticiper trois mois à l'avance les alternances, la surperfomance de la gauche n'est plus statistiquement significative.

Keywords: Paris Stock exchange, political puzzle, political impact, stock returns, 19th century, 20th century

JEL classification: G1, G18, H1, N23, N24.

[67] Remerciements à Amir Rezzae, Charles-Henri Reuter, Emmanuelle Gabillon, Jean Belin, Daniel Goyean, Christophe Boucher, Malika Lounès, Callado Muñoz Francisco José et à tous les participants du séminaire du Gretha (Bordeaux, 2009) et du colloque de l'AFSE (Paris, 2010). Suite à sa nomination pour le Grand Prix de la Réflexion Impertinente, une précédente version de cette étude, intitulée « Les actionnaires votent socialiste ? », a été publiée à la Documentation Française dans la collection *Impertinences*, 2010, p. 67-90.

Un an après l'arrivée au pouvoir de Nicolas Sarkozy et avant le début de la crise financière, le CAC 40 perdait 25 %. A la fin de l'année 2008, la chute était de 50 %. Personne aujourd'hui n'imagine que l'action du Président de la République ou de son Premier Ministre joue un rôle autre que marginal dans cette défavorable évolution. Il n'en a pas toujours été ainsi. Lors de l'élection de François Mitterrand en mai 1981, la bourse perd immédiatement 33 % enregistrant ainsi sa pire performance mensuelle depuis 1854. De manière inattendue, le reste du premier septennat socialiste voit les actions progresser de plus 250 %, et même de 450 % jusqu'à son départ en mai 1995, soit la période la plus faste de l'histoire boursière. Les actionnaires auraient-ils eu intérêt à voter socialiste en 1981 ?

Il semble pourtant évident qu'un gouvernement de droite est plus attentif aux soucis des entreprises afin d'améliorer l'offre tandis que la gauche privilégie la demande par une redistribution faite souvent au détriment des entreprises. C'est probablement le clivage le plus fondamental entre droite et gauche. Si les politiques gouvernementales peuvent influencer positivement l'activité économique des entreprises, ce clivage fondamental devrait se répercuter en bourse. Ces inclinaisons différentes devraient se traduire par de meilleures performances boursières sous la droite que sous la gauche. La relation théorique entre gouvernements de droite et meilleure performance boursière (ou inversement entre gouvernements de gauche et plus mauvaise rentabilité) se vérifie-t-elle ?

En utilisant les données mensuelles d'une récente reconstitution du HCAC 40 (Le Bris and Hautcoeur, 2010 ou chapitre 1), la performance moyenne des actions est mesurée sous la gauche et sous la droite depuis le début de la Troisième République. Si les taux de dividendes ne sont pas sensiblement différents, le cours des actions progresse plus vite sous la gauche (5,90 % par an contre 2,12). A l'inverse, l'inflation est légèrement plus forte sous la droite (5,61 % par an contre 5,46). Au final la rentabilité réelle totale des actions est de 4,40 % sous les gouvernements de gauche contre 0,11 % sous ceux de droite.[68] La mesure de la prime de risque par rapport au taux court terme (« excess return »[69]) donne une différence tout aussi favorable à la gauche.

Face à ce résultat contre-intuitif, différents tests de contrôle méritent d'être menés. La différence de rentabilité selon la couleur du gouvernement est statistiquement validée et n'a qu'une faible chance d'être le fruit du hasard. Quelques périodes exceptionnelles n'expliquent

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[68] La rentabilité moyenne des actions françaises est nettement inférieure à celle observée aux Etats-Unis qui est, à tort, parfois prise comme une observation généralisable (Le Bris and Hautcoeur, 2010 ou chapitre 1)

[69] Les mots anglais sont encadrés de guillemets à leur première utilisation seulement.

pas cette différence comme le montre la comparaison de deux stratégies d'investissement politiques : acheter des actions sous la gauche et placer au taux court terme sous la droite contre acheter des actions sous la droite et placer au taux à court terme sous la gauche. Cette différence ne provient pas non plus d'une rémunération d'un risque supérieur sous la gauche. Au contraire, le risque est nettement plus faible sous la gauche. En revanche, un contexte macro-économique souvent plus favorable à la gauche justifie partiellement un tel écart. Après contrôle pour différentes variables macro-économiques, la différence se réduit mais reste clairement favorable à la gauche. En revanche, une part de la bonne performance de la gauche provient des derniers mois avant une alternance à droite et inversement. En acceptant l'hypothèse d'un marché efficient capable d'anticiper trois mois à l'avance les alternances, il est possible de déplacer les limites gauche-droite : ces dernières sont avancées de trois mois. La surperformance de la gauche se réduit alors nettement devenant explicable par le seul hasard.

Le facteur politique a donc bien un impact sur la bourse mais dans le sens inverse de celui imaginé. A court terme, un impact politique attendu (selon la théorie de l'information incertaine, voir Brown *et al.*, 1988) est que le marché apprécie la fin de l'incertitude que constitue la mise en place d'un nouveau gouvernement. Les 150 mois de changements de gouvernements sont effectivement trois fois plus rentables que la moyenne[70]. En revanche, il n'apparaît pas de différence significative entre nouveau gouvernement de gauche ou de droite ni lorsque le gouvernement change de couleur politique. Le marché ne semble donc pas anticiper les meilleures performances à venir avec l'arrivée de la gauche au gouvernement.

Pour valider si la gauche est systématiquement une agréable surprise pour le marché, les rentabilités boursières sont décomposées entre part attendue et part non-attendue. La rentabilité attendue est celle prévue par une régression sur différentes variables macro-économiques prédictives des cours boursiers. Le résidu (la différence avec la rentabilité réellement observée) constitue la part non-anticipée. Cette rentabilité non-anticipée est négative de 1,48 % sous la droite et positive d'autant (1,56 %) sous la gauche. Le marché est donc (systématiquement) positivement surpris par la gauche et négativement déçu par la droite.

L'influence de la politique sur les actions a été le sujet de nombreuses études durant ces dernières années. Knight (2004) teste si les projets politiques sont capitalisés dans les

[70] Et même quatre fois plus en excluant l'exceptionnelle baisse enregistrée en mai 1981.

cours des actions lors de l'élection américaine de 2000. Ayers *et al.* (2005) étudient si les prix des actions reflètent l'incertitude sur la politique fiscale lors de ces mêmes élections. En combinant des sondages quotidiens et les cours boursiers aux Etats-Unis, Li et Born (2006) montrent que le marché donne un prix à l'incertitude politique. Mattozzi (2008) montre que les investisseurs peuvent se couvrir contre le risque politique d'une hausse de la fiscalité en cas de victoire démocrate en achetant les actions des sociétés qui versent le plus à ce parti. La surperformance de ces entreprises en cas de victoire démocrate (évaluée au jour le jour par sondage) compense la hausse d'impôts programmée par ce parti.

La meilleure performance des actions sous la gauche a déjà été plusieurs fois étudiée dans le cas des Etats-Unis, notamment par Riley et Luksetich (1980), Huang (1985), Siegel (1994), Hensel et Ziemba (1995) ou Johnson *et al.* (1999). Santa-Clara et Valkanov (2003) profitent d'un échantillon plus large simplement grâce au temps qui passe. Surtout, ils mesurent et testent de manière détaillée cette problématique. Ils concluent que la nette surperformance des actions sous les Démocrates est une énigme. A l'inverse, Döpke et Pierdzioch (2006) ne confirment pas ce constat pour l'Allemagne entre 1960 et 2003. Toutefois, pendant cette courte période, l'Allemagne connait une politique économique particulièrement consensuelle. Sur 24 pays de 1980 à 2005, Bialkowski *et al* (2006) ne confirment pas non plus une plus forte rentabilité (totale en dollar) sous la gauche.

Par rapport au cas américain, la présente étude couvre une période bien plus longue 1871-2008 (1 654 mois) contre seulement 1927-1998 (852 mois) dans l'étude de Santa-Clara et Valkanov (2003). Les Etats-Unis ont un régime présidentiel. Il n'existe pas de chef de gouvernement mais seulement le président dont la stabilité est grande. L'étude de Santa-Clara et Valkanov couvre donc 18 mandats présidentiels alors qu'en France 157 gouvernements différents se succèdent sur notre période. L'échantillon est donc plus large avec plus de changements. De plus, l'histoire politique française est marquée par une gauche puissante, notamment communiste qui est hostile aux marchés financiers et qui gouverne à différentes reprises.

Santa-Clara et Valkanov commencent en 1927 car auparavant la différence Républicains-Démocrates leur apparaît moins marquée. En France, l'opposition semble plus ancienne. La gauche d'avant 1914 (notamment la gauche radicale) a un respect sacré de la propriété privée et des contrats dans la droite ligne de la Déclaration universelle des droits de l'homme. Toutefois, l'Etat n'hésite pas à intervenir. Un bon exemple est le chemin de fer. Les concessions des compagnies privées, signées au milieu du XIX^{ème} siècle, ne sont jamais remises en cause mais l'Etat s'engage par de multiples subventions et règlementations, notamment pour construire un réseau secondaire non rentable, le plan Freycinet (voir Le Bris, 2009). A l'inverse, aux Etats-Unis, il faut attendre 1907 pour voir la création d'un office qui réfléchit aux tarifs de chemin de fer.

La section I présente les données politiques et financières. La section II montre les principaux résultats, la probabilité qu'ils soient dus au hasard et leur constance dans le temps. La section III vérifie que cette différence n'est pas une rémunération du risque mais seulement partiellement le fruit d'un contexte macro-économique plus favorable. La section IV montre qu'en acceptant l'hypothèse d'un marché suffisamment efficient pour prévoir les alternances trois mois à l'avance, la surperformance de la gauche disparaît. Enfin, la section V conclut.

I Données

1.1 Données politiques

Les gouvernements successifs sont classés à droite ou à gauche, cette classification binaire ne semblant pas avoir déjà été faite[71]. C'est la couleur politique du chef de gouvernement qui est utilisée comme critère. 157 gouvernements se succèdent en France entre 1871 et 2008 dirigés par 142 hommes (dont une femme) différents. Parmi ces gouvernements, sept ont une durée de vie inférieure à un mois et ne peuvent être retenus dans cette étude qui utilise des données boursières mensuelles. Sur les 150 gouvernements restants, la durée moyenne est de 11 mois (8 sans la Cinquième République) avec un maximum de 75 pour M. Pompidou et, avant la Cinquième République, 36 pour M. Waldeck-Rousseau. L'ensemble des chefs de gouvernements (Vice-Présidents du Conseil[72], Présidents du Conseil et Premiers Ministres) sont classés de manière binaire gauche-droite (voir en Annexe D).

Le critère gauche-droite utilisé ne correspond pas à une grille constante dans l'analyse des positions mais à l'échiquier politique de l'époque. Cela évite d'avoir à classer précisément

[71] Merci à Laurent de Boissieu du site france-politique.fr qui recense un maximum de résultats électoraux.
[72] Terme utilisé avant 1876 et pendant le régime de Vichy, le Président étant le Chef de l'Etat

chaque parti.[73] La société en général a évolué vers la « gauche » au cours du XX^{ème} siècle. Par exemple, le socialiste Aristide Briand est contre le droit de grève des fonctionnaires en 1910 et la droite très hostile à l'impôt sur le revenu avant 1914. A l'inverse, depuis quelques décennies, un mouvement vers la droite peut probablement être distingué. L'appartenance à tel bord selon les équilibres politiques de l'époque est donc privilégié par rapport à la recherche d'une hypothétique couleur politique fondamentale.

Avant 1950 et surtout avant 1914, le classement gauche-droite est dans certains cas délicat. Le sinistrisme désigne le remplacement progressif des partis de gauche par des partis encore plus à gauche. Au début de la Troisième République, la gauche est incarnée par les Républicains face à une droite monarchiste et bonapartiste mais l'apparition successive de la gauche radicale puis de la gauche socialiste et enfin communiste déporte les Républicains et l'ensemble des partis existants vers la droite. Rapidement, la droite est incarnée par les Républicains alors que sa première expression (monarchiste et bonapartiste) devient très minoritaire (Rémond, 1954). De ce fait, les mêmes hommes avec des idées inchangées peuvent se déplacer de la gauche vers la droite de l'échiquier. Les cas litigieux sont toutefois rares et ne doivent pas affecter profondément les résultats.

La répartition temporelle de la gauche et de la droite est assez équilibrée. La droite est au pouvoir durant 844 mois environ (51 % du temps) contre 810 pour la gauche. 26 basculements de droite vers la gauche et 25 de gauche vers la droite sont observés.

1.2 Données financières

Un nouvel indice mensuel, un CAC 40 historique, des performances boursières est utilisé pour la période 1871-1987 (Le Bris and Hautcoeur 2010 ou chapitre 1). Il permet de mesurer avec précision la rentabilité des actions et ainsi de comparer la création de richesse par les entreprises sous la gauche et la droite. De 1988 à 2008, c'est le CAC 40 d'Euronext qui est utilisé. La variation de cours est la moyenne pondérée par la capitalisation des 40 plus grosses entreprises identifiées en début de chaque année. Le taux de dividende est mesuré en pourcentage du prix des actions en début de période. Pour obtenir une série mensuelle, un taux est recalculé chaque mois de l'année selon les variations de cours puis divisé par douze

[73] Rosa et Amson (1976) parlent de « l'éternel marais » pour désigner le large centre de l'échiquier politique lorsqu'ils étudient les élections de 1919 à 1973.

afin d'obtenir une valeur mensuelle.[74] De janvier 1871 à juin 2008, 1 654 observations mensuelles se répartissent entre la droite et la gauche sur le graphique 1. Cette courbe montre également le résultat de la classification gauche-droite retenue.

D'autres données financières sont utilisées. Le taux d'intérêt supporté par les emprunts d'Etat de long terme et la rentabilité totale d'un placement dans cet actif proviennent également de Le Bris and Hautcoeur (2010). Les taux court terme sont les taux de l'escompte de la Banque de France (série NBER) disponibles en données mensuelles[75] (données annuelles interpolées pour 1914-1925 et 1940-1951). A partir de 1952, le taux utilisé est le taux du marché monétaire (série Banque de France). Les données d'inflation proviennent de Lévy-Leboyer et Bourguignon (1985) avant 1914 puis de l'INSEE. Une interpolation linéaire est utilisée pour obtenir une série mensuelle à partir de ces données annuelles d'inflation.

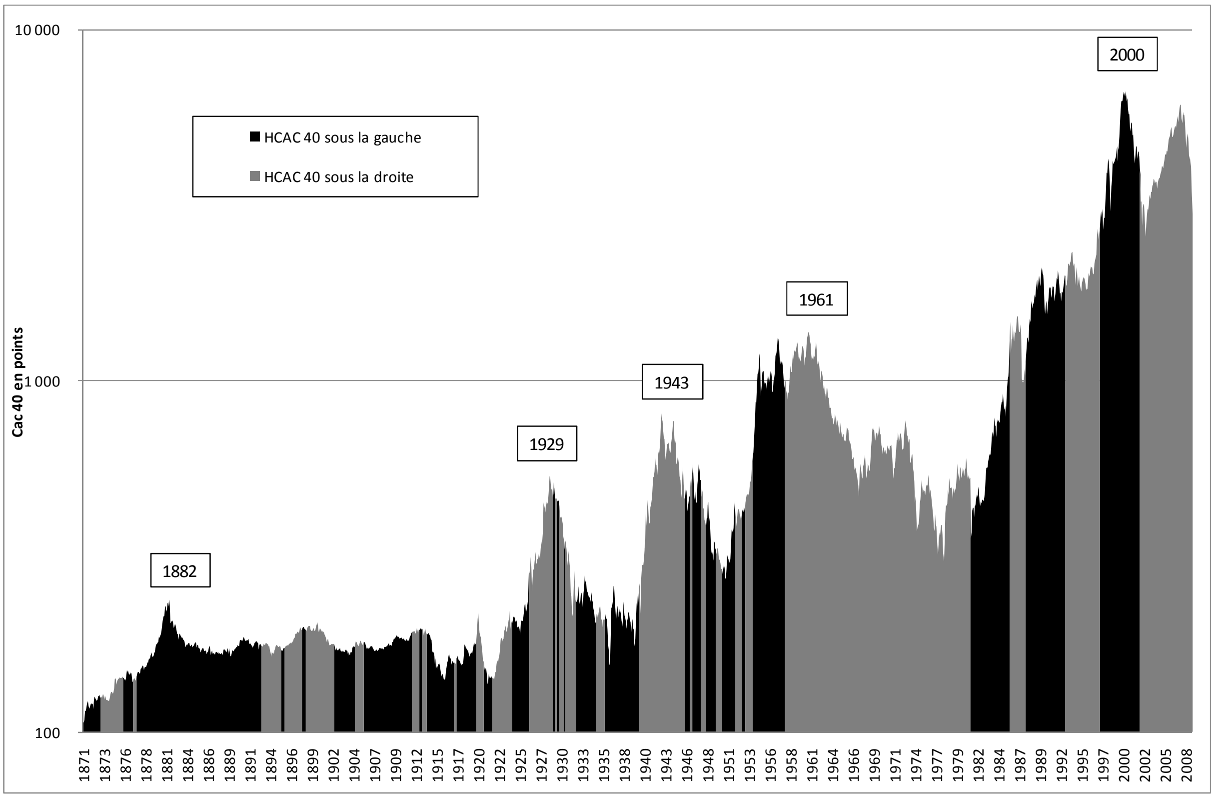

Figure 1, Cours du HCAC 40 sous la gauche et la droite. 1871-2008. Ce graphique montre le cours du HCAC 40 depuis 1871. Les 1 000 points arbitrairement définis par Euronext le 1 janvier 1988 constituent la base. Le HCAC 40 reconstitué pour la période antérieure à 1988 indique 104 points en janvier 1871. Les gouvernements de gauche et de droite alternent à 26 reprises.

[74] Avec *D*, le montant de dividendes touché au cours de l'année *n*, et *P*, le cours de l'action, chaque mois est calculé un taux annuel qui est ensuite divisé par 12: *taux de dividende mensuel = D/P/12*.

[75] Chaque mois, le taux annuel est divisé par douze pour obtenir une valeur mensualisée.

II Principaux résultats

2.1 Le marché apprécie les changements de gouvernement

Le premier résultat de cette étude est de constater la très bonne réaction du marché à l'installation des nouveaux gouvernements. Les variations de cours sont étudiées le mois de tous les changements de gouvernement. Depuis 1871, la variation moyenne de cours sur les 1 654 mois est de 0,33 % (valeur non-annualisée) et de 0,27 % sur les 1 504 mois sans nouveau gouvernement. Les 150 mois qui voient les gouvernements changer présentent une hausse moyenne de 0,92 % et même de 1,15 % sans le terrible mois de mai 1981[76]. Le marché réagit donc de manière nettement positive avec une performance moyenne triple (voire quadruple sans mai 1981, voir Tableau 1) lors des changements de gouvernements. Ce résultat se fonde sur un nombre très important d'observations (150) grâce à la forte instabilité politique française.

[76] L'élection de François Mitterrand en mai 1981 constitue la pire variation mensuelle de l'histoire boursière avec -32,79 % à cause d'une élection à l'issue incertaine et d'un programme ouvertement hostile aux entreprises cotées.

Table 1, Moyennes des variations mensuelles du HCAC 40 à l'arrivée des gouvernements. Ce tableau montre la moyenne et l'écart-type des variations de cours du HCAC 40 en mensuelles non annualisées. Il présente la moyenne de tous les mois et celle observée lorsqu'un nouveau gouvernement est nommé et selon sa couleur. Les mois d'élection sont nettement favorables à la bourse (0,92 % en moyenne contre 0,27 % le reste du temps), quelle que soit la couleur du gouvernement élu. Il présente aussi la moyenne des variations de cours lors de la nomination d'un gouvernement selon sa couleur et lors des 25 alternances. Un second panel exclut le mois de mai 1981. Le T-test (test de Student ou de Student-Cochrane) est celui de l'hypothèse nulle que les moyennes sont égales. Un bootstrap mesure la probabilité que cette différence soit le fruit du seul hasard.

	sauf	nouveaux		nouveaux gouvernements			alternance		
	neau gvt (II)	gvt (I)	(II-I)	G	D	G-D	G	D	G-D
				Panel A : 1871-2008					
moyenne	0.27	0.92	0.65	0.82	1.06	-0.24	0.24	1.08	-0.83
écart-type	4.85	6.57		5.19	6.91		8.10	5.36	
F-Test (p-value)			0.00			0.46			0.05
F-Test signification			diff.			égale			diff.
T-test (p-value)			13.19			80.66			66.53
T-test (signification)			égale			égale			égale
bootstrap aléatoire			6.39						
nb. observations	1504	150		87	63		25	26	
				Panel B : 1871-2008 sauf mai 1981					
moyenne	0.27	1.14	0.87	1.19	1.06	0.13	1.55	1.08	0.47
écart-type	4.85	5.95		5.19	6.91		4.29	5.36	
F-Test (p-value)			0.00			0.01			0.28
F-Test signification			diff.			diff.			égale
T-test (p-value)			4.08			89.55			73.17
T-test (signification)			diff.			égale			égale
bootstrap aléatoire			1.87						
nb. observations	1504	149		86	63		24	26	

Deux tests statistiques sont menés afin de valider cette observation. Un T-test rejette la possibilité que la moyenne des variations de cours observées lors de la nomination d'un nouveau gouvernement soit égale à celle observée tous les autres mois uniquement pour les observations réalisées en excluant le très mauvais mois de mai 1981 (Tableau 1, panel B). Un autre test de type « bootstrap aléatoire » est réalisé afin de mesurer la probabilité qu'une telle observation soit uniquement due au hasard. 150 variations mensuelles sont désignées de manière purement aléatoire[77]. Puis, la moyenne des ces 150 observations aléatoires est calculée ainsi que celle des autres mois. La différence entre la moyenne des 150 mois désignés par le hasard et les autres est calculée. Cette opération est répétée 10 000 fois. Le nombre de cas d'une différence de moyennes des tirages aléatoires supérieure à celle réellement observée est rapporté à 10 000 afin de connaître la probabilité que le seul hasard soit à l'origine du constat ci-dessus.

[77] Sans chercher à respecter les décalages observés entre les nominations de gouvernements contrairement à ce qui sera fait dans les Tableaux 2, 5 et 6.

Le supplément de rentabilité observé lors des nominations de gouvernement n'a que 6,39 % de chance d'être le fruit du seul hasard. Cette possibilité chute même à 1,87 % lorsque l'on exclut des nouveaux gouvernements le mois de mai 1981. Il n'y a que 1,87 % de chance que la surperformance de 0,87 % observée lors des changements de gouvernements provienne du hasard. Autrement dit, en choisissant 10 000 fois, 150 mois au hasard, seulement 1,87 % des cas présentent un supplément de rentabilité par rapport aux 1 504 autres mois, au moins égale au 0,87 réellement observé. Ce test est particulièrement robuste car il ne nécessite aucune hypothèse sur le type de distribution des rentabilités.

Cette meilleure performance est cohérente avec l'idée selon laquelle un changement de gouvernement met fin à une certaine incertitude qui a un coût pour les investisseurs (Brown *et al.* 1988). Ce constat confirme Pantzalis *et al.* (2000) qui ont identifié une réaction positive de la bourse dans les périodes d'élections à travers 33 pays entre 1974 et 1995.

En revanche, seule une faible différence apparaît en faveur des nominations de gouvernements de droite mais cette prime disparaît lorsque le mois de mai 1981 est exclu. De la même manière, la légère prime observée lors des passages à droite tourne en faveur de la gauche si le mois de mai 1981 n'est pas pris en compte. La taille de l'échantillon est limitée car seulement 26 passages de gauche à droite et 25 de droite à gauche sont enregistrés. Si le marché salue nettement les nouveaux gouvernements, il ne semble pas faire de claire distinction entre la gauche et la droite lors des nominations ou des alternances.

2.2 La rentabilité des actions est nettement plus forte sous la gauche

La rémunération de l'actionnaire se compose de deux parties. La première est le dividende perçu dans l'année. Ce taux de dividende est faiblement différent selon les gouvernements (annualisé, 3,91 % sous la gauche contre 3,53 % sous la droite). La seconde partie de la rémunération consiste en une variation de cours (plus ou moins value). La différence devient ici sensible. Les cours progressent de 5,90 % en moyenne arithmétique annualisée sous la gauche contre seulement 2,12 % sous la droite. La somme du taux de dividende et de la variation de prix constitue la rentabilité totale nominale. Elle est donc nettement supérieure sous la gauche (9,80 % contre 5,65 %, voir tableau 2).

L’actionnaire s’intéresse plus à la rentabilité réelle qu’à la rentabilité nominale. L’important est ce que son placement lui permet d’acheter en plus ou en moins. Il est donc nécessaire de tenir compte de l’inflation du prix des biens et services. A l’inverse du prix des actions, l’inflation est légèrement[78] plus rapide sous la droite (5,61 %) que sous la gauche (5,46 %).[79] La différence entre droite et gauche est donc accentuée pour la rentabilité réelle. Au final, la rentabilité totale réelle des actionnaires est de + 4,40 % sous les gouvernements classés à gauche contre 0,11 % sous les gouvernements de droite.

Un autre ajustement de la rentabilité nominale consiste à mesurer la prime de risque (excess return). Cette prime est obtenue en déduisant de la rentabilité des actions, la rentabilité autorisée par un placement hypothétiquement sans risque. Cet actif est approché par le taux court terme. La prime de risque est le supplément de rentabilité offert à l’investisseur qui accepte de supporter le risque des actions. Cet excess return suppose que l’investisseur est de toute façon exposé au risque d’inflation mais qu’il arbitre entre un placement sans risque et les actions. Cet indicateur évite de recourir à des taux d’inflation discutables lorsqu’ils dépassent les 50 % comme de 1946 à 1948, surtout lorsqu’il s’agit de réaliser des calculs mensuels basés sur des données annuelles.

Comme pour la rentabilité réelle, la prime de risque est nettement plus importante sous la gauche que sous la droite. L’excess return est de 5,48 % sous la gauche contre 1,18 % sous la droite. Santa Clara et Valkanov (2003) font un constat similaire aux Etats-Unis avec une différence de 9 % en faveur des Démocrates mais avec une rentabilité moyenne des actions plus élevée qu’en France. Les formules utilisées apparaissent dans l’Annexe A et les résultats dans le Tableau 2.

Un dernier élément serait à prendre en compte : les taux d’imposition de ces rentabilités. Ces taux sont difficiles à quantifier, très fluctuants dans le temps, différents pour les dividendes et les gains en capital ; de plus l’impôt sur le revenu varie souvent selon les situations individuelles. Mais parvenir à une correcte mesure de l’imposition ne changerait pas les résultats car la rentabilité réelle sous la droite est proche de zéro. En effet, en admettant que l’imposition soit plus forte sous la gauche, il est préférable de payer plus d’impôts sur un gain que de ne pas en enregistrer. De plus, à cause de l’inflation, l’imposition réelle est probablement plus forte sous la droite. En effet, l’impôt est calculé sur une

[78] Cette différence n’est pas statistiquement significative.
[79] A l’inverse aux Etats-Unis, Chappell and Keech (1986) montrent que le taux d’inflation est 2,5 % plus haut sous les Démocrates.

rentabilité nominale et s'applique donc même si la rentabilité réelle avant impôt est négative[80]. Avec une inflation plus forte, ce biais doit être plus pénalisant sous la droite.

2.3 Cette surperformance ne semble pas due au hasard

Compte-tenu de la nature contre-intuitive de ces résultats, différentes vérifications statistiques s'imposent. La première consiste, après avoir réalisé un test de Fischer pour tester l'égalité des variances, à effectuer un test de Student[81] (ou Student-Cochrane en cas de variance différente) sur chaque série gauche et droite pour savoir dans quelle mesure elles sont susceptibles d'avoir une moyenne identique. Le T-test montre que les différences observées entre gauche et droite pour les variations de cours, la rentabilité totale, la rentabilité totale réelle et l'excess return sont significatives (aussi bien en moyennes arithmétiques que géométriques). A l'inverse, cette différence n'est pas significative pour les taux de dividende.

Afin de préciser la solidité statistique des résultats, une procédure de bootstrap aléatoire permet de connaître la probabilité que la différence observée entre la droite et la gauche soit due au seul hasard. En effet, une différence même significative selon un T-test peut être le résultat du seul hasard. Pour chaque série de rentabilité étudiée, 10 000 rééchantillonnages sont effectués. Les 1 654 performances mensuelles sont attribuées aléatoirement à la gauche ou à la droite. Pour les 10 000 combinaisons, la différence de moyenne est ensuite calculée. Le nombre de cas aléatoires de différences supérieures ou égales à celle réellement observée est rapporté à 10 000 pour connaître la probabilité qu'une telle différence soit le fruit du seul hasard.

Contrairement au test de bootstrap précédent (en 2.1) tirant au hasard 150 mois, l'attribution des mois à la gauche et à la droite est réalisée en conservant deux continuités : celle de la durée des gouvernements et celle des séries de performances mensuelles. Il convient tout d'abord de conserver les durées de gouvernements, c'est-à-dire que les changements gauche-droite aléatoires ne doivent pas se faire en créant des séries où les gouvernements hypothétiques s'enchaînent par le fait du hasard. Le nombre d'alternances est

[80] L'inflation peut entraîner un taux d'imposition réel plus élevé que le taux facial. Un commerçant achète un produit puis le revend un an plus tard pour une valeur réelle identique. Il n'a pas gagné d'argent mais si entre-temps l'inflation est de 10 %, il dégage une marge apparente soumise à l'impôt. Le taux réel de l'impôt augmente donc avec l'inflation.

[81] Une moyenne identique impliquerait que la couleur du gouvernement en place n'a pas d'impact sur les performances.

conservé ainsi que la durée de chaque couleur au pouvoir. Ensuite, comme il s'agit d'étudier les performances cumulées et pas une seule variation mensuelle, les séries de performances doivent conserver leurs structures. En effet, ces séries peuvent avoir certaines propriétés qui seraient cassées en désignant des mois au hasard. Chaque série de performance (variation de cours, taux de dividende, rentabilité nominale, rentabilité réelle…) conserve son intégrité.

Pour parvenir à conserver ces deux continuités, les séries des performances sont décalées d'un mois à chaque rééchantillonage tandis que la couleur du gouvernement en place est maintenue. A titre d'exemple, pour le premier rééchantillonnage, la performance attribuée pour le mois janvier 1871 est celle observée en février 1871 décalant ainsi l'ensemble des performances. La performance attribuée au mois de décembre 2008 (fin de cette étude) devient celle de janvier 1871. Le rééchantillonage suivant attribue au mois de janvier 1871, la performance observée en mars 1871 et ainsi de suite. 10 000 rééchantillonnages étant effectués, la série de 1 654 performances mensuelles observée « tourne » plusieurs fois car « seulement » 1 654 séries aléatoires peuvent être désignées tout en conservant les deux propriétés énoncées au-dessus.[82]

Le pourcentage de chance que le hasard soit à l'origine de la différence observée est donné quel que soit le sens de la différence. Le nombre de cas rapportés à 10 000 sont ceux d'une surperformance aléatoire supérieure à celle réellement observée aussi bien dans un sens que dans l'autre. Une approche plus restrictive serait de mesurer les seuls cas où la « gauche aléatoire » surperforme la droite. Ces cas sont moitié moins nombreux que les probabilités ici présentées. Ce choix est motivé par un souci de simplification dans la présentation des résultats. En effet, dans le cas des très faibles différences que le hasard parvient bien à expliquer (voir Tableau 6), le chiffre indiqué par le bootstrap s'approche des 100 %. A l'inverse, en ne retenant que les différences du sens réellement observé, une explication par le hasard plafonnerait à 50 %.

Cette méthode donne des résultats très solides pour mesurer la probabilité d'un simple effet de la chance sans aucune hypothèse sur la nature de la distribution et tout en conservant d'éventuelles propriétés aux séries de rentabilités. La rentabilité réelle sous la gauche est supérieure de 4,61 % en moyenne géométrique. Une telle différence a 26,40 % de chance d'être le fruit du hasard. Une telle différence en faveur de la gauche aurait moitié moins de probabilité (13,20 %) de provenir du simple hasard. Cette probabilité, quel que soit le sens,

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[82] Pour conserver un nombre standard dans la littérature, 10 000 tirages sont tout de même réalisés.

apparait dans la ligne bootstrap aléatoire du Tableau 1. La procédure de bootstrap permet de relativiser ces différences validées par le T-test en montrant que le hasard a une probabilité non négligeable d'être moteur. Le hasard ne peut toutefois pas être retenu comme seule cause à ce stade de l'étude.

Table 2, Performance des actions françaises sous la gauche et la droite. La rentabilité nominale des actions se compose du taux de dividende et des variations de cours. La rentabilité réelle est obtenue en « déduisant » le taux d'inflation. L'excess return en déduisant le taux court terme. G désigne les rentabilités sous la gauche, D sous la droite et G-D la différence. Le F-test est celui de l'hypothèse nulle qu'il n'y a pas de différence de variance. Le T-test (test de Student ou de Student-Cochrane) est celui de l'hypothèse nulle qu'il n'y a pas de différence de rentabilité moyenne. La ligne bootstrap désigne la probabilité en pourcentage que cette différence provienne d'un simple hasard.

	Variation de cours			Taux de dividende			Rentabilité Nominale		
	G	D	G-D	G	D	G-D	G	D	G-D
écart type	16.49	18.36	-1.86	4.58	5.78	-1.20	16.38	18.39	-2.01
F-test (p-value)			0.00			0.00			0.00
F-test (signification)			diff.			diff.			diff.
Moyenne arithmétique	5.90	2.12	3.78	3.91	3.53	0.38	9.80	5.65	4.15
T-test (p-value)			0.00			13.77			0.00
T-test (signification)			diff.			égales			diff.
bootstrap			28.04			27.12			24.02
Moyenne géométrique	4.54	0.44	4.10				8.45	3.97	4.47
T-test (p-value)			0.00						0.00
T-test (signification)			diff.						diff.
bootstrap			24.58						20.52
nb. observations	810	844		810	844		810	844	
				Taux d'inflation			Rentabilité Réelle		
				G	D	G-D	G	D	G-D
écart type				2.89	2.81	0.08	16.49	18.40	-1.91
F-test (p-value)						0.39			0.00
F-test (signification)						égales			diff.
Moyenne arithmétique				5.46	5.63	-0.17	4.40	0.09	4.32
T-test (p-value)						28.89			0.00
T-test (signification)						égales			diff.
bootstrap						94.02			28.60
Moyenne géométrique							3.05	-1.58	4.64
T-test (p-value)									0.00
T-test (signification)									diff.
bootstrap									26.40
nb. observations				810	844		810	844	
				Taux Court Terme			Excess Return		
				G	D	G-D	G	D	G-D
écart type				0.93	0.79	0.13	16.51	18.42	-1.91
F-test (p-value)						0.00			0.00
F-test (signification)						diff.			diff.
Moyenne arithmétique				4.33	4.47	-0.14	5.48	1.18	4.29
T-test (p-value)						0.10			0.00
T-test (signification)						égales			diff.
bootstrap						62.08			23.18
Moyenne géométrique							4.12	-0.50	4.62
T-test (p-value)									0.00
T-test (signification)									diff.
bootstrap									20.78
nb. observations				810	844		810	844	

2.4 Stratégie d'investissement politique et stabilité de l'écart

L'idée d'un possible décalage entre les décisions politiques et leurs résultats en bourse ne peut être retenue. Selon la théorie de l'efficience informationnelle des marchés financiers (Fama, 1991), le cours intègre immédiatement toutes les nouvelles informations disponibles. Est ainsi valorisé de manière optimale tout ce qui peut être anticipé et probabilisé, y compris les décisions politiques. Le cours ne varie qu'en fonction des informations nouvelles qui ne peuvent pas être probabilisées, c'est-à-dire de ce qui est aléatoire.[83]

La large différence de performance sous la droite et sous la gauche peut s'illustrer par une stratégie de placement politique. Deux stratégies opposées sont étudiées :

1) Achat d'actions lorsque la gauche gouverne et placement au taux court terme lorsque c'est la droite.
2) Achat d'actions lorsque la droite gouverne et placement au taux court terme lorsque c'est la gauche.

Le graphique 2 présente les deux stratégies d'investissement. La divergence entre les deux stratégies débute dès le XIX^ème^ siècle. Entre les années 1878 et 1921, la stratégie actions sous la gauche offre une performance légèrement supérieure. En décembre 1920, elle a rapporté près de 36 % de plus. La stratégie actions sous la droite surperforme seulement provisoirement à partir de 1941. Au cours de la Seconde Guerre Mondiale,[84] les actions connaissent un sommet très artificiel en 1943. Elles sont poussées à la hausse par l'immense création monétaire qui incite à chercher des valeurs réelles pour fuir l'inflation.[85]

La stratégie actions sous la gauche reprend le dessus à partir du mois d'août 1951 coïncidant avec l'arrivée à Matignon de René Pleven. Elle diverge fortement avec la forte hausse des actions en 1954 qui accompagne le gouvernement de Pierre Mendès-France. Durant ses 7 mois à Matignon, le cours des actions monte de 75 % ; il progresse encore de 10 % le mois suivant son départ. Il est porté par la découverte du gisement de pétrole de Parentis dans les Landes par Esso-France. Cette dernière voit son cours multiplié par dix. Toutes les

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[83] Ce qui est à l'origine de la marche aléatoire des variations de cours (Malkiel, 2003)

[84] Bien que le régime de Vichy corresponde à une situation très particulière et qu'il trouve pendant longtemps un soutien large et transpartisan avec une politique économique particulièrement étatiste et souvent « sociale », il a été choisi de classer cette période à droite pour éviter d'avoir une rupture dans la série d'alternance.

[85] Voir chapitre 3 ou Le Bris D. (2010), « Les conséquences de la Seconde Guerre mondiale sur la bourse en France : l'Etat se substitue au marché » H. Joly (dir.), *Les entreprises françaises, l'Occupation et le second XX^ème^ siècle*, Presses Universitaires de Metz, à paraître.

compagnies explorent le sud-ouest dont l'avenir est imaginé comme celui d'un Texas français.

A l'inverse durant la première moitié des années 1960, les actions connaissent une chute continue (- 66 % entre avril 1961 et juillet 1967). Cette période catastrophique correspond au gouvernement Pompidou[86] sous le Général De Gaulle. Toutefois, cette chute peut être vue comme un simple retour à la réalité ainsi qu'en témoigne le taux de dividende. En janvier 1955, il atteint 1,97 % (dividendes versés en 1954/cours de janvier 1955). Les cours se maintiennent pendant la fin des années cinquante et le taux de dividende tombe à seulement 1,21 % en janvier 1960. Ce chiffre est ridiculement bas. En effet, à ce rythme, il faut plus de 83 années pour que les dividendes remboursent l'achat d'action. C'est le niveau le plus bas jamais enregistré en temps de paix.[87] Pour comparaison, il n'était descendu qu'à 2,76 % en janvier 1929 ou 2,50 % en janvier 2000. Surtout, la moyenne observée au XX^{ème} siècle est de 3,41 % et même de 3,84 % depuis le milieu du XIX^{ème} siècle. Ainsi la baisse des cours lors de la crise boursière des années 1960 ramène seulement le taux de dividende vers sa moyenne historique qui est à nouveau atteinte en janvier 1967 ; date qui coïncide parfaitement avec l'arrêt de la baisse entamée six années auparavant. De ce point de vue, la baisse n'est donc qu'un retour à la normale.[88] D'ailleurs, la fameuse de phrase du Général De Gaule prononcée en octobre 1966 (la baisse est déjà de 56 %) est bien plus pertinente quand elle n'est pas tronquée : « La Bourse, en 1962, était exagérément bonne. En 1966, elle est exagérément mauvaise. Mais vous savez, la politique de la France ne se fait pas à la corbeille ».

Après cet effondrement sous le gouvernement Pompidou, la stratégie actions sous la droite stagne sous la présidence Pompidou alors que la rémunération au taux court terme

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[86] Ancien directeur de la Banque Rostchild.
[87] Il était tombé à 0,72 % en janvier 1943.
[88] La hausse des cours du milieu des années cinquante peut toutefois se justifier. Le taux minimum de dividende de 1,21 % en janvier 1960 correspond à un versement de 474 millions de nouveaux francs pour une capitalisation boursière de 39 milliards. Pour retourner vers sa moyenne séculaire de 3,41 %, les dividendes auraient du monter à 1,33 milliards soit une croissance de 180 %. Dans ce cas, le taux de dividende serait retourné à sa moyenne historique par la croissance des dividendes versés et non par la chute des cours. Cette anticipation de croissance de 180 % des dividendes est parfaitement raisonnable. En effet, mesurés en pourcentage du PIB, les dividendes progressent à un rythme très soutenu de 10.50 % (moyenne géométrique) entre 1950 et 1961. A ce taux, il suffit de seulement six années pour cumuler une croissance de 180 % des dividendes. Les anticipations du marché valorisent donc une poursuite de la tendance observée durant la décennie précédente. Cette hausse aurait porté les dividendes à environ 0,56 % du PIB retournant vers les niveaux atteints dans l'entre-deux-guerres (0,70 % en 1935) et encore loin de ceux observés avant 1914 (plus de 1 % en 1900). L'exubérance du marché au début des années 1960 n'est donc pas forcément « irrationnelle ».

procure des gains réguliers à la stratégie actions sous la gauche. Le point bas de la stratégie action sous la droite est atteint en 1977. Avec le retour au pouvoir de la gauche en mai 1981, les actions connaissent leur pire mois de l'histoire mais la suite des années 1980 est particulièrement favorable. La comparaison des performances sous les gouvernements de la fin du XX$^{\text{ème}}$ siècle est peu flatteuse pour la droite. Le gouvernement est repassé à droite lors du krach d'octobre 1987, le cours des actions sous le gouvernement Chirac baisse ainsi de 6 % alors que sous celui de Fabius il avait progressé de 91 % et de 94 % sous celui de Mauroy. La gauche revenue à Matignon, les gouvernements Rocard et Cresson cumulent de 60 %. La baisse du début des années 2000 est répartie sur les gouvernements Jospin et Raffarin.

Le résultat de ces deux stratégies montre une profonde divergence. Avec 1 placé en 1871, la valeur finale est de 6 693 pour l'achat d'actions sous la gauche et de seulement 299 pour le placement en actions sous la droite. Ces calculs sont réalisés en valeur nominale, c'est-à-dire sans tenir compte de l'inflation. Avec cette dernière, l'écart est encore plus important puisque l'inflation est légèrement plus élevée sous la droite que sous la gauche.

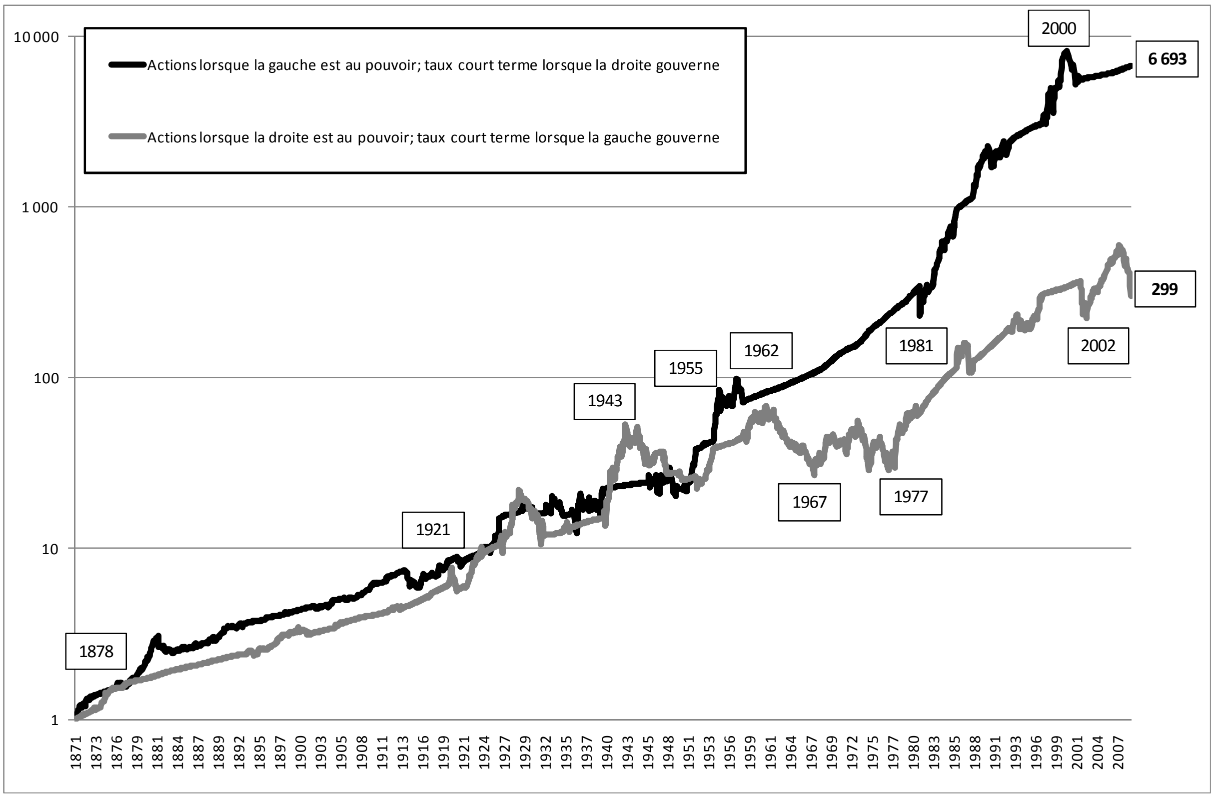

Figure 2, Stratégies de placement politique. Ce graphique montre le résultat d'un franc placé en actions sous la gauche et au taux court terme sous la droite contre le résultat d'un franc placé en action sous la droite et au taux court terme sous la gauche. La stratégie action sous la gauche est meilleure dans de nombreuses périodes et creuse l'écart dans la durée.

III Tests de contrôle pour le niveau de risque et le contexte macro-économique

3.1 Ce supplément de rentabilité sous la gauche n'est pas une rémunération du risque

En finance, la rentabilité est la contrepartie du risque. Il est cohérent d'observer des performances supérieures lorsque le risque est aussi plus élevé. Ce risque est mesuré par l'écart-type des rentabilités. Cette explication peut être rejetée car le risque sous la gauche est nettement inférieur à celui observé sous la droite. Cette différence au niveau du risque est validée par un test de Fischer sur les variances (voir Tableau 2) qui rejette l'égalité pour toutes les mesures performances. Autrement dit, la rentabilité des actions est inférieure sous la droite alors que le risque supporté par les investisseurs est plus élevé. Ce risque supérieur creuse encore l'écart entre gauche et droite, si l'on cherche à mesurer la rémunération du risque pris plutôt que la seule rentabilité apparente.

Le ratio de Sharpe combine rentabilité et risque en donnant une mesure de la rémunération de chaque unité de risque. Comme pour l'excess return, la rentabilité obtenue sans risque est déduite de celle des actions pour obtenir la rémunération du seul risque pris. Puis, cet excess return est divisé par le risque effectivement pris qui est mesuré par l'écart-type des rentabilités. Appréhendée de cette manière, la sous-performance sous la droite est encore plus grande car un risque plus élevé se combine à une rentabilité inférieure. Le Sharpe sous la gauche est 0,33 contre seulement 0,06 sous la droite. Le risque pris par les actionnaires n'est donc que très faiblement rémunéré sous la droite.

On pourrait arguer que le risque est mal mesuré par l'écart-type des rentabilités et que la meilleure performance sous la gauche constitue tout de même une prime de risque. Toutefois, une prime de cette nature exigée par les investisseurs lorsque la gauche arrive au pouvoir devrait se traduire par une chute rapide des cours afin d'offrir ultérieurement cette rentabilité supérieure. Les faits infirment cette hypothèse (voir Tableau 1).

3.2 Le contexte économique explique partiellement cette prime pour la gauche

La rémunération plus élevée sous la gauche n'est pas non plus le seul résultat d'un contexte économique plus favorable. La couleur du gouvernement n'est pas une simple « proxy » de l'activité économique générale. Les rentabilités boursières sont affectées par les variations de l'activité économique (Fama, 1989 ou Campbell *et al.*, 1997). Si la couleur politique est corrélée avec le cycle des affaires, la corrélation observée avec les performances boursières peut n'être qu'indirecte.

Différentes variables macroéconomiques sont connues pour pouvoir partiellement prévoir les cours de bourse : le taux de dividende, le taux d'intérêt à long terme, le taux d'inflation, le « spread » de termes sur les taux (différence entre le taux long terme et le taux court terme) et le taux court terme relatif (différence entre le taux court terme et sa moyenne mobile sur les douze derniers mois). Ces variables sont disponibles en données mensuelles sur presque toute la période. Les corrélations croisées laissent logiquement apparaître une forte corrélation entre les taux longs et le spread de terme. Les taux longs sont donc exclus car l'ensemble de l'information doit être contenue dans la variable spread de terme ; d'autant que les taux longs sont aussi fortement corrélés avec le ratio D/P. A l'inverse, malgré leur forte corrélation avec le spread de terme et avec l'inflation (corrélation négative), le ratio D/P est toute de même maintenu car il doit contenir des informations différentes. Surtout, l'objectif de cette régression est de contrôler pour ces variables et pas d'identifier des variables explicatives (et donc de rechercher des résultats significatifs). Pour la même raison, la stationnarité des variables n'est pas importante. En effet, la régression pourrait même être fallacieuse car il n'est pas recherché la significativité dans les relations mais seulement des contrôles.

Table 3, Caractéristiques des variables. Cette table présente la moyenne et l'écart-type des différentes variables ainsi que leurs corrélations croisées.

	Exs Return	*Tx longs*	*D/P*	*Spread Term*	*Tsr relatif*	*Inflation*
Exs Return	1					
Tx longs	-0.00106	1				
D/P	0.07849	0.46304	1			
Spread Term	0.00186	0.99918	0.46337	1		
Tsr relatif	-0.04792	0.04289	-0.05007	0.02308	1	
Inflation	0.00854	0.07466	-0.22656	0.07543	0.08361	1
Moyenne (annualisée)	1.75%	5.31%	3.72%	4.94%	0.00%	5.56%
Ecart-type (annualisé)	17.52%	0.75%	0.44%	0.68%	0.27%	2.85%

Une régression permet de contrôler pour le contexte macro-économique. Tout d'abord, il convient de noter que la rentabilité moyenne observée sous une couleur politique peut être mesurée par deux régressions simples. La mesure de performance est notée par r_{t+1} est régressée pour la gauche avec la variable politique π_t (qui est une « dummy ») prenant la valeur 1 si la gauche gouverne et 0 si c'est la droite. Une seconde régression est effectuée pour la droite avec π_t égal à 0 sous les gouvernements de gauche et à 1 sous ceux de droite. La moyenne sous une couleur est alors le coefficient β augmenté de la constante $(\propto + \beta)$.

$$r_{t+1} = \propto + \beta\pi_t + u_{t+1} \quad (1)$$

Pour isoler l'influence du gouvernement du contexte macroéconomique, les cinq indicateurs macro-économiques sont utilisés comme variables de contrôle. L'équation (1) est augmentée par X_t qui est un vecteur contenant les cinq variables macroéconomiques connues pour influencer les rentabilités boursières. Si les variables politiques contiennent uniquement des informations déjà identifiées par le contexte macroéconomiques, alors le coefficient β[89] sera proche de 0 dans l'équation ci-dessous. La régression est effectuée avec la dummy gauche puis avec la dummy droite. La mesure de performance utilisée est l'excess return mesuré en logarithme. [90]

$$r_{t+1} = \propto + \beta\pi_t + \gamma' X_t + u_{t+1} \quad (2)$$

A contexte macroéconomique identique, la différence entre la gauche et la droite se réduit mais demeure sensible.[91] Autrement dit, le contexte macro-économique est plus favorable quand la gauche gouverne. Sous la gauche l'excess return ajusté est de 3,35 % tandis que sous la droite il n'est que de 0,23 %. La différence n'est plus que de 3,12 % contre 4,62% sur les données non ajustées. La différence se réduit donc de 32,45 % (3,12/4,62) après contrôle pour la situation macro-économique. Le bootstrap sur les séries mensuelles d'excess return indique qu'il n'y a qu'une probabilité de 27,42 % pour que cette différence ajustée de 3,12 % soit le fruit du simple hasard. Le contrôle pour la situation macroéconomique ne permet donc pas de dire que la surperformance sous la gauche est le seul fait du hasard.

[89] Pour obtenir des rentabilités ajustées directement comparables aux moyennes précédemment présentées, toutes les variables macroéconomiques de contrôles sont démoyennées.
[90] Cette démarche est proposée par Santa Clara et Valkanov (2003).
[91] Voir en Annexe B, les détails de chaque régression. La totalité du contexte macro-économique n'est probablement pas captée par les variables utilisées.

3.3 La forte rentabilité sous la gauche est inattendue

Les cinq variables macroéconomiques utilisées au-dessus permettent de décomposer la rentabilité boursière entre rentabilité attendue et inattendue. Avec une régression des variables macroéconomiques sur les rentabilités (excess return mesuré en logarithme) selon l'équation (3), il est possible de prendre les rentabilités prévues ($\propto + \gamma' X_t$, y compris les variables non significatives car elles peuvent tout de même contenir une certaine information) pour la partie anticipée selon le contexte macro-économique et les résidus de la régression (u_{t+1}) comme la partie inattendue.[92]

$$r_{t+1} = \propto + \gamma' X_t + u_{t+1} \tag{3}$$

Chaque mois, la partie attendue et non-attendue de la rentabilité sont ainsi mesurées puis classée selon le critère politique. Les résultats de cette analyse peuvent être critiqués car les rentabilités anticipées ne sont que mal capturées par les variables macroéconomiques avec un R^2 inférieur à 0,1 (classique dans ce type d'exercice). Ce test donne toutefois un indicateur intéressant grâce au grand nombre de mois étudiés.[93]

Compte-tenu de la situation macroéconomique, l'excess return attendu sous la gauche est de 2,56 % et seulement 0,98 % sous la droite. Ce contexte moins favorable sous la droite est cohérent avec le fait que la différence gauche-droite se réduit lorsque l'on tient compte des variables macro-économiques (voir en 3.2). Finalement, c'est une rentabilité de 4,12 % qui est observée sous la gauche (d'où 1,56 % inattendu) et de -0,50 sous la droite (soit – 1,48 % inattendu). Tout se passe comme si le marché était agréablement surpris par la gauche et souvent déçu par la droite avec une différence de 3,04 en faveur de la gauche. La différence observée selon la couleur du gouvernement provient pour les deux tiers (3,04/4,62) d'une meilleure performance inattendue sous la gauche et donc seulement pour un tiers du contexte macro-économique plus favorable à la gauche.

[92] Ce test s'inspire également de Santa Clara et Valkanov (2003).
[93] Voir les détails de la régression en Annexe C.

Table 4, Rentabilité attendue contre inattendue. Ce tableau montre la décomposition de la rentabilité mensuelle entre rentabilité attendue selon les indicateurs macro-économiques pris comme variables explicatives dans une régression et la part inattendue. Cette part inattendue est la différence entre la rentabilité effectivement observée est celle prévue par les paramètres tirés de la régression (*i.e.* les résidus de cette régression). Le T-test (test de Student ou de Student-Cochrane) est celui de l'hypothèse nulle qu'il n'y a pas de différence de rentabilité.

	Excess Return								
	Attendu (I)			Inattendu (II)			Réalisé (I+II)		
	G	D	G-D	G	D	G-D	G	D	G-D
moyenne annualisée	2.56	0.98	1.58	1.56	-1.48	3.04	4.12	-0.50	4.62
écart-type annualisé	1.72	1.91	-0.19	16.51	18.25	-1.75	16.51	18.42	-1.91
F-test (p-value)			0.14%			0.19%			0.08%
F-test (signification)			diff.			diff.			diff.
T-test (p-value)			0.00%			0.04%			0.00%
T-test (signification)			diff.			diff.			diff.

IV Un marché efficient peut-il expliquer cette surperformance de la gauche ?

4.1 Chocs avant les changements de gouvernements

La réaction du marché dans les mois précédents les alternances est plus conforme à l'opinion commune. Durant les trois mois[94] précédents l'arrivée de la gauche au pouvoir, les actions chutent de 7,44 % en moyenne annualisée (Tableau 5). A l'inverse, lorsque la droite va remplacer la gauche, la bourse progresse en moyenne de 9,63 %. Cette profonde différence de 17,07 % sur les variations de cours s'observe également en rentabilité réelle et excess return. Dans tous les cas, elle est statistiquement solide. De plus, le hasard (ligne bootstrap) n'a qu'une très faible chance d'être à l'origine de ces différences.

Il est à noter que cette surperformance sous les gouvernements de gauche juste avant les alternances n'est pas incohérente avec le constat (présenté en 2.1) que le marché apprécie toutes les nominations. En effet, dans ce premier cas, les cours des actions réagissent à la fin de l'incertitude qui caractérise la période précédent la chute d'un gouvernement quel qu'il soit par une forte performance le mois de la nomination du nouveau. Alors qu'ici, le marché valorise un programme plus ou moins favorable aux entreprises en anticipant sur trois mois les alternances gauche-droite.

[94] Une durée de trois mois est celle qui offre les différences les plus importantes selon un test non-reporté.

La très forte différence de performances dans les trois mois précédant une alternance est cohérente avec l'idée qu'un gouvernement de droite est plus favorable aux entreprises. La force de cette différence implique que le marché anticipe correctement la couleur d'un futur gouvernement. Une mauvaise anticipation trop fréquente lisserait les différences observées. Cette forte divergence avant les alternances s'observe parallèlement à la faible différence de réaction durant le mois de nomination (Tableau 1). Le marché semble réagir avant les changements de gouvernement et reste donc indifférent lors du changement effectif.

Ce constat est cohérent avec la théorie d'un marché efficient qui intègre parfaitement l'information disponible y compris les données politiques. En effet, il n'y a aucune raison pour que le changement de gouvernement ne soit pas « pricé » dès qu'il apparaît probable. Les alternances sont rarement des chocs exogènes imprévisibles. En conséquence, les acteurs du marché financier sont partiellement capables de l'intégrer avant sa réalisation. Ainsi, *une partie de la bonne performance observée sous la gauche provient des trois derniers mois qui intègrent l'anticipation de son remplacement par la droite. A l'inverse, la mauvaise évolution de la bourse sous la droite s'explique partiellement par les trois mauvais mois qui précédent l'arrivée de la gauche*. Ce contre-effet doit expliquer une part de la différence observée en faveur de la gauche.

Table 5, Performance des actions françaises sous les trois derniers mois de gauche et de droite. La rentabilité nominale des actions se compose du taux de dividende et des variations de cours. La rentabilité réelle est obtenue en « déduisant » le taux d'inflation. L'excess return en déduisant le taux court terme. G désigne les rentabilités sous la gauche, D sous la droite et G-D la différence. Le F-test est celui de l'hypothèse nulle qu'il n'y a pas de différence de variance. Le T-test (test de Student ou de Student-Cochrane) est celui de l'hypothèse nulle d'égalité de moyenne. La ligne bootstrap désigne la probabilité en pourcentage que cette différence provienne d'un simple hasard.

	Variation de cours			Taux de dividende			Rentabilité Nominale		
	G	D	G-D	G	D	G-D	G	D	G-D
écart type	17.33	15.82	1.51	4.68	4.62	0.06	17.71	15.69	2.02
F-test (p-value)			0.30			0.91			0.30
F-test (signification)			égales			égales			égales
Moyenne arithmétique	9.63	-7.44	17.07	3.52	3.51	0.01	13.15	-3.93	17.08
T-test (p-value)			0.00			93.12			0.00
T-test (signification)			diff.			égales			diff.
bootstrap			9.18			59.30			9.54
Moyenne géométrique	8.11	-8.69	16.80				11.62	-5.18	16.80
T-test (p-value)			0.00						0.00
T-test (signification)			diff.						diff.
bootstrap			10.02						9.90
nb. observations	73	75		73	75		73	75	
				Taux d'inflation			Rentabilité Réelle		
				G	D	G-D	G	D	G-D
écart type				4.04	3.47	0.57	18.01	15.89	2.11
F-test (p-value)						0.20			0.29
F-test (signification)						égales			égales
Moyenne arithmétique				7.23	5.85	1.38	6.05	-9.62	15.67
T-test (p-value)						2.73			0.00
T-test (signification)						diff.			diff.
bootstrap						33.80			12.90
Moyenne géométrique							4.54	-10.87	15.41
T-test (p-value)									0.00
T-test (signification)									diff.
bootstrap									13.78
nb. observations				73	75		73	75	
				Taux Court Terme			Excess Return		
				G	D	G-D	G	D	G-D
écart type				0.69	0.66	0.03	17.28	15.83	1.45
F-test (p-value)						0.74			0.31
F-test (signification)						égales			égales
Moyenne arithmétique				3.82	3.57	0.25	9.33	-7.50	16.83
T-test (p-value)						0.00			0.00
T-test (signification)						diff.			diff.
bootstrap						58.96			9.80
Moyenne géométrique							7.80	-8.75	16.55
T-test (p-value)									0.00
T-test (signification)									diff.
bootstrap									10.50
nb. observations				73	75		73	75	

4.2 La différence de rentabilité devient nulle en réattribuant les trois derniers mois :

En acceptant, l'idée que le marché anticipe correctement la couleur d'un nouveau gouvernement trois mois avant sa nomination, il est pertinent d'allouer les trois derniers mois de la gauche à la droite et vice-versa. Ainsi, la performance sous la gauche et sous la droite sera mesurée non plus selon la délimitation juridique que constituent les changements effectifs de gouvernements mais selon celle qui peut se dessiner en reconnaissant au marché une efficience suffisante pour intégrer l'information d'une alternance avant la réalisation de cette dernière. Trois mois semblent raisonnables.

Les résultats ainsi obtenus contrastent avec les précédents. Tout d'abord, la différence de performances sous la gauche et la droite devient très faible (la différence de rentabilité réelle tombe de 4,15 à 1,18 %). De plus, ces différences ne sont plus significatives selon un T-test (exception faite de celle mesurée sur la rentabilité réelle en moyenne géométrique). Enfin et surtout, le hasard a toutes les chances d'être la seule explication de la légère prime en faveur de la gauche. Sur les variations de cours, la différence en faveur de la gauche se retrouve dans 98,18 % des cas lors d'une allocation aléatoire. Dans la mesure la moins favorable au hasard (excess return mesuré en moyenne géométrique), ce dernier a encore 72,10 % de chance d'en être la seule cause.

On peut être certain que la faible prime restante en faveur de la gauche et qui peut facilement s'expliquer par le hasard, disparaitrait complètement après contrôle pour la situation macro-économique. Les actionnaires n'ont donc pas intérêt à voter à gauche. En revanche, le marché « vote » trois mois avant les nominations.

Table 6, Performance des actions françaises sous la gauche et la droite avec un décalage de trois mois. La rentabilité nominale des actions se compose du taux de dividende et des variations de cours. La rentabilité réelle est obtenue en « déduisant » le taux d'inflation. L'excess return en déduisant le taux court terme. G désigne les rentabilités sous la gauche, D sous la droite et G-D la différence. Le F-test est celui de l'hypothèse nulle qu'il n'y a pas de différence de variance. T-test (test de Student ou de Student-Cochrane) est celui de l'hypothèse nulle qu'il n'y a pas de différence de rentabilité moyenne. La ligne bootstrap désigne la probabilité en pourcentage que cette différence provienne d'un simple hasard.

	Variation de cours			Taux de dividende			Rentabilité Nominale		
	G	D	G-D	G	D	G-D	G	D	G-D
écart type	16.42	18.45	-2.03	4.57	5.79	-1.22	16.26	18.52	-2.26
F-test (p-value)			0.00			0.00			0.04
F-test (signification)			diff			diff			diff
Moyenne arithmétique	4.14	3.79	0.35	3.90	3.54	0.37	8.04	7.32	0.72
T-test (p-value)			68.24			14.97			40.03
T-test (signification)			égales			égales			égales
bootstrap			98.18			31.18			89.38
Moyenne géométrique	2.80	2.08	0.72				6.70	5.62	1.09
T-test (p-value)			40.39						0.00
T-test (signification)			égales						diff.
bootstrap			86.92						79.94
nb. observations	814	840		814	840		814	840	
				Taux d'inflation			Rentabilité Réelle		
				G	D	G-D	G	D	G-D
écart type				2.82	2.87	-0.05	16.36	18.55	-2.19
F-test (p-value)						0.77			0.00
F-test (signification)						égales			égales
Moyenne arithmétique				5.31	5.77	-0.46	2.79	1.61	1.18
T-test (p-value)						0.11			17.10
T-test (signification)						égales			égales
bootstrap						99.74			84.00
Moyenne géométrique							1.46	-0.08	1.54
T-test (p-value)									7.34
T-test (signification)									égales
bootstrap									78.94
nb. observations				814	840		814	840	
				Taux Court Terme			Excess Return		
				G	D	G-D	G	D	G-D
écart type				0.93	0.79	0.13	16.43	18.51	-2.08
F-test (p-value)						0.00			0.00
F-test (signification)						diff.			diff.
Moyenne arithmétique				4.30	4.50	-0.20	3.74	2.82	0.92
T-test (p-value)						0.00			28.37
T-test (signification)						diff.			égales
bootstrap						85.80			83.00
Moyenne géométrique							2.40	1.12	1.29
T-test (p-value)									13.46
T-test (signification)									égales
bootstrap									72.10
nb. observations				814	840		814	840	

V Conclusion

Le marché financier est sensible au facteur politique mais l'impact politique est complexe à appréhender. A court terme, la bourse salue tous les changements de gouvernement en progressant trois fois plus vite qu'en temps normal car ils mettent fin à une incertitude. Cette surperformance lors des changements de gouvernements apparaît particulièrement solide grâce au grand nombre d'observations et à la faible chance que le hasard en soit la cause.

Mais sur le long terme, la rentabilité des actions est nettement meilleure sous la gauche que sous la droite. Cette surperformance ne s'explique pas par un risque plus élevé et n'a qu'une chance limitée d'être le fruit du hasard. Elle n'est jamais anticipée constituant une agréable surprise renouvelée alors que la droite déçoit tout aussi régulièrement. Ce surprenant constat ne peut être aisément expliqué.

Au pire, le facteur politique joue effectivement dans le sens inverse de celui attendu. On pourrait alors en conclure que les actionnaires ont intérêt à voter socialiste et ceux qui veulent atténuer les inégalités provenant de l'épargne accumulée, devraient voter à droite. Toutefois, cette différence de rentabilité se réduit de 35 % lorsque l'on tient compte du contexte macro-économique qui est en général plus favorable sous la gauche.

Surtout, une partie de la différence provient du fait que les actions connaissent une meilleure performance dans les trois derniers mois d'un gouvernement de gauche en anticipant l'alternance et inversement les chiffres mesurés sous la droite souffrent des trois mois précédant l'arrivée de la gauche au pouvoir. Cette forte divergence dans les mois précédant les alternances, combinée avec la faible réaction observée lors des changements effectifs est cohérente avec l'idée d'un marché suffisamment efficient pour intégrer à l'avance les effets d'alternances qui sont toujours partiellement prévisibles.

Ainsi, en retenant une délimitation gauche-droite fonction de ce que le marché peut anticiper et non la délimitation gauche-droite respectant les changements effectifs, la différence en faveur de la gauche disparaît en grande partie. La simple chance a alors une forte probabilité d'expliquer cette surperformance. C'est donc en mobilisant la théorie de l'efficience pour tracer des délimitations gauche-droite décalées que la différence contre-intuitive de la surperformance sous la gauche disparaît.

Au mieux, il apparaît donc que la droite n'autorise pas de meilleures performances boursières. Du point de vue des entreprises, certaines bénéficient manifestement de choix politiques lorsqu'elles obtiennent contrat ou subvention mais globalement elles ne profitent pas de l'attention affichée par la droite. Ces constats impliquent qu'il est illusoire d'attendre d'un gouvernement *a priori* mieux disposé de plus grands succès économiques. Un gouvernement ne créé pas de richesse.

REFERENCES

Bialkowski J., Gottschalk K. and T. Wisniewski (2007), "Political Orientation of Government and Stock Market Returns", *MPRA Paper* No. 307.

Brown K.C., Harlow W.V. and S.M. Tinic (1988), "Risk Aversion, Uncertain Information and Market Efficiency", *Journal of Financial Economics*, 22, p. 355-385.

Campbell J., Lo A., and C. MacKinley (1997), *Econometrics of Financial Markets*, Princeton, Princeton University Press.

Chappell H. W. and W. R. Keech (1986), "Party Differences in Macroeconomic Policies and Outcomes", *American Economic Review*, 76, p. 71-74.

Hensel C.R. and W.T. Ziemba (1995), "United States Investment Returns during Democratic and Republican Administrations, 1928-1993", *Financial Analysts Journal*, 51, p. 61-69.

Fama E. (1991), "Efficient Capital Market: II", *Journal of Finance*, 46, p. 1575-1648.

Fama E. and F. Kenneth (1989), "Business Conditions and Expected Returns on Stocks and Bonds", *Journal of Financial Economics*, 25, p. 23-49.

Huang R.D. (1985), "Common Stock Returns and Presidential Elections", *Financial Analysts Journal*, March-April, 41, p. 58-61.

Johnson R.R., Chittenden W. and G. Jensen (1999), "Presidential Politics, Stocks, Bonds, Bills and Inflation", *Journal of Portfolio Management*, 26, p. 27-31.

Knight B. (2004), "Are Policy Platforms Capitalized into Equity Prices? Evidence from the Bush/Gore 2000 Presidential Election", *Working Paper,* NBER, No. 10333.

Lévy-Leboyer M. et F. Bourguignon (1985), *L'Economie Française au XIX*ème *siècle, analyse macro-économique*, Paris, Economica.

Le Bris D. (2009), « Les grands travaux du plan Freycinet : de la subvention à la Dépression ? », 14th Congress of Accounting and Management History and Academy of Accounting Historians, Sceaux.

Le Bris D. and P-C Hautcoeur (2010), "A Challenge to the Triumphant Optimist: A new Index for the Paris Stock-Exchange (1854-2007)", *Financial History Review*,27, p. 141-183.

Li J and Born J.A. (2006), "Presidential Election Uncertainty and Common Stock Returns in the United States", *Journal of Financial Research*, 29, p. 609-622.

Pantzalis C., Stangeland D.A. and H.J. Turtle (2000), "Political Elections and the Resolution of Uncertainty: the International Evidence", *Journal of Banking and Finance*, 24, p. 1575-1604.

Rosa J-J and D. Amson (1976), « Conditions économiques et élactions : une analyse politico-économétrique, 1920-1973 », *Revue Française de Sciences Politiques*, 26, p. 1101-11024.

Santa-Clara P and R. Valkanov (2003), "The Presidential Puzzle: Political Cycles and the Stock Market", *Journal of Finance*, 58, p. 1841-1872.

Malkiel B.G. (2003), *A Random Walk Down Wall Street*, New-York, Norton.

Riley W. and W. Luksetich (1980), "The Market Prefers Republicans: Myth or Reality." *Journal of Financial and Quantitative Analysis*, 15, p. 541-560.

Rémond R. (1954), *La Droite en France de 1815 à nos jours. Continuité et diversité d'une tradition politique*, Paris, Aubier-Montaigne.

Siegel J. (1994), *Stocks for the Long Run*, New-York, Irvine.

Annexe A, Formules utilisées

$$Taux\ de\ dividende = \frac{dividende}{P_t} \quad (1)$$

$$Variation\ de\ cours = \frac{P_{t+1} - P_t}{P_t} \quad (2)$$

$$Rentabilité\ Totale\ Nominale = \frac{dividende + P_t - P_t}{P_t} \quad (3)$$

$$Rentabilité\ totale\ réelle = \frac{(Rentabilité\ totale\ nominale + 1)}{(Taux\ d'inflation + 1)} - 1 \quad (4)$$

$$Excess\ Return = Rentabilité\ Totale\ Nominale - Rentabilité\ taux\ court\ terme \quad (5)$$

$$Sharpe = \frac{Rentabilité\ Totale\ Nominale - Rentabilité\ sans\ risque}{Ecart\ type\ des\ rentabilités\ totales\ nominales} \quad (6)$$

Annexe B, Régression de l'excess return par les variables macro-économiques avec une dummy pour la gauche puis pour la droite :

	Coefficients	*Erreur-type*	*Statistique t*	*Probabilité*
Gauche	0.00260062	0.002512203	1.03519327	30.07%
Constante	-0.0087783	0.003829828	-2.2920906	2.20%
D/P	4.15309835	1.170627994	3.54775246	0.04%
spread	-1.2242642	0.7286103	-1.6802729	9.31%
TSR relatif	-2.9506697	1.58845578	-1.8575712	6.34%
Inflation	0.2449327	0.158562511	1.54470748	12.26%
R^2	0.01159173			
R^2 ajusté	0.00859292			
Observations	1654			
Excess return ajusté		3.35%		

	Coefficients	*Erreur-type*	*Statistique t*	*Probabilité*
Droite	-0.002600616	0.0025122	-1.0351933	30.07%
Constante	-0.006177698	0.00404873	-1.5258377	12.72%
D/P	4.153098348	1.17062799	3.54775246	0.04%
spread	-1.224264163	0.7286103	-1.6802729	9.31%
TSR relatif	-2.950669705	1.58845578	-1.8575712	6.34%
Inflation	0.244932697	0.15856251	1.54470748	12.26%
R^2	0.011591731			
R^2 ajusté	0.008592919			
Observations	1654			
Excess return ajusté		0.23%		

Annexe C, Régression de l'excess return par les variables macro-économiques :

	Coefficients	*Erreur-type*	*Statistique t*	*Probabilité*
Constante	-0.0078333	0.00371953	-2.1060017	3.54%
D/P	4.34744307	1.15550096	3.76238809	0.02%
spread	-1.2992757	0.7250139	-1.7920701	7.33%
TSR relatif	-2.8832229	1.58715348	-1.8165999	6.95%
Inflation	0.25086931	0.15846221	1.58314912	11.36%
R^2	0.01094901			
R^2 ajusté	0.00854986			
Observations	1654			

Annexe D, Liste des chefs de gouvernement de leur parti et de leur appartenance gauche-droite

Début	Fin	Chef de gouvernement	Courant puis parti*	Gauche	Droite	Début	Fin	Chef de gouvernement	Courant puis parti*	Gauche	Droite
19/02/1871	24/05/1873	Jules-Armand Dufaure	Centre Gauche	■		29/07/1929	03/11/1929	Aristide Briand	Parti Républicain Socialiste	■	
24/05/1873	24/11/1873	Albert de Broglie	Centre Droit		■	03/11/1929	21/02/1930	André Tardieu	Alliance Démocratique		■
26/11/1873	18/05/1874	Albert de Broglie	Centre Droit		■	21/02/1930	02/03/1930	Camille Chautemps	Parti Radical	■	
22/05/1874	10/03/1875	Ernest Courtot de Cissey	Centre Droit		■	02/03/1930	13/12/1930	André Tardieu	Alliance Démocratique		■
10/03/1875	23/02/1876	Louis-Joseph Buffet	Centre Droit		■	13/12/1930	27/01/1931	Théodore Steeg	Parti Radical	■	
09/03/1876	12/12/1876	Jules-Armand Dufaure	Centre Gauche	■		27/01/1931	13/06/1931	Pierre Laval	non-inscrit		■
12/12/1876	17/05/1877	Jules Simon	Gauche Républicaine	■		13/06/1931	14/01/1932	Pierre Laval	non-inscrit		■
17/05/1877	23/11/1877	Albert de Broglie	Centre Droit		■	14/01/1932	20/02/1932	Pierre Laval	non-inscrit		■
23/11/1877	13/12/1877	G. de Grimaudet de Rochebouët			■	20/02/1932	10/05/1932	André Tardieu	Alliance Démocratique		■
13/12/1877	04/02/1879	Jules-Armand Dufaure	Centre Gauche	■		10/05/1932	03/06/1932	André Tardieu	Alliance Démocratique		■
04/02/1879	28/12/1879	William Henry Waddington	Centre Gauche	■		03/06/1932	17/12/1932	Édouard Herriot	Parti Radical	■	
28/12/1879	23/09/1880	Charles de Freycinet	Gauche Républicaine	■		17/12/1932	30/01/1933	Joseph Paul-Boncour	Parti Républicain Socialiste	■	
23/09/1880	14/11/1881	Jules Ferry	Gauche Républicaine	■		30/01/1933	24/10/1933	Édouard Daladier	Parti Radical	■	
14/11/1881	30/01/1882	Léon Gambetta	Union Républicaine	■		26/10/1933	25/11/1933	Albert Sarraut	Parti Radical	■	
30/01/1882	07/08/1882	Charles de Freycinet	Gauche Républicaine	■		25/11/1933	30/01/1934	Camille Chautemps	Parti Radical	■	
07/08/1882	29/01/1883	Charles Duclerc	Gauche Républicaine	■		30/01/1934	09/02/1934	Édouard Daladier	Parti Radical	■	
29/01/1883	21/02/1883	Armand Fallières	Union Démocratique	■		09/02/1934	08/11/1934	Gaston Doumergue	Parti Radical	■	
21/02/1883	06/04/1885	Jules Ferry	Union Démocratique	■		08/11/1934	01/06/1935	Pierre-Étienne Flandin	Alliance Démocratique		■
06/04/1885	07/01/1886	Henri Brisson	Gauche Radicale	■		07/06/1935	24/01/1936	Pierre Laval	non-inscrit		■
07/01/1886	11/12/1886	Charles de Freycinet	Gauche Républicaine	■		24/01/1936	04/06/1936	Albert Sarraut	Parti Radical	■	
11/12/1886	30/05/1887	René Goblet	Union des Gauches	■		04/06/1936	22/06/1937	Léon Blum	Section Française de l'Internationale Ouvrière	■	
30/05/1887	12/12/1887	Maurice Rouvier	Union des Gauches	■		22/06/1937	18/01/1938	Camille Chautemps	Parti Radical	■	
12/12/1887	03/04/1888	Pierre Tirard	Union des Gauches	■		18/01/1938	14/03/1938	Camille Chautemps	Parti Radical	■	
03/04/1888	22/02/1889	Charles Floquet	Gauche Radicale	■		14/03/1938	10/04/1938	Léon Blum	Section Française de l'Internationale Ouvrière	■	
22/02/1889	17/03/1890	Pierre Tirard	Gauche Républicaine	■		10/04/1938	11/05/1939	Édouard Daladier	Parti Radical	■	
17/03/1890	27/02/1892	Charles de Freycinet	Gauche Républicaine	■		11/05/1939	14/09/1939	Édouard Daladier	Parti Radical	■	
27/02/1892	06/12/1892	Émile Loubet	Gauche Républicaine	■		14/09/1939	21/03/1940	Édouard Daladier	Parti Radical	■	
06/12/1892	11/01/1893	Alexandre Ribot	Union des Gauches	■		21/03/1940	07/06/1940	Paul Reynaud	Alliance Démocratique		■
11/01/1893	04/04/1893	Alexandre Ribot	Union des Gauches	■		15/06/1940	12/07/1940	Philippe Pétain	-		■
04/04/1893	03/12/1893	Charles Dupuy	Rép. de Gouvernement		■	10/07/1940	13/12/1940	Pierre Laval			■
03/12/1893	30/05/1894	Jean Casimir-Perier	Rép. de Gouvernement		■	13/12/1940	09/02/1941	Pierre-Étienne Flandin			■
30/05/1894	01/07/1894	Charles Dupuy	Rép. de Gouvernement		■	09/02/1941	18/04/1942	François Darlan			■
01/07/1894	26/01/1895	Charles Dupuy	Rép. de Gouvernement		■	18/04/1942	19/08/1944	Pierre Laval			■
26/01/1895	01/11/1895	Alexandre Ribot	Rép. de Gouvernement		■	19/08/1944	26/01/1946	Charles de Gaulle	non-inscrit		■
01/11/1895	29/04/1896	Léon Bourgeois	Radical-Socialiste	■		26/01/1946	24/06/1946	Félix Gouin	Section Française de l'Internationale Ouvrière	■	
29/04/1896	28/06/1898	Jules Méline	Rép. de Gouvernement		■	24/06/1946	16/12/1946	Georges Bidault (par interim)	Mouvement Républicain Populaire		■
28/06/1898	01/11/1898	Henri Brisson	Gauche Démocratique	■		16/12/1946	22/01/1947	Léon Blum	Section Française de l'Internationale Ouvrière	■	
01/11/1898	18/02/1899	Charles Dupuy	Rép. Progressistes		■	22/01/1947	19/11/1947	Paul Ramadier	Section Française de l'Internationale Ouvrière	■	
18/02/1899	22/06/1899	Charles Dupuy	Rép. Progressistes		■	24/11/1947	19/07/1948	Robert Schuman	Mouvement Républicain Populaire		■
22/06/1899	07/06/1902	Pierre Waldeck-Rousseau	Union Républicaine		■	26/07/1948	27/08/1948	André Marie	Parti Radical	■	
07/06/1902	24/01/1905	Émile Combes	Parti Radical	■		11/09/1948	05/10/1949	Henri Queuille	Parti Radical	■	
24/01/1905	18/02/1906	Maurice Rouvier	Union Républicaine		■	28/10/1949	24/06/1950	Georges Bidault	Mouvement Républicain Populaire		■
18/02/1906	14/03/1906	Maurice Rouvier	Union Républicaine		■	12/07/1950	28/02/1951	René Pleven	Union Démocratique et Socialiste de la Résistance	■	
14/03/1906	25/10/1906	Ferdinand Sarrien	Parti Radical	■		10/03/1951	04/07/1951	Henri Queuille	Parti Radical	■	
25/10/1906	24/07/1909	Georges Clémenceau	Parti Radical	■		11/08/1951	07/01/1952	René Pleven	Union Démocratique et Socialiste de la Résistance	■	
24/07/1909	03/11/1910	Aristide Briand	Parti Républicain Socialiste	■		20/01/1952	28/02/1952	Edgar Faure	Parti Radical	■	
03/11/1910	02/03/1911	Aristide Briand	Parti Républicain Socialiste	■		08/03/1952	23/08/1952	Antoine Pinay	Centre National des Indépendants et Paysans		■
02/03/1911	27/06/1911	Ernest Monis	Parti Radical	■		08/01/1953	21/05/1953	René Mayer	Parti Radical	■	
27/06/1911	14/01/1912	Joseph Caillaux	Parti Radical	■		27/06/1953	12/06/1954	Joseph Laniel	Centre National des Indépendants et Paysans		■
14/01/1912	21/01/1913	Raymond Poincaré	Alliance Démocratique		■	18/06/1954	05/02/1955	Pierre Mendès France	Parti Radical	■	
21/01/1913	18/02/1913	Aristide Briand	Parti Républicain Socialiste	■		01/02/1955	01/12/1955	Edgar Faure	Parti Radical	■	
18/02/1913	22/03/1913	Aristide Briand	Parti Républicain Socialiste	■		01/12/1955	21/05/1957	Guy Mollet	Section Française de l'Internationale Ouvrière	■	
22/03/1913	09/12/1913	Louis Barthou	Alliance Démocratique		■	12/06/1957	30/09/1957	Maurice Bourgès-Maunoury	Parti Radical	■	
09/12/1913	09/06/1914	Gaston Doumergue	Parti Radical	■		06/11/1957	15/04/1958	Félix Gaillard	Parti Radical	■	
13/06/1914	26/08/1914	René Viviani	Parti Républicain Socialiste	■		13/05/1958	28/05/1958	Pierre Pflimlin	Mouvement Républicain Populaire		■
26/08/1914	29/10/1915	René Viviani	Parti Républicain Socialiste	■		01/06/1958	08/01/1959	Charles de Gaulle	Gaulliste		■
29/10/1915	12/12/1916	Aristide Briand	non-inscrit		■	08/01/1959	14/04/1962	Michel Debré	Union pour la Nouvelle République		■
12/12/1916	20/03/1917	Aristide Briand	non-inscrit		■	14/04/1962	10/07/1968	Georges Pompidou	Union pour la Nouvelle République		■
20/03/1917	12/09/1917	Alexandre Ribot	Union Républicaine		■	10/07/1968	16/06/1969	Maurice Couve de Murville	Union pour la Défense de la République		■
12/09/1917	16/11/1917	Paul Painlevé	Parti Républicain Socialiste	■		20/06/1969	05/07/1972	Jacques Chaban-Delmas	Union pour la Défense de la République		■
16/11/1917	20/01/1920	Georges Clemenceau	Parti Radical	■		07/07/1972	27/05/1974	Pierre Messmer	Union des Démocrates pour la République		■
20/01/1920	18/02/1920	Alexandre Millerand	Ligue Républicaine Nationale		■	28/05/1974	25/08/1976	Jacques Chirac	Union des Démocrates pour la République		■
18/02/1920	24/09/1920	Alexandre Millerand	Ligue Républicaine Nationale		■	27/08/1976	13/05/1981	Raymond Barre	non-inscrit		■
24/09/1920	16/01/1921	Georges Leygues	Alliance Démocratique		■	22/05/1981	19/07/1984	Pierre Mauroy	Parti Socialiste	■	
16/01/1921	15/01/1922	Aristide Briand	Parti Républicain Socialiste	■		23/07/1984	20/03/1986	Laurent Fabius	Parti Socialiste	■	
15/01/1922	29/03/1924	Raymond Poincaré	Alliance Démocratique		■	20/03/1986	30/04/1988	Jacques Chirac	Rassemblement pour la République		■
29/03/1924	09/06/1924	Raymond Poincaré	Alliance Démocratique		■	22/05/1988	15/05/1991	Michel Rocard	Parti Socialiste	■	
14/06/1924	17/04/1925	Édouard Herriot	Parti Radical	■		15/05/1991	31/03/1992	Édith Cresson	Parti Socialiste	■	
17/04/1925	29/10/1925	Paul Painlevé	Parti Républicain Socialiste	■		02/04/1992	28/03/1993	Pierre Bérégovoy	Parti Socialiste	■	
29/10/1925	28/11/1925	Paul Painlevé	Parti Républicain Socialiste	■		29/03/1993	16/05/1995	Édouard Balladur	Rassemblement pour la République		■
28/11/1925	09/03/1926	Aristide Briand	Parti Républicain Socialiste	■		16/05/1995	02/06/1997	Alain Juppé	Rassemblement pour la République		■
09/03/1926	23/06/1926	Aristide Briand	Parti Républicain Socialiste	■		02/06/1997	06/05/2002	Lionel Jospin	Parti Socialiste	■	
23/06/1926	19/07/1926	Aristide Briand	Parti Républicain Socialiste	■		06/05/2002	31/05/2005	Jean-Pierre Raffarin	Union pour un Mouvement Populaire		■
23/07/1926	11/11/1928	Raymond Poincaré	Alliance Démocratique		■	02/06/2005	15/05/2007	Dominique de Villepin	Union pour un Mouvement Populaire		■
11/11/1928	29/07/1929	Raymond Poincaré	Alliance Démocratique		■	15/05/2007		François Fillon	Union pour un Mouvement Populaire		■

*courant avant 1902 selon Laurent de Boissieu

Chapitre 5, Identifier les krachs : quelles sont les causes ? « What is a Market Crash? »[95]

Abstract: Identifying market crashes can be problematic. In a stable financial environment, the same price variation in percentage will result in greater negative impact than during a highly volatile period. In order to take into account changes of volatility throughout time, a new method is proposed, one which allows to adjust each price variation to accurately reflect its financial environment. This adjustment is made by measuring each price variation in number of standard-deviations calculated over the prior period. These adjusted variations can then be ranked therefore permitting the identification of market crashes. This method is tested on four long-termseries. Results on the French market, for example, are highly consistent with history. WWI caused major stock adjusted variations despite a low level of volatility and low price variations in percentage. Contemporary markets however are characterized more by a high level of volatility than a time of frequent crashes.

Keywords: Market crashes, volatility, rare events, 19th century, 20th century**.**

JEL classification: G1, G12, N23, N24.

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October 2008 is a perfect example of stock price adjustments sometimes remaining strong (see White (1996) for a survey of crashes). Mai 2010 provides a similar illustration on bonds prices. Extreme events are essential to the final performance of any asset in any given period. Whilst at first it may appear that extreme events are rare anomalies without any economic importance, they are in fact crucial to the final performance.[96] Whilst it is recognized that extreme events, both positive and negative, have a crucial impact on the final performance of stock investments, only negative extreme events, or crashes, are studied in this paper as they negatively influence the stock holder wealth.

Kindleberger (1978) studies historical examples of market panic but few statistical measures are available to identify market crashes. Patel and Sarkar (1998) confirm that the literature is surprisingly poor. Barro and Ursua (2009) use a decrease of more than 25 % as a criterion, over a period of time, ranging from one day to several years. Sornette (2003) deals with "drawdowns" or "runs" which measure downturns by cumulating consecutive days of negative variations. Mishkin and White (2002) define a crash as a fall of 20 %, as it was the level reached in both 1929 and 1987. They then look for a decrease of this level during different periods: 1 day, 2 days, 5 days, 1 month, 1 quarter and 1 year. Arbulu and Gallais-Hamonno (2002) identify extreme monthly changes by the number of standard deviation between 1802 and 2000 on Arbulu-SGF-INSEE series of the French market. Patel and Sarkar (1998) define a variable named *CMAX* which measures the price according to maximum fall on the prior *j* period: $CMAX_t = P_t/max\left[P\epsilon(x_{t-j}|j = 0,1, \dots t)\right]$. The *j* period can vary from a few days to several years. This tool measures the worst performance during a specific period of time. Extreme events are identified when the *CMAX* is outside this average by a certain threshold; two standard-deviation for example. Illing and Liu (2003) state that the *CMAX* is an hybrid measure of volatility and loss. Boucher (2004) uses this tool and a decrease of 20 % on different windows to identify market crisis in several countries. Das *et al.* (2005) or Coudert and Gex (2006) use the *CMAX* to study market crisis globally.

This paper focus on market crashes, defined as a sudden adjustment: a violent and quick decrease. Market crisis or in other words, slow decreases, are not explored. Monthly data lends to use a variation on one month to identify crashes and daily data to look for a daily fall. The innovation here is to propose a new tool in understanding market crashes, with the unique capacity to adjust each monthly price variation relative to its financial context. A fall

[96] See Appendix A for a measure of the impact of extreme events on final performance of stock markets.

has a stronger impact on a stable market than on a highly volatile one and therefore a crash is not a certain percentage decrease during a specific period but represents an important discrepancy compared with what was previously observed. This tool can partially explain the puzzle of big news without big moves and big moves without big news point out by Cutler, Poterba and Summers (1989) or Siegel (1994).

The new method of adjustment for the prior volatility is presented in (I) before the data used (II). The instability of the volatility for several assets is measured in (III). The quality of this method is demonstrated by its originality and the historical consistency of the crashes identified whereas a "classical analysis" of market crashes identifies extreme events without apparent shocks to the market but is unable to take into account historically known shocks (IV). Statistical characteristics of the series are measured in (V) before some robustness checks in (VI). The last section concludes.

I A new method to identify crashes: price variations adjusted for the prior volatility

An extreme variation of a same percentage leads to different consequences depending on the context. In a highly volatile market, a fall of x % has more limited repercussions than on a market used to great stability. For example, the French stock index, CAC 40, falls by 16 % in August 2002 without any real impact. However a similar decrease in January 1882 leads to several failures of French brokers. The consequences of one similar fall are totally different because stock prices are clearly less volatile at the end of 19^{th} century. This is illustrates by a standard-deviation inferior to 10 % whereas, during the recent years, it is approximately 20 %. Today investors are used to deal with large variations whereas this was not the case in 1882.

The shock constituted by a large fall should be measured relatively. The strength of the fall can be measured only within the context of volatility. Therefore, the crash should not be defined by an absolute level of variation but by the gap compared to the prior period. Thus, a variation adjusted for the volatility is calculated. Each monthly price change (Δ_t) is "contextualized" by calculating an *adjusted* Δ_t named Δ_t^a. This Δ_t^a, takes into account the financial context by characterizing the pure variation (Δ_t) by its deviation from the standard deviation observed during the prior period.

This adjustment can also be justified from the point of view of the investor. The magnitude of the loss on his initial wealth depends not only on the price change in terms of percentage but also on the leverage used to invest. Investors adjust their leverage strategies in function to the prior volatility. If investors have a constant risk aversion, the leverage should be higher on a stable market than on an unstable one. Thanks to the leverage, investors support a constant risk level despite the instability of the market volatility. They should adjust their strategies taking into account the volatility of the prior period. Today, most market strategies are controlled by the ValueAtRisk. This tool is directly function of the volatility, thus operators are obliged to adjust their positions correspondingly. Previously, investors could also use leverage. For example in the French market, the stability prior to the crash of 1882 allowed investors to build a large leverage (see White 2007 or Flandreau and Sicsic, 2003).

Formally, to identify market crashes, we needed to identify the most important loss on the initial wealth of one investor. The profit or loss of an investor is calculated by the change in price minus the initial return anticipation, which corresponds to an opportunity cost because he would have been able to obtain remuneration by investing his wealth in other assets. This total percentage cost should be multiplied by the leverage to measure the impact of the event on the initial wealth. This adjustment authorized to identify crash by measuring the worst global loss taking account both for change in price and the leverage of this time.

We have :

$$Global\ Loss = \Delta_t^a = (\Delta_t - E_t) * \ell \qquad (1)$$

with

- Δ_t, the price change, $\Delta_t = \frac{P_t}{P_{t-1}} - 1$
- Δ_t^a, the price change adjusted for the prior volatility
- l, the leverage
- E_t, the return anticipation evaluated by the average return observed on the prior period T, thus $E_t = \mu_{t-1,\, t-T}$

Accepting the hypothesis that the level of risk the investor looks for, *R*, is constant through time[97] and that the investor bases his expectation of volatility on the previous periods. Thus, the investor chooses a leverage relative to the level of anticipated risk leading to a level of risk, *R*, conform to what he looks for.

$$R = \ell * \sigma_{t-1,t-T} \tag{2}$$

with $\sigma_{t-1,t-T}$, the standard deviation measured on the prior period *T*

thus

$$\ell = \frac{R}{\sigma_{t-1,t-T}} \tag{3}$$

Combining Equations (1) and (3), we obtain:

$$\Delta_t^a = \left(\Delta_t - \mu_{t-1,t-T}\right) * \frac{R}{\sigma_{t-1,t-T}} \tag{4}$$

Since, the hypothesis of a stable risk aversion through time is accepted, we can simplify by using a constant value *R* of 1. Thus:

$$\Delta_t^a = \frac{(\Delta_t - \mu_{t-1,t-T})}{\sigma_{t-1,t-T}} \tag{5}$$

Equation (5) is a standardization of price variations (a *z* value). A standardization is a transformation leading to a standard score. This allows a direct comparison of variables with different averages and standard deviations. The first step is to center by minus the average, as consequence the transformed variable will be equal to 0 in average. The second step is to reduce, by dividing by the standard deviation, as a consequence the standard deviation of the transformed variable will be 1. Unit of measurement of the transformed variable is thus the standard deviation.

To take into account the instability, each monthly price variation is adjusted according to Equation (5). It is a "rolling standardization" of each monthly price variation. In practical

[97] This assumption of a constant risk aversion is not inconsistent with changes observed on stock market prices through changes in discount rate (Pindyck, 1988).

terms, the average price variation over the prior period T is deduced from the price variation observed each month (Δ_t). This deviation from the average is divided by the standard deviation observed over the same period T to obtain the adjusted series (Δ_t^a) measured in terms of number of standard deviations over the prior period.[98] As a result of the rolling aspect of this "standardization", the average of the adjusted series (Δ_t^a) is not exactly equal to 0; price variations (Δ_t) are not minus by the average of the whole period but only by the average measured on the prior T period. For a similar reason, the standard deviation of the adjusted series (Δ_t^a) is not exactly equal to 1.

Over which period of time should be measured the financial context prior one variation of price? Theoretically, this period should be the one used by investors to anticipate volatility. This period used to build anticipations of volatility is probably unstable through time. In order to simplify this, we assume a stable period T. For all the price variations used below, an adjusted series (Δ_t^a) is calculated following Equation (5) for a value of T between one and twenty years for monthly data and between 12 and 5,000 (35 values of T used) days for daily data. Standard deviations of these adjusted series are calculated. We look for a period T which provides the more stable adjusted series; meaning the value of T leading to the smallest standard deviation of the adjusted series (Δ_t^a). This period of T leading to the smallest standard deviation of the adjusted series is then retained to measure adjusted price variations.

II Data

Extreme events are exceptional and as this phenomenon is rare, long-term data becomes necessary in order to study market crashes. This method of market crashes identification is applied on four series (see details in Appendix B). The choice of these series is driven by the availability of high quality data. The longer one is the monthly UK state bond rate since 1754. The rate is first observed on the Consol (a perpetual state bond) and then on long-term UK bonds. They come from six series compiled by Richard Sylla between 1754 and 1998 and updated to December 2008. The second one is monthly US stock prices combining the "Old NYSE" from Goetzmann, Ibbotson and Peng (2001) between 1815 and December 1925 and S&P from Shiller's database covering January 1926-December 2008. A

[98] The weakness of this method is that a second exceptional variation over the period T after one first crash can not be detected since the level of the rolling standard deviation rises quickly after the first crash.

third one is the daily stock prices coming from the Dow Jones between 25 May 1898 and 27 April 2009. Whilst the Dow Jones is an inaccurate index for measuring long-term stock performances since it is weighted by stock prices. It can be useful in the analysis of extreme events. Additionally it is the single source of daily data over an extensive period of time. About 27,770 daily price variations are used.

The last series is a monthly French stock index between January 1854 and December 2008 combining two different series. Prices cited post 1988 are those from the current French stock index, the CAC 40, which was launched in January 1988 just after the crash of October 1987. Prior to that, between 1854 and 1987, prices used are from a rebuilding of an index based on the design of the current CAC 40 (Le Bris and Hautcoeur, 2010 or chapter 1). The components of this historical CAC 40 are selected at the beginning of each year by the first 40 market capitalizations among all firms listed in Paris. Prices of these 40 firms are collected the first Wednesday of each month. Monthly price variation of the index is the average of these firms weighted by market capitalization. In January of the following year, components of the index change. If we apply this method to the decade between 1988 and 1997, and compare its results with those of the NYSE-Euronext index, it can be seen that they are statistically similar. In addition, the use of 40 firms allows an accurate image of the market given the high concentration of capitalizations. In recent years, the CAC 40 represents about 70 % of all French market capitalization. In the middle of the 19th century, this level was 90 %.

III The instability of the volatility through time

The large changes observed on the volatility of several markets legitimate to use the method proposed in (I) to adjust for the prior volatility. The volatility is not stable through time. Shiller (1981) shows that in the US, the unpredictability of stock prices is higher than what is implied by the instability of the dividends. Schwert (1989) details the US volatility since 1857. Schwert (1997) explains that "volatility measured using the standard deviation of rates of return has been stable since the mid-19th century in the United States. The major exception is the Great Depression period from 1929-39." He shows that leverage is not enough to explain changes observed, particularly the high levels reached during the Great

Depression of the 1930s. Voth (2003) tests and confirms the hypothesis of Schwert-Merton, stating that political uncertainty during the interwar period explains the exceptional market instability. Others, such as Odean (1999) agree that economic factors cannot exclusively explain market volatility, despite the fact that it clearly rises during economic recession (Schwert, 1989). Compared to other markets, US stock volatility appears very stable.

In France, stock market instability[99] is different from the US one. Contrary to the US, a high volatility regime starts with the First World War. A rapid rise in instability is experienced by comparable companies listed both before and after the war (at the opposite, components of French market is affected by nationalizations after WWII). French stocks volatility is three times higher after the war. This structural break is clear and is perhaps a consequence of the end of the monetary stability (the value of the franc in gold had been constant since 1802). A similar rise is observed on the volatility of UK bonds. The French volatility peaks in 1946-1949 and not during the interwar period. This may be explained through political factors such as a process of nationalization implemented in 1944-1946, revolutionary riots of 1947 and the ascent of the Parti Communiste Français as the first party (one third of votes at the election of November 1946). The risk decreases between 1949 and 1971 but then rises again after 1973. The 1980s appear to be historically volatile.[100]

For UK bonds, their volatility is also unstable through time. The US and French revolutions cause a strong increase of the volatilities at the end of the 18th century whereas a continuous decrease is observed along the 19th century. WWI and WWI lead to two maximums without any important decrease during the interwar period. As for French stocks, despite peace and economic stability, the volatility of UK bonds never reach again its pre-1914 level. An historical maximum is observed at the beginning of the 1980s and the current level remains historically high.

[99] Given the sensitivity of the standard deviation to one observation far from the average, extreme events have a clear impact. For example, on the French stocks, the strong prices decrease of January 1882 or May 1981 cause an increase in the standard deviation during the ten years of the rolling window. These ten years appear clearly as a brutal increase and decrease of the standard deviation.

[100] This picture is similar in Belgium where a high quality stock index exists (Annaert, and Van Hyfte, 2006).

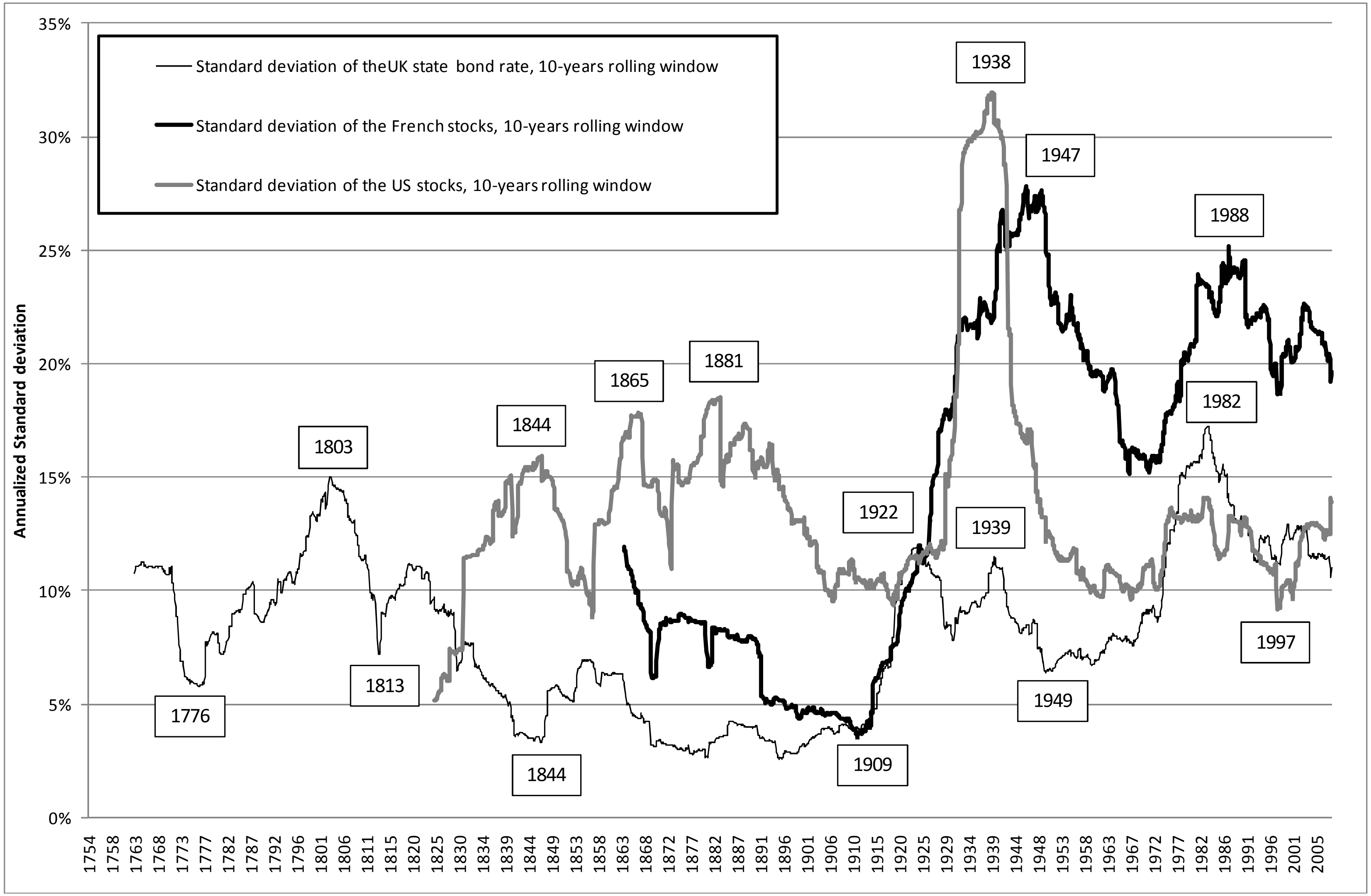


Figure 1, The volatility of assets is unstable through time. Standard deviation is measured on monthly price variations on a ten year rolling window and annualized. The standard deviation is clearly unstable with one peak occurring during the Great Depression for US stocks, in 1949 for French stocks and at the beginning of the 1980s for UK bonds. The long-term relative stability (except the 1930s) of the US stocks is not verified on other assets. See Appendix B for data.

IV Results: Originality and historical consistency of the crashes identified

4.1 French monthly stocks prices, 1854-2008

The more classical way of measuring crashes is to observe the worst variation outside of a certain threshold. As we saw in the introduction, only slight disagreements amongst authors occur pertaining to the magnitude and the time period used to identify a stock crash. Using the simplest way, classical crashes are measured by the 20 worst monthly variations. They appear on the first part of the table 1. Using this measure, the crash of October 2008 is about 15 %. At the worst moment (as with the *CMAX* measure on one month), the 27th of October, the fall was approximately 25 %.

The worst month in French history is that of May 1981 with the election of the socialist president, François Mitterrand. The end of campaign proved very uncertain and the agenda, common to socialist and communist parties, was clearly opposed to the stock market. However, two months later, Italy suffered a crash with the United Kingdom following four months after that. In July of the following year Japan also experienced a crash (Patel and Sarkar, 1998). France did not suffer a crash in 1929. The price hit its peak in February 1929 and decreased very slowly thereafter (only –14 % by the end of the year). This contrasts starkly with –34 % observed on the S&P between October and November 1929. The lowest point of this drop in France is reached in August 1936 with –71 % in nominal terms.

We observe that some of the worst months occur in the absence of any big news event while some of the biggest news events don't appear to move the market. Cutler *et al.* (1989) or Siegel (1994) point out this puzzle on the US market. The fact that only one crash is noted before WW1 is atypical. The French defeat against Prussia in 1870 does not appear in the top 20 monthly falls despite the fact that it was brutal, unexpected and very expensive. The loss of the Alsace-Lorraine and a tribute for 5 billion Francs (20 % of the GDP, Occhino *et al.*, 2007) collected on the bond market attest to the shock. The absence of the First World War is also surprising given that this conflict constituted the major financial shock of the 20th century. In contrast, many of the classical crashes identified in recent years does not appear actually as dramatic financial events as July and September 2002 or May 1986. This paradox of big news without big moves and big moves without big news can be explained because a “classical” analysis only identifies crashes during period of high volatility.

Table 1, "Classical" and new crashes identified on the monthly French stock index. January 1854-December 2008. This table shows the simplest classical identification of stock crashes: worst monthly price variations in percentage. Only two cases are observed before the First World War. This war, or the French defeat against Prussia in 1870, seems not to have caused major stock adjustments. Worst months not identified as a crash by the new method are in bold. Crashes identified after adjustment for volatility are different from classical crashes since they can be identified despite a low variation in absolute terms. Prior volatility is also presented. For example, the major crash is January 1882 with only a fall of 14.40 % compared to the classical record of -32.79 % in May 1981. But this decrease of 14.40 % occurs during a period with a standard deviation of 2.60 %. Thus, it is 7.5 standard deviation versus "only" 5.19 in May 1981. New months identified as crashes are in bold.

	Classical crashes		Crashes after adjustment for volatility			
Crash rank	Date	Change	Date	Change	Prior standard dev.	Adjusted change
1	May 1981	-32.79%	January 1882	-14.40%	2.60%	-7.50
2	October 1987	-25.00%	**July 1914**	**-7.14%**	**1.42%**	**-6.09**
3	May 1955	-21.40%	**December 1914**	**-8.39%**	**1.70%**	**-5.78**
4	May 1986	-18.56%	May 1981	-32.79%	7.27%	-5.19
5	September 1998	-17.66%	**September 1870**	**-10.43%**	**2.33%**	**-4.97**
6	**May 1940**	**-16.12%**	**July 1870**	**-7.84%**	**2.00%**	**-4.26**
7	**July 2002**	**-15.99%**	**March1924**	**-12.82%**	**3.53%**	**-4.12**
8	November 1926	-15.22%	May 1955	-21.40%	6.06%	-4.05
9	October 2008	-14.99%	October 1987	-25.00%	7.44%	-3.83
10	**September 2002**	**-14.81%**	November 1926	-15.22%	4.71%	-3.63
11	**September 1931**	**-14.76%**	April 1859	-13.81%	3.92%	-3.58
12	**January 1947**	**-14.53%**	September 1998	-17.66%	5.69%	-3.49
13	January 1882	-14.40%	**March 1867**	**-5.27%**	**1.82%**	**-3.14**
14	November 1973	-14.31%	May 1986	-18.56%	6.86%	-3.09
15	**November 1948**	**-14.20%**	**June 1900**	**-3.75%**	**1.34%**	**-3.09**
16	November 2008	-13.87%	November 1973	-14.31%	5.06%	-3.03
17	May 1859	-13.81%	**October 1912**	**-2.70%**	**0.99%**	**-2.94**
18	**November 1944**	**-13.57%**	October 2008	-14.99%	5.35%	-2.93
19	**August 1990**	**-13.39%**	**December 1892**	**-4.06%**	**1.51%**	**-2.86**
20	**June 1974**	**-13.27%**	**May 1920**	**-7.75%**	**2.95%**	**-2.81**

The adjustment is realized using a *T* period of seven years to measure the prior volatility since this window provides the most stable adjusted series (lower standard deviation, see a test on Figure 3). Stock market crashes identified after adjustment for the prior volatility are more historically consistent. Whilst pre-1914 is defined by numerous crashes, recent decades reflect more a high volatile period than a time of frequent crashes. Most importantly, major shocks constituted by the wars appear clearly whereas they were absent in the "classical" analysis. The First World War causes two crashes in the top three and the Franco-Prussian war of 1870 two others in the top ten.[101] Strong absolute decreases of

[101] The French « débâcle » of May 1940 is only ranked 31. It is not a surprise since the stock prices not suffered from this conflict in nominal terms. Between the declaration of war and January 1943 stocks prices are multiplied five times. This rise comes from a massive monetary creation to finance the war and the German occupation. Frontiers are closed and most of the prices are not free. Therefore, it is a boom for all "real assets"

May 1986, September 1998, July and September 2002 and October 2008 disappear from the top ten because they occur during period of high volatility. Conversely, July and December 1914, September and July 1870, November 1926 and March 1924 are identified as major crashes despite a weak fall in absolute terms. October 2008 is only at the 18th position but November 2008 is another bad month at the 30th rank. One measure of crashes over two months should probably give more importance to the crash of October-November 2008.

Since the French history, is not always well-known, the top ten crashes are detailed below:

1) January 1882: The *Banque de l'Union Générale*, sixth market capitalization failed. It is the only case of brutal failure in the top ten market capitalization over 155 years. It is the beginning of a long-term decrease in stock prices. Stock prices will wait 44 years in order to touch again (in nominal terms) the level reach just before this crash. A long economic depression starts also around this crash and finished only at the end of the century.

2) July 1914: Austria-Hungria declares war to Serbia the 28th July; the next day Russia declares war against Vienna. The mechanism of the alliances snaps it. The worst European conflict starts.

3) December 1914: Stock prices react to the chess of the counter-offensives of the Allied. It is the end of the movement war. The front line is stabilized and all belligerents digging trenches since December 1914. A long war can now be anticipated (Miquel, 1983).

4) May 1981: Uncertain election of François Mitterrand with an agenda hostile to the quoted firms.

5) September 1870: The 2th September, Napoleon III and 100,000 French soldiers are captured by the Prussian. A Parisian revolution proclaims a national defense government. This crash is notable because it occurs just after one in July 1870 (the declaration of war) and thus, a rise in the rolling standard deviation.

6) July 1870: The 19th July France declares war against Prussia.

7) March 1924: The French franc is attacked but the government succeeds to escape a devaluation thanks to a loan from JP Morgan which imposes structural reforms. Many

with free prices (stocks, real estate, art, carpets…). For the rise of the price of art in Parisian auctions, you can see Oosterlinck (2009).

operators support important losses. Interest rates start a strong rise and French firms have to support an artificially high currency rate.

8) May 1955: Different political events are not favorable like the denunciation by the USSR of the Franco-Soviet assistance pact (signed in Moscow in December 1944), the integration of the RFA in NATO, the signature of the Warsaw Pact the 14th. But they seem to be predictable, and thus, are, at least partially, integrated into the stocks prices. Maybe financial reasons have a part in the explanation because for the twelve prior months, the HCAC 40 had progressed by 220 % thanks to the discovery of oil in South-West of France.

9) October 1987: The October 19th, in New-York , the Dow Jones falls by 22.6 % involving all markets places in the world.

10) November 1926: Monetary problems. Radicaux party leaves the government of R. Poincaré.

4.2 US monthly stocks prices, 1815-2008

Given the more homogeneous nature of the US volatility, adjustment for the prior volatility causes only a slight difference in crashes identified. The adjustment is realized using a financial context (*T*) of 13 years since this period provides the most stable adjusted variations. November 1929 is the worst crash in adjusted terms with a fall of 7.64 standard deviations to the prior period.[102]

The following table show the twenty worst crashes in terms of the maximum monthly fall in prices and the twenty adjusted crashes. Only nine absolute price variations disappear since they occur during periods of high volatility (January 1931, September 1931, September 1946, October 1937, May 1880, September 1937, April 1828, October 1932 and May 1940). On the other hand, by taking into consideration the adjusted price variation, despite their low absolute level, nine “new” crashes are identified. They are consistent with the well-known US history and are quickly detailed below:

1) June 1962: The Cuban Missile Crisis.

[102] This maximum is very close to what is observed on other monthly data. In France the worst crash is January 1882 with a level very close to 7.50 standard deviations. On UK bonds, it is November 1792 with an adjusted rise in bond rates of 6.85 prior standard deviations. October 2008 is historically the third sharpest fall.

2) May 1970: Protests against the Vietnam war (invasion of Cambodia) after the Kent States shootings?

3) September 2001: World Trade Center attacks.

4) April 1861: The American Civil War begins at Fort Sumter.

5) October 1987: Crash of 19th October.

6) July 1974: Watergate.

7) November 1987: follow the crash of the 19th October.

8) January 1910: US War in Nicaragua.

9) July 2002: accountancy scandals?

Table 2, Classical and new crashes identified on the monthly US stock index. January 1815-December 2008. This table shows the simplest classical identification of stock crashes: worst monthly price variations in percentage. Three of them took place during the 1930s without any big news. Worst months not identified as a crash by the new method are in bold. Crashes identified after adjustment for volatility are different from classical crashes since they can be identified despite a low variation in absolute terms. Prior volatility is also presented. New months identified as crashes are in bold.

	Classical crashes		Crashes after adjustment for volatility			
Crash rank	Date	Change	Date	Change	Prior standard dev.	Adjusted change
1	february 1818	-31.33%	november 1929	-26.47%	4.16%	-7.64
2	november 1929	-26.47%	february 1818	-31.33%	5.00%	-6.27
3	april 1932	-23.97%	october 2008	-20.39%	3.96%	-5.84
4	october 2008	-20.39%	september 1857	-16.24%	3.31%	-5.38
5	september 1873	-20.17%	september 1873	-20.17%	4.31%	-5.18
6	december 1931	-18.77%	april 1932	-23.97%	5.50%	-4.68
7	**january 1831**	**-18.19%**	march 1837	-15.86%	3.60%	-4.66
8	october 1873	-17.84%	**june 1962**	**-11.68%**	**3.07%**	**-4.30**
9	september 1857	-16.24%	october 1873	-17.84%	4.54%	-4.22
10	march 1837	-15.86%	october 1857	-13.80%	3.48%	-4.17
11	**september 1931**	**-14.89%**	**may 1970**	**-11.51%**	**3.07%**	**-4.08**
12	september 1839	-14.89%	**september 2001**	**-11.36%**	**3.23%**	**-4.03**
13	**september 1946**	**-14.75%**	september 1839	-14.89%	3.95%	-3.92
14	**october 1937**	**-14.54%**	december 1931	-18.77%	5.15%	-3.87
15	**may 1880**	**-14.38%**	**april 1861**	**-13.39%**	**3.69%**	**-3.80**
16	**september 1937**	**-14.16%**	**november 1987**	**-12.08%**	**3.67%**	**-3.74**
17	**april 1828**	**-13.88%**	**july 1974**	**-11.67%**	**3.36%**	**-3.70**
18	**october 1932**	**-13.80%**	**october 1987**	**-12.56%**	**3.82%**	**-3.69**
19	october 1857	-13.80%	**january 1910**	**-10.28%**	**3.12%**	**-3.64**
20	**may 1940**	**-13.77%**	**july 2002**	**-10.89%**	**3.44%**	**-3.52**

4.3 US daily stocks prices, 1898-2008

It is interesting to test if this method provides consistent results on stock data with a higher frequency. For this purpose, we use the prices of the Dow Jones. Schwert (1997) present the 25 largest daily decreases. Table 3 updates this work and shows the rank of recent bad market days (15 and 9 October 2008). The test of the most stable period of financial contextualization (measure of T) leads to adjusting daily stock prices on 2,500 open days (about 7 years). The worst day in prices changes (19 October 1987) is the same in adjusted terms. This day represent a fall of 24.56 standard deviations. It is far from what is observed on monthly variations (-7.64 for November 1929 on the US market).

Focusing on the twenty greatest crashes, this adjustment excludes six crashes despite their high absolute variation. All of them, except December 1st, 2008, occur during the highly volatile period of the 1930s: 12 August 1932, 04 January 1932, 21 July 1933, 18 October 1937 and 5 October 1932 The six “new crashes” detected are detailed below:

1) 6 September 1955: President Eisenhower suffers heart attack and is replaced by Nixon.

2) 28 May 1962: The Anadyr operation, Soviet missiles are deployed in Cuba.

3) 31 August 1998: Asian crisis.

4) 17 September 2001: World Trade Center, Dow Jones first price since the attack.

5) 30 July 1914: Russia orders general mobilization before German declaration of war against Russia. General mobilization in France on August 1st. US stock markets were closed from July 31 to December, 12, 1914.

6) 29 September 2008: Rejection of the Emergency Economic Stabilization Act of 2008.

Table 3, Classical and new crashes identified on the daily US stock index. May 1898-April 2009. This table shows the simplest classical identification of stock crashes: worst daily price variations in percentage. Five of them took place during the 1930s without any big news and are excluded using the new method. Worst months not identified as a crash by the new method are in bold. Crashes identified after adjustment for volatility are different from classical crashes since they can be identified despite a low variation in absolute terms. Prior volatility is also presented. New months identified as crashes are in bold.

	Classical crashes		Crashes after adjustment for volatility			
Crash rank	Date	Change	Date	Change	Prior standard dev.	Adjusted change
1	19-oct-87	-22.61%	19-oct-87	-22.61%	1.03%	-24.56
2	14-Dec-1914	-20.53%	14-Dec-1914	-20.53%	1.07%	-20.81
3	28-oct-29	-13.47%	28-oct-29	-13.47%	1.09%	-12.75
4	18-Dec-1899	-11.99%	29-oct-29	-11.73%	1.12%	-10.76
5	29-oct-29	-11.73%	18-Dec-1899	-11.99%	1.21%	-9.89
6	05-oct-31	-10.73%	**26-sept-55**	**-6.54%**	**0.74%**	**-9.04**
7	06-nov-29	-9.92%	**28-May-1962**	**-5.71%**	**0.66%**	**-8.82**
8	**12-Aug-1932**	**-8.40%**	27-oct-97	-7.18%	0.85%	-8.61
9	14-mars-07	-8.29%	06-nov-29	-9.92%	1.17%	-8.60
10	**04-janv-32**	**-8.10%**	**31-Aug-1998**	**-6.37%**	**0.85%**	**-7.68**
11	26-oct-87	-8.04%	26-oct-87	-8.04%	1.07%	-7.65
12	15-oct-08	-7.87%	05-oct-31	-10.73%	1.43%	-7.62
13	16-juin-30	-7.87%	**17-sept-01**	**-7.13%**	**0.96%**	**-7.58**
14	**21-juil-33**	**-7.84%**	**30-juil-14**	**-6.91%**	**0.99%**	**-7.09**
15	**01-Dec-2008**	**-7.70%**	14-mars-07	-8.29%	1.21%	-6.84
16	09-oct-08	-7.33%	15-oct-08	-7.87%	1.16%	-6.84
17	01-Feb-1917	-7.24%	09-oct-08	-7.33%	1.13%	-6.54
18	**18-oct-37**	**-7.20%**	16-juin-30	-7.87%	1.22%	-6.53
19	27-oct-97	-7.18%	01-Feb-1917	-7.24%	1.12%	-6.52
20	**05-oct-32**	**-7.15%**	**29-sept-08**	**-6.98%**	**1.11%**	**-6.36**

4.3 UK monthly bonds rates, 1754-2008

To confirm the consistency of this method on market crashes other than stocks, we study the UK bonds rates since 1754. Of course, in this case a crash is a rise of the rate. To use changes of (long-term or perpetual at the beginning of the period) bond price is just the inverse to use changes in bond rates (see Appendix C). The test of the most stable period of financial contextualization (measure of *T*) leads to adjusting monthly bond rates on 11 years[103]. Since this asset presents large changes of his volatility through time, the effect of adjusted changes for the prior volatility is strong. On this point, UK bonds looks like French

[103] In the case of UK bonds, after a first floor starting with T=11 years, the standard deviation of adjusted series shows a continuous decrease when T increases. We choose to use this first weak level to compute adjustments.

stocks. As a result, 13 crashes differ according to the method used. Among the 13 worst rate changes excluded, six took place between 1974 and 1994 during the period of current historical maximum level of volatility (see Figure 1). They are mainly big moves without big news. Six others are concentrated between 1796 and 1815 during the first high level of volatility due to Napoleonic wars. Only one is isolated in September 1931.

New crashes identified are more homogeneous distributed through time. Four of them occur during WWI. Most of the others are due to wars in the second part of the 19th century: Crimean war, Boer war, Second Italian war of independence or Boxers war. All these events were big news without big moves in a "classical" analysis since they occur during period of weak volatility of UK bond rates. They are detailed below:

1) March 1848: 22-25 February, Parisian revolution ended the "Monarchie de Juillet" and led to the Second Republic. Revolutions in German states in March. End of British capital exports to Europe.

2) July 1914: Austria-Hungria declares war to Serbia the 28th July, the next day Russia declares war against Vienna. The mechanism of alliances snaps it. The main European conflict starts.

3) November 1915: Chess of the massive Allied offensive, the Second Battle of Champagne. Threats on the Egyptian frontier.

4) February 1885: End of the Berlin conference dividing Africa.

5) October 1847: Commercial distress and financial panic.

6) March 1854: 27 and 28, UK and France declare war against Russia (Crimean war).

7) April 1859: Austria attacks Piemont, allied of France. Start of the Second Italian war of independence.

8) December 1899: Battle of Colenso, British defeat during the Boer war.

9) October 1916: The socialist President Hipólito Yrigoyen is elected in Argentina fighting against the power of the City.

10) September 1853: 26 September, chess of the Olmütz meeting. 29 September, the Ottoman Empire declares war to Russia.

11) July 1900: Start of the Boxer war in China.

12) January 1917: The use of unrestricted submarine warfare was announced by Germany on January 9th, 1917.

13) April 1877: 19 April, Russia declares war to the Ottoman Empire due to the conflicts in Balkans.

Table 4, Classical and new crashes identified on the monthly UK bond rates. 1754-2008. This table shows the simplest classical identification of bond crashes: worst monthly rises in the bond rate in percentage. Worst months not identified as a crash by the new method are in bold. Crashes identified after adjustment for volatility are different from classical crashes since they can be identified despite a low variation in absolute terms. Prior volatility is also presented. New months identified as crashes are in bold.

	Classical crashes		Crashes after adjustment for volatility			
Crash rank	Date	Change	Date	Change	Prior standard dev.	Adjusted change
1	Nov-1792	14.76%	Mar-1778	14.73%	2.11%	6.85
2	Mar-1778	14.73%	**Mar-1848**	**8.42%**	**1.51%**	**5.50**
3	Mar-1803	14.49%	**Jul-1914**	**7.50%**	**1.35%**	**5.38**
4	Jun-1974	12.88%	Dec-1918	11.73%	2.13%	5.34
5	Mar-1814	12.15%	**Nov-1915**	**8.35%**	**1.52%**	**5.30**
6	Dec-1918	11.73%	Nov-1792	14.76%	2.94%	5.07
7	Sep-1938	11.17%	**Feb-1885**	**5.04%**	**1.06%**	**4.84**
8	**Sep-1986**	**11.17%**	**Oct-1847**	**5.67%**	**1.19%**	**4.73**
9	**Feb-1994**	**10.91%**	Jun-1974	12.88%	3.01%	4.05
10	**Nov-1982**	**9.97%**	Sep-1938	11.17%	2.80%	4.02
11	**Sep-1799**	**9.90%**	**Mar-1854**	**6.90%**	**1.70%**	**4.00**
12	**Jul-1803**	**9.83%**	**Apr-1859**	**8.01%**	**2.01%**	**3.91**
13	**Mar-1815**	**9.66%**	Mar-1814	12.15%	3.11%	3.87
14	**Jan-1794**	**9.28%**	**Dec-1899**	**3.15%**	**0.88%**	**3.61**
15	**Feb-1980**	**9.15%**	**Oct-1916**	**6.21%**	**1.66%**	**3.56**
16	**Jan-1801**	**9.11%**	**Sep-1853**	**5.34%**	**1.51%**	**3.51**
17	**Mar-1974**	**8.90%**	**Jul-1900**	**3.10%**	**0.90%**	**3.43**
18	**Aug-1796**	**8.78%**	Mar-1803	14.49%	4.18%	3.40
19	**Oct-1974**	**8.66%**	**Jan-1917**	**6.25%**	**1.73%**	**3.39**
20	**Sep-1931**	**8.49%**	**Apr-1877**	**2.97%**	**0.90%**	**3.31**

V Statistical characteristics

When we look for extreme events in the distribution of variations measured in percentage of changes, it is clear that they mainly occur during periods of high volatility. Appendix D presents time distribution of changes in percent and after adjustment for the prior volatility according to Equation (5). As expected, the difference between these two series is stronger for assets with large changes in volatility (French stocks and UK bond rates) than for those with a more stable volatility (US stocks measured monthly or daily).

For French stocks, before 1914, price variations in percent are very low and only two extreme events (measured by the top 20 worst fall, May 1859 and January 1882, see table 1) occur. At the opposite since WWI, prices variations are very strong with many large decreases. For UK bonds rates, two extreme periods (during Napoleonic wars and since WWI and worst after 1970s) appear interrupted by a stable one during an historical 19th century (1815-1914). No one “classical” bond crash (in top 20 worst rate increase, see table 4) take place during this period. After adjustment these two series present a different face thanks to the smooth effect of the adjustment. Extreme events are distributed more homogeneously through time. For US stocks, the two series are more similar due to the relative stability of the volatility through time.

Following Johansen and Sornette (2002) or Sornette (2009), we investigate for the existence of outliers (or “Dragon-Kings”). These authors identified outliers on drawdowns (or runs) as graphically revealed using the logarithm of the cumulative number of observations. The adjusted series of variation (without runs) exhibit several outliers whereas it is not clearly the case on the pure variations in percent (not report). As for run in Johansen and Sornette (2002), outliers on the adjusted series exist only for negative variations. These extreme events in negative variations are very special and should correspond to market crashes.

All these series supports a different distribution from that of the Gaussian one mainly due to the presence of fat tails (see Table 5). The non-normality is confirmed by the Jarque-Berra test. Extreme events are more frequent and more severe than those shown by a Gaussian law. For example, the worst month for French stocks, - 32.79 % in May 1981, would perhaps not appear within the normal law as this fall represents 7.5 standard deviation. It is worst for daily US stock price since the fall of 19 October 1987 represents 19 standard deviations which is almost impossible in a Gaussian world.

We can also reject the normal law for the adjusted series but less strongly. The kurtosis decreases after adjustment for all series (except for daily US stocks). The skewness also decreases (except for UK bond rates) but this decrease can lead to be more far from 0 than in non-adjusted series (French stocks and US daily stocks). Combining both effects, the Jarque-Berra test for adjusted series is below the number found on pure changes in percent (except for daily US stocks).

Table 5, Descriptive statistics of adjusted and non-adjusted series. This table shows several statistics of the series used.

	Monthly price variations of French stocks		Monthly price variations of US stocks		Daily price variations of US stocks		Monthly rate variations of UK bond	
	in percent	*adjusted*	*in percent*	*adjusted*	*in percent*	*adjusted*	*in percent*	*adjusted*
Average	0.30%	0.00	0.33%	-0.01	0.02%	0.00	0.05%	0.01
Annualized average	3.56%		4.01%		6.19%		0.56%	
Standard deviation	4.85%	1.07	4.31%	1.05	1.15%	1.05	2.62%	1.00
Annualized standard deviation	16.81%		14.94%		18.15%		9.06%	
Kurstosis	7.01	6.81	22.79	12.94	24.15	26.83	8.33	7.67
p-value kurtosis=3	*0.00080*	*0.00089*	*0.00003*	*0.00010*	*0.00000*	*0.00000*	*0.00029*	*0.00036*
Skewness	0.05	-0.35	0.78	-0.11	-0.45	-0.88	0.00	0.21
p-value skewness=0	*0.4661*	*0.0252*	*0.0042*	*0.1726*	*0.0011*	*0.0003*	*0.9629*	*0.0431*
Minimum	-32.79%	-7.50	-31.33%	-7.64	-22.61%	-24.56	-17.84%	-6.07
Maximum	25.24%	4.80	50.30%	9.86	15.34%	11.00	14.76%	6.85
Number of observations	1859	1858	2327	2326	27773	27772	3065	3064
Jarque-Berra	1246	1165	38224	9579	518445	660432	3449	2810

VI Robustness checks

6.1 The volatility at the stock level

Stock index instability can be the result of significant changes in stocks correlations. The volatility of the index is a combination of both the correlation among stocks and the volatility of the individual stocks it comprises. Figure 1 presented the volatility of French and US stocks indices, hence well-diversified portfolios. The average investor however probably benefit from less diversification. Barber and Odean (2000) show that in the US, studying 60,000 investors between 1991 and 1996, the average portfolio is composed of only four stocks leading to undiversified portfolios (Goetzmann and Kumar, 2007). This is far from what is necessary to obtain a true diversification. Campbell *et al.* (2001) measure that volatility at the individual level is different from that at the aggregate level because the correlation among stocks is also instable through time.

To test whether the instability is observed only at the aggregate level, we checks if this figure is the same at the level of individual stocks. We apply this test on the more volatile index: the French one. The next figure presents the standard-deviations of the top 5 stock market capitalizations. The companies vary yearly. The concentration of market capitalizations explains that these top five represent on average, from 1854 to 2006, 42 % of the market capitalization of all the HCAC 40. The standard deviation of the HCAC 40 is also figured. Both historically and currently, the difference between index risk and individual stock risk constitutes the profit obtained thanks to diversification. The effect of the diversification depends on the correlation among securities. Again, individual stocks are also instable like the index stocks. Thus, changes in index volatility cannot be only explained through changes in stock correlations. An investor with only a few stocks is just as exposed as one with a well diversified portfolio to larges changes in volatility.

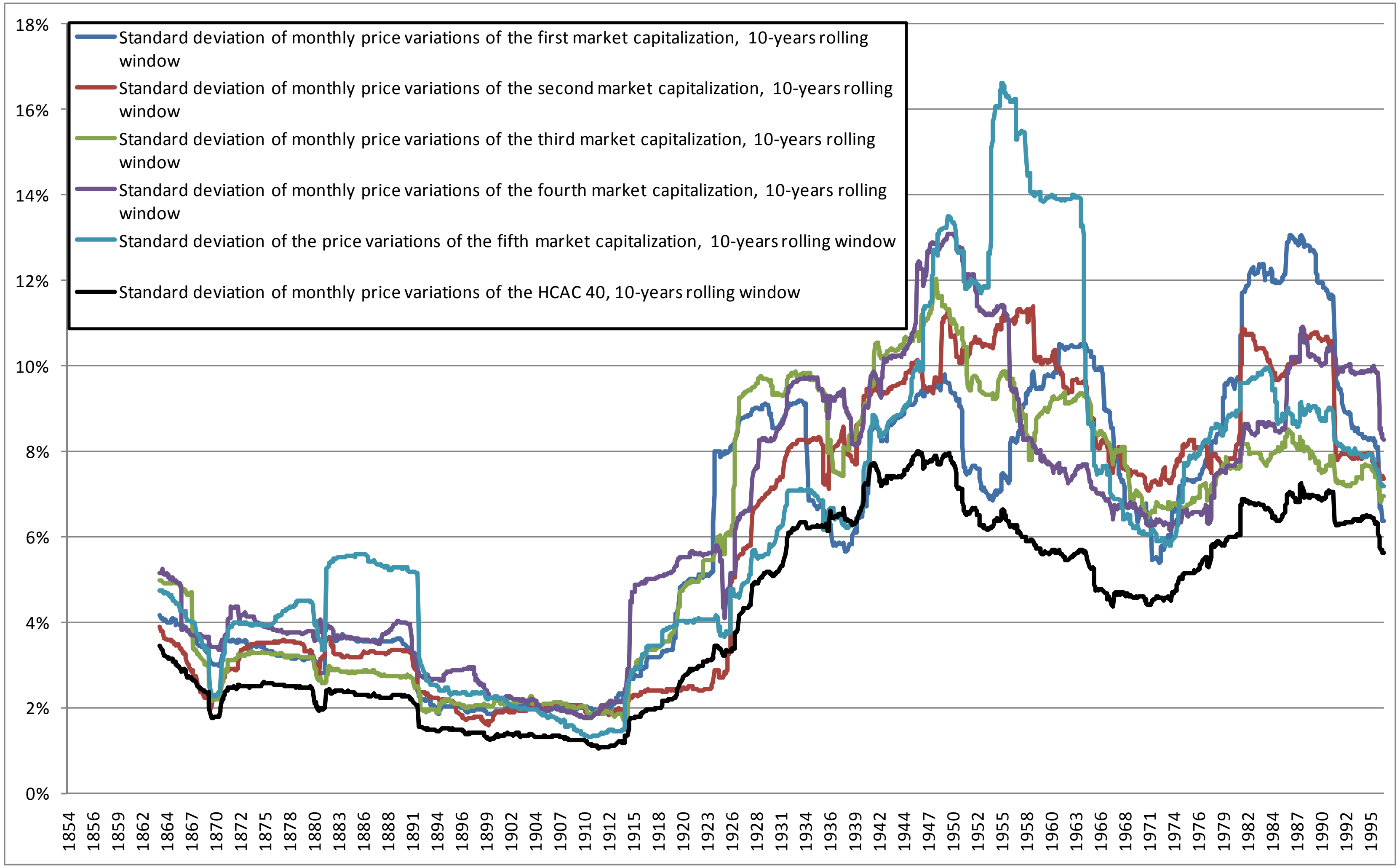


Figure 2, Standard deviations of the monthly change of the top 5 French stock market capitalizations. January 1854-December 2008. Standard deviation are measured on a ten year rolling window and not annualized. This graph illustrates the hypothesis that large movements of volatility are observable only at the aggregate level as an indirect result of changes in correlations among stocks. The difference between the average of the standard deviation of individual stock and the standard deviation of the average (the HCAC 40) is the profit from diversification.

6.2 Robustness of the measure of the prior volatility (the financial context T)

This section tests the robustness of the results vis a vis the way the prior volatility is measured. For each asset, we chose to use the prior volatility on the period leading to the most stable adjusted series. For example, in the case of the French stocks, the standard deviation of the adjusted price variations is 1.08 standard deviation over seven years but 1.22 over one year.

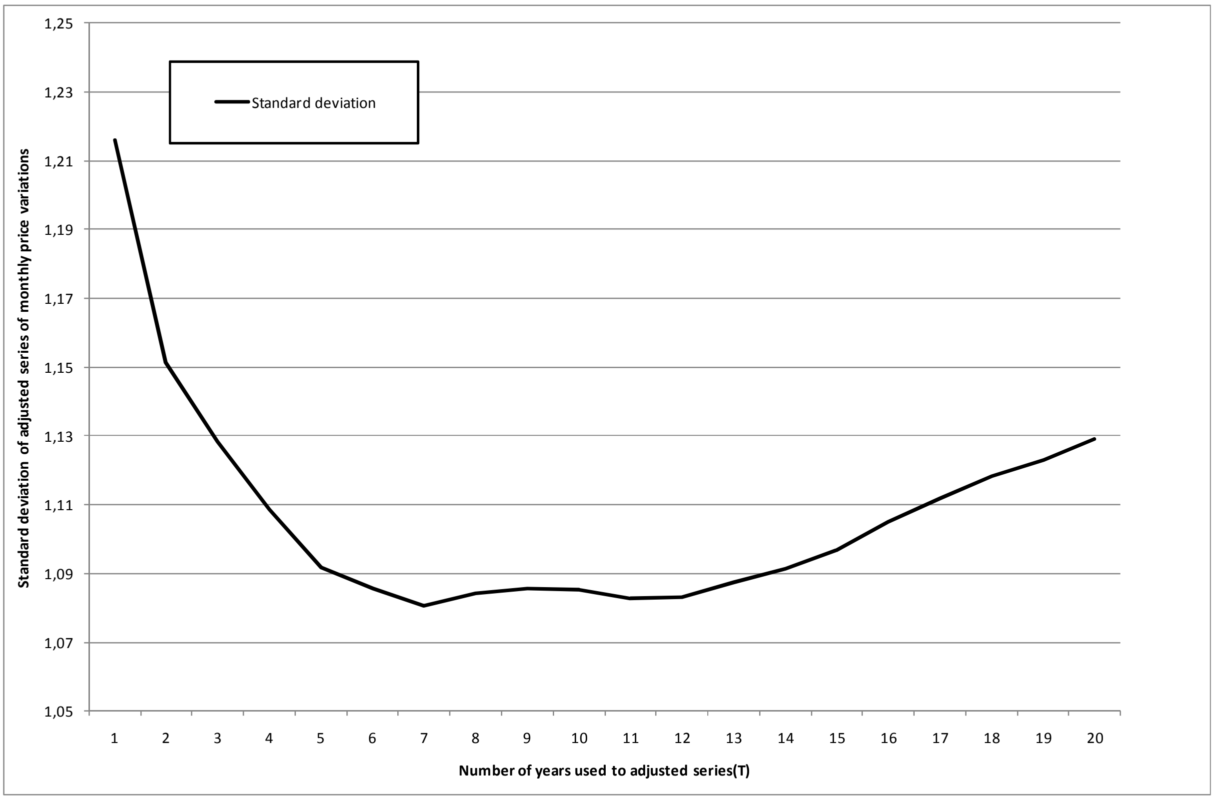


Figure 3, Average and standard deviation of the monthly variations adjusted on different periods. January 1854-December 2008. To find the optimal period *T* used to adjust each monthly variation, we look for the most stable adjusted series. Monthly price variations are adjusted over a period between one to twenty years. Standard deviations of these series appear on this figure. A period *T* of 7 years provides the most stable adjusted series.

However the choice of one *T* period has a limited impact on the crashes identified. For example, again on the French stock market, the crash of January 1882 is the first for all periods of *T* after one year (with *T* equal one year, it is the second one). Between, five and twenty years, the top 4 crashes are the same (but with different orders). This top 4 is in the same order for period of *T* between six and nine years.

A systematic study on the French stock market of the crashes identified by different period *T* of contextualization show graphically that the choice of *T* is not really crucial. For each period *T* between one and twenty years, Figure 4 shows all "top tens" crashes identified. Globally, 22 months can be in top ten according to different period of *T*. Many candidates exist for short periods of *T*. But after six years, identified crashes are more aligned. After about ten years, identified crashes appear similar. Therefore, the choice of one period *T* between six and twenty years is without any strong impact on the identified crashes.

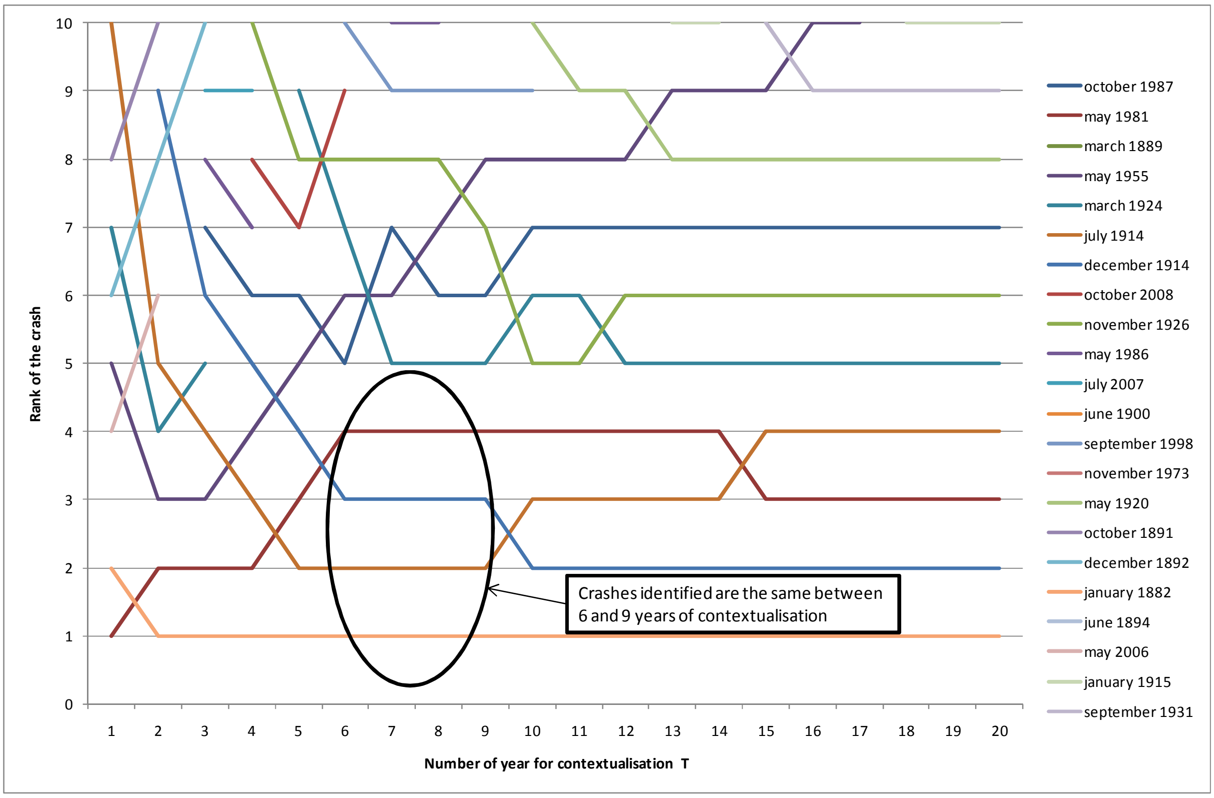


Figure 4, Ranks of crashes identified according to the period *T* of contextualization. To test the impact of choosing one period of seven years to adjust monthly price variation, the top ten crashes identified with different period *T* are presented here. The worst crash is the same (January 1882) for most of the period excluding one. After about ten years, crashes identified appear similar.

VII Conclusion

This paper demonstrates that the shock to financial systems, reverberating from a crash, cannot be measured purely by change in price. The total loss on the initial wealth for an investor should include both the decrease in percentage and the leverage used to invest. Accepting the hypothesis of a constant risk aversion, investor uses the leverage to maintain constant his exposition to the risk. If the anticipations of risk of the investor are based on past volatility, the leverage used depends on the past volatility. As a result, the global loss for the investors is function of both the decrease in percentage and the prior volatility.

Volatility is unstable through time. Large decreases in percentage are more frequent during periods of prior high volatility. However if we measure in terms of global loss, the shocks to the financial system are clearly different from those experienced with pure price decreases. Each variation is adjusted to be measured in number of standard deviation of the prior period. This tool identifies market crashes adjusted for the financial context of volatility. The effect of this adjustment depends on the stability of the volatility of the asset. US stocks are more stable through time than French stocks or UK bonds. As a result, crashes identified after adjustment for volatility differ more strongly in the case of French stocks or UK bonds than for US stocks.

Crashes identified using this method are highly consistent with history. This method excludes some big moves without big news and identifies, as a crash, big news without large change in percentage. By the way, this paper partially solves this old puzzle of big moves without big news and big news without big moves. For example, French stock history can be divided into two areas of volatility. Risk of holding stocks is three times lower pre-1914 than and that experienced after the conflict. The wars of 1870 and 1914-1918 are identified as causing major stock crashes even though in terms of pure price changes, they cannot be considered so. In contrast, recent times are characterized by a high level of volatility rather than a period of frequent stock market crashes.

REFERENCES

Annaert J. and W. Van Hyfte (2006), "Long-Horizon Mean Reversion for the Brussels Stock Exchange: Evidence for the 19th Century", *Working Paper*, Ghent University.

Arbulu P. et G. Gallais-Hamonno (2002), « Valeurs extrêmes et changements d'appréciation du risque à la bourse de Paris sur deux siècles », *Finance*, vol. 23.2, p. 145-176.

Barber N.M. and T. Odean (2000), "Trading is Hasardous to Your Wealth: The Common Stock Investment Performance of Individual Investors", *The Journal of Finance*, 55.2, p. 773-806.

Barro R. and J. Ursua (2009), "Stock Market Crashes and Depression", *Working Paper,* NBER, n. 14760.

Boucher C. (2004), « Identification et comparaison des crises boursières », in Boyer *et al.* (dir.), *Les crises financières,* Rapport du Conseil d'Analyse Economique, Paris, La Documentation Française.

Campbell J.Y., Lettau M., Malkiel B.G and Y. Xu (2001), "Have Individual Stocks Become More Volatile? An Empirical Exploration of Idiosyncratic Risk", *Journal of Finance,* 56.1, p. 1-44.

Coudert V. and M. Gex (2006), « Les indicateurs d'aversion pour le risque peuvent-ils anticiper les crises financières ? », *Revue de la stabilité financière*, Banque de France, 9.

Cutler D. M., Poterba J. M. and L.H. Summers (1989), "What Moves Stock Prices", *Journal of Portfolio Management*, 15.3, p. 4-12.

Das U.S., Iossifov P., Popdiera R. and D. Rozhkov (2005), "Quality of Financial Policies and Financial System Stress", *Working Paper,* IMF, n 05/73.

Eichengreen B. and R. Portes (1987), "The Anatomy of Financial Crises", *Working Paper*, NBER, n. 2126.

Estrada J. (2009), "Black Swans, Market Timing, and the Dow." *Applied Financial Economics Letters*, 16, p. 1117-1121.

Flandreau M. and P. Sicsic (2003), « Crédit à la speculation et marché monétaire : le marché des report en France de 1875 à 1914 », in Feiertag O. et M. Margairaz (dir.), *Politiques et pratiques des banques d'émission en Europe*, Albin Michel, Paris, p. 197–222.

Goetzmann W. and A. Kumar (2008), "Equity Portfolios Diversification, *Review of Finance*, 12.3, p 433-463.

Illing M. and Y. Liu (2003), "An Index of Financial Stress for Canada", *Working Paper,* Bank of Canada, n. 14.

Johansen A. and D. Sornette (2002), "Large Stock Market Price Drawdowns Are Outliers", *Journal of Risk,* 4.2, p. 69-110.

Kindleberger C. (1978), *Manias, Panics, and Crashes: A History of Financial Crises*, New-York, Wiley.

Le Bris D. (2009), "The French Stock Market in War", *working paper*, AFC, n.2.2010.

Mauboussin M. (2006), *More Than You Know. Finding Financial Wisdom in Unconventional Places*, Columbia, Columbia University Press.

Miquel P. (1983), *La Grande Guerre*, Paris, Fayard.

Mishkin F. and E. White (2002), "US Stock Market Crashes and Their Aftermath: Implications for Monetary Policy", *Working Papers*, NBER, n. 8992.

Oochino F., K. Oosterlick and E. White (2007), "How Occupied France Financed Its Own Exploitation in World War II," *American Economic Review*, 97.2, p. 295-299.

Odean T. (1999), "Do Investors Trade Too Much?", *American Economic Review*, 89, p. 1279-1298.

Oosterlinck K. (2009), "The Price of Degenerate Art", *Working Paper,* CEB, n. 09/031.

Patel S. and A. Sarkar (1998), "Crises in Developed and Emerging Stock Markets", *Financial Analysts Journal*, vol. 54.6, p. 50-59.

Pindyck R. S. (1988), "Risk Aversion and Determinants of Stock Market Behavior", *The Review of Economics and Statistics*, 70.2, p. 183-190.

Schwert G. (1989), "Why does Stock Market Volatility Change over Time?", *Journal of Finance,* 44.5, p. 1115-1153.

Schwert G. (1997), "Stock Market Volatility: Ten Years after the Crash", *Working Paper,* NBER, n.6381.

Siegel J. (2002), *Stocks for the Long Run*, New-York, Irvine.

Sornette D. (2003), *Why Stock Markets Crash: Critical Events in Complex Financial Systems*, Princeton, Princeton University Press.

Sornette D. (2009), “Dragon-Kings, Black Swans and the Prediction of Crises” *International Journal of Terraspace Science and Engineering*, 1.3, p. 1-17.

Voth H-J. (2003), “Stock Price Volatility and Political Uncertainty: Evidence from the Interwar Period”, *Working Paper*, MIT, 02-09.

White E. (1996), “Stock Market Crashes and Speculative Manias”, in Elgar E. (ed.), *The International Library of Macroeconomic and Financial History*, Brookfield.

White E. (2007), “The Krach of 1882 and the Bailout of the Paris Bourse », *Cliometrica*, 1.2, p. 115-144.

Appendix A, Impact of extremes events on final performances of stock markets.

On daily prices of the Dow Jones between 1900 and 2006, Estrada (2009) shows that the ten best days (0.03 % of market days) gained 65 % of the final level of the index. Taking away the 100 best days (2.23 % of observations) leads to a final loss of 72 %. In the same way, according to Mauboussin (2006) using the daily data of the S&P since 1978, the average annualized daily change is 9.6 % but excluding the 50 best days (on 7 000), it falls to 2.2 % and rises to 18.4 % by excluding the 50 worst.

In the French market since 1854, the 20 best months on 1,858 (about 1 % of the observations) made up 96 % of the final level of the index. In other words, it would have been sufficient to invest into the stock market only 1 % of the time to achieve 96 % of the profit from the price changes. The majority of time, changes in prices balance each other out. On the other hand, the 20 worst months are also crucial for the final value of the index. Without these or selling the portfolio just prior and reinvesting the following month, the value of a portfolio should be 3,890 % more that observed with a strict buy and hold.

Appendix B, Data.

French stocks:

1854-1988: Le Bris D. and P-C. Hautcoeur, “Challenge to the Triumphant Optimists: A Blue Chips for the Paris Stock Market”, *Financial History Review*, 27, p. 141-183, 2010.

1988-2008: CAC 40 from NYSE-Euronext

US stocks (monthly):

1815-1925: Goetzmann W., Ibbotson R., and L. Peng (2001), “A New Historical Database for the NYSE 1815 to 1871: Performance and Predictability.”, *Journal of Financial Markets*, 4.1, p. 1-32.

1926-2008: S&P according to the Shiller online version
http://www.econ.yale.edu/~shiller/data.htm

US stocks (daily):

1898-2008: Dow Jones from official website
www.dowjones.com

UK bond rates:

1753-1998: Niall Ferguson database from R. Sylla webpage, details below,
http://pages.stern.nyu.edu/~rsylla/FergusonDatabases.htm

1753-1723: Neal L., *The Rise of Financial Capitalism*, Cambridge, Cambridge University Press, 1990, p. 241-257.

1824-1842: from the *Spectator*

1843-1849: from *The Economist*

1850-1914: J.T. Klovland, “Pitfalls in the estimation of the yield on British consols, 1850-1914”, *Journal of Economic History*, 54, 1994.

1914-1962: F. Capie and A. Weber, *A Monetary History of United Kingdom*, London, Taylor & Francis, 1985, p. 514-527.

1963-1998: ONS, *Financial Statistics*

Update:

1998-2008: UK debt management office
www.dmo.gov.uk/

Appendix C, Used long-term bond price variation or variation of bond rates.

We can use the rate of perpetual (or long-term) bonds to measure the price variation of a bond. Formally we have: *r* the price variation of the bond between *t* and *t+1*, *P is* the price of the bond, *C* is the amount of the coupon and *T* is the rate of the perpetual bond (*C/P*):

$$r = \frac{P_t}{P_{t-1}} - 1 \qquad (1)$$

In the case of a perpetual bond, we have $P = \frac{C}{T}$. Thus:

$$r = \frac{\frac{C}{T_t}}{\frac{C}{T_{t-1}}} - 1 \ + T_t \qquad (2)$$

Since the amount of the coupon, *C*, is constant and $\frac{\frac{a}{b}}{\frac{a}{c}} = \frac{c}{b}$, we have, *r*, the price variation of the bond as:

$$r = \frac{T_{t-1}}{T_t} - 1 \qquad (3)$$

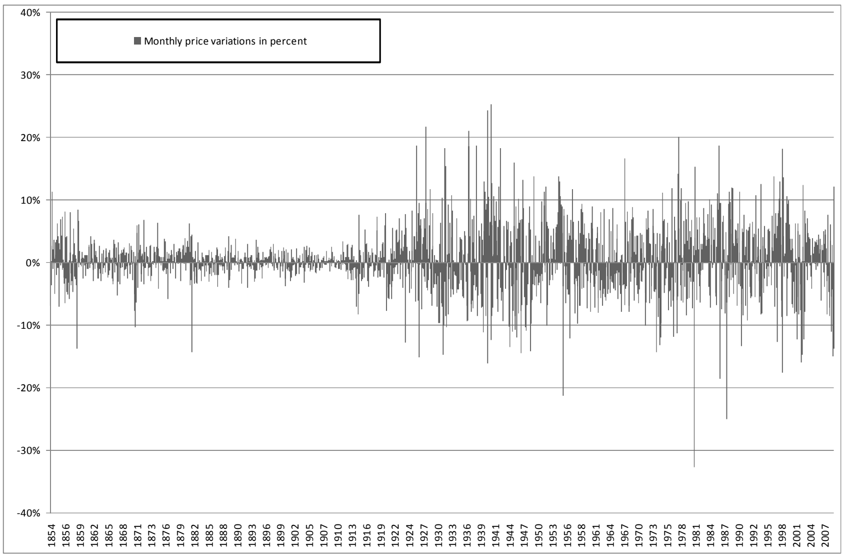
We choose to measure this variation by the inverse of the price variation, the bonds rate variation:

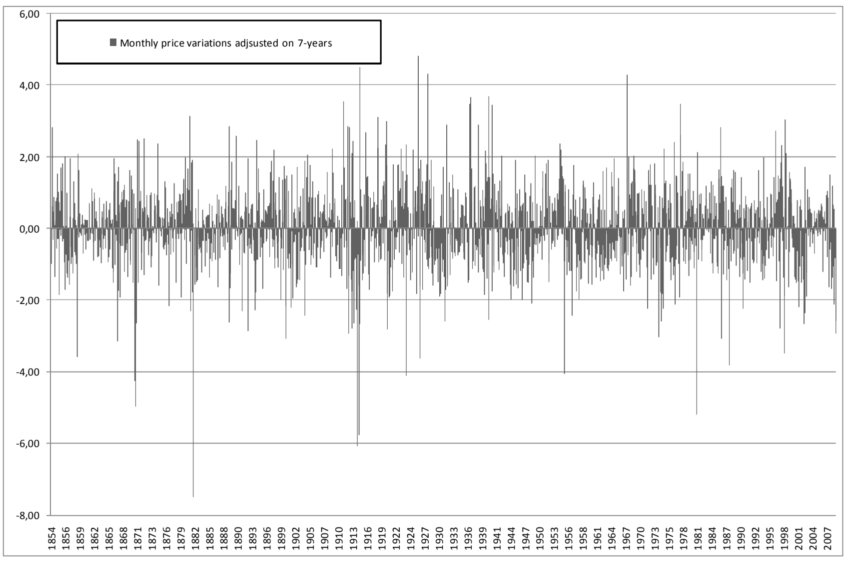
$$\Delta_t^T = \frac{T_t}{T_{t-1}} - 1 \qquad (4)$$

Appendix D, Variations of non-adjusted and adjusted series.

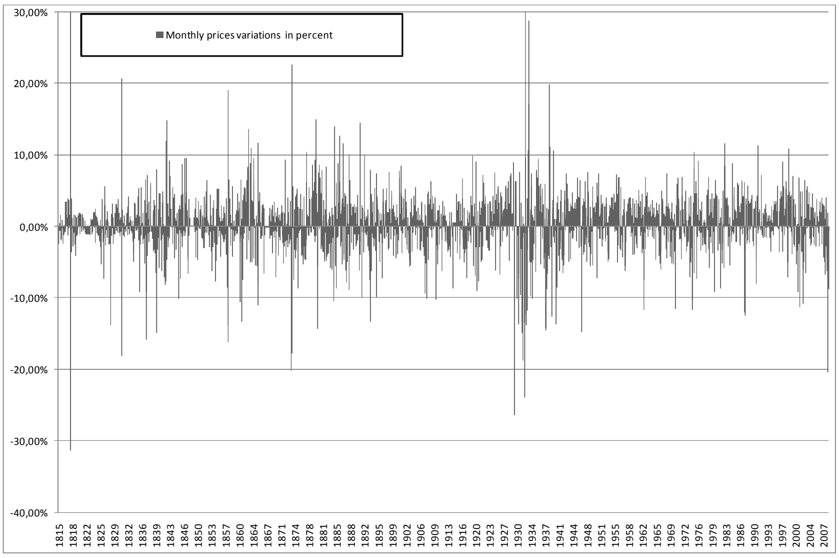
First figure presents price (rate) variations in percent. The second one is the adjusted series according to Equation (5). Each variation is minus by the average variation over the rolling *T* prior years. This extra variation is divided by the standard deviation over the same *T* prior years. These adjusted variations are more homogenous throughout time than non-adjust variations. This smoothie effect is stronger for assets with large instability of the volatility (French stocks and UK bond rate). Before 1914, French stocks price variation presents a very low level of volatility compared to the post WWI observations. On UK bonds, the beginning and the end of the period are volatile whereas the middle supports a stability of monthly variations. More important extreme events are more homogeneously distributed through time.

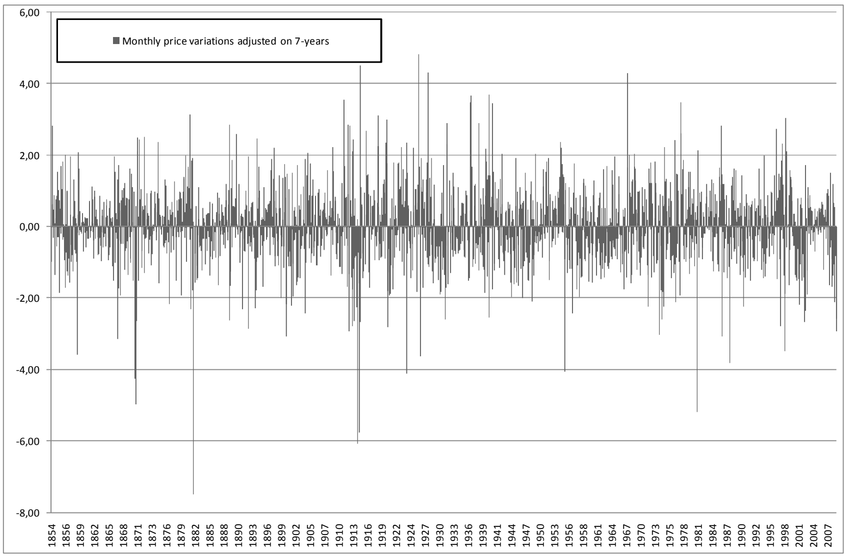
French stocks monthly price variations, 1854-2008



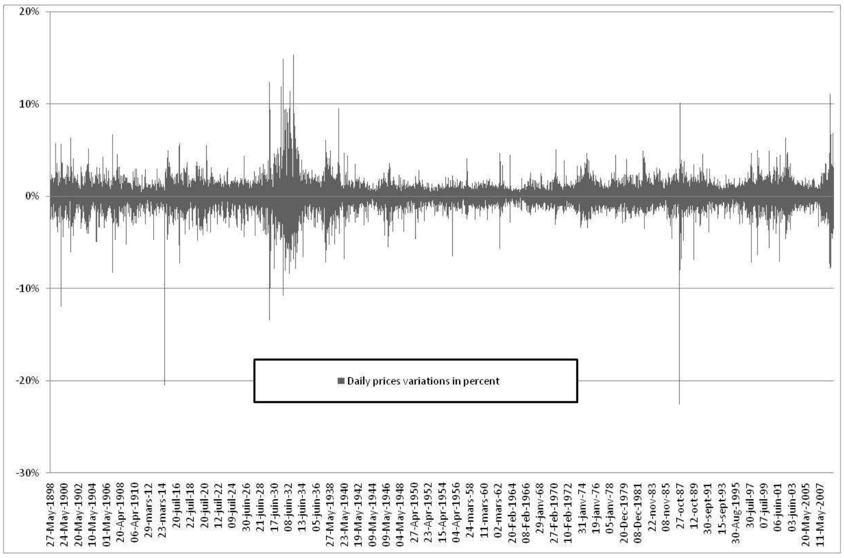


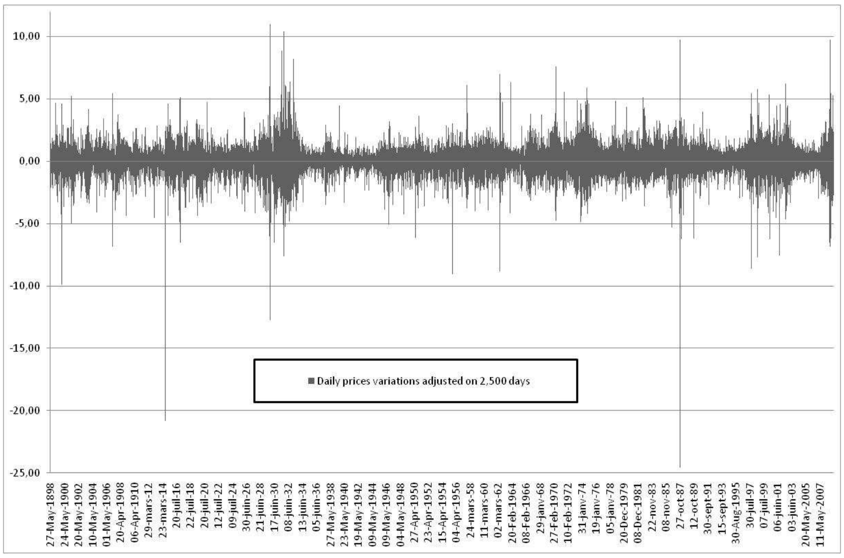
US stocks monthly price variations, 1815-2008



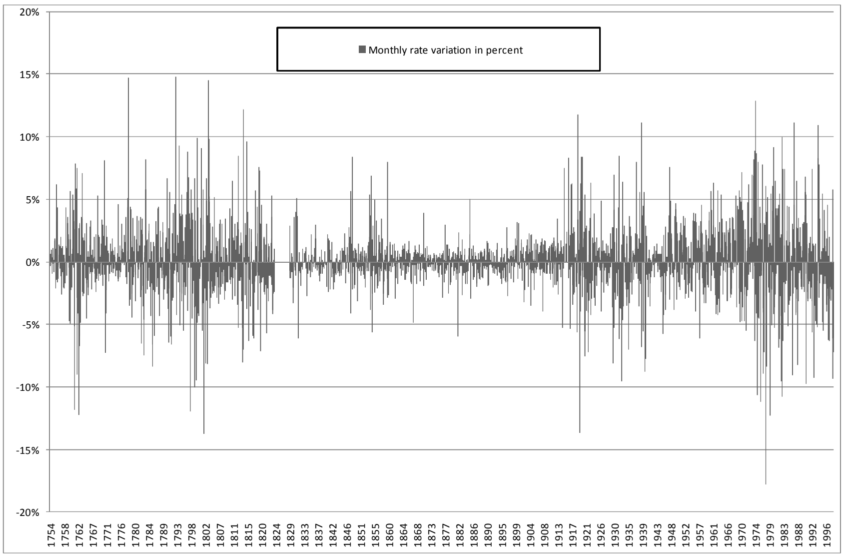


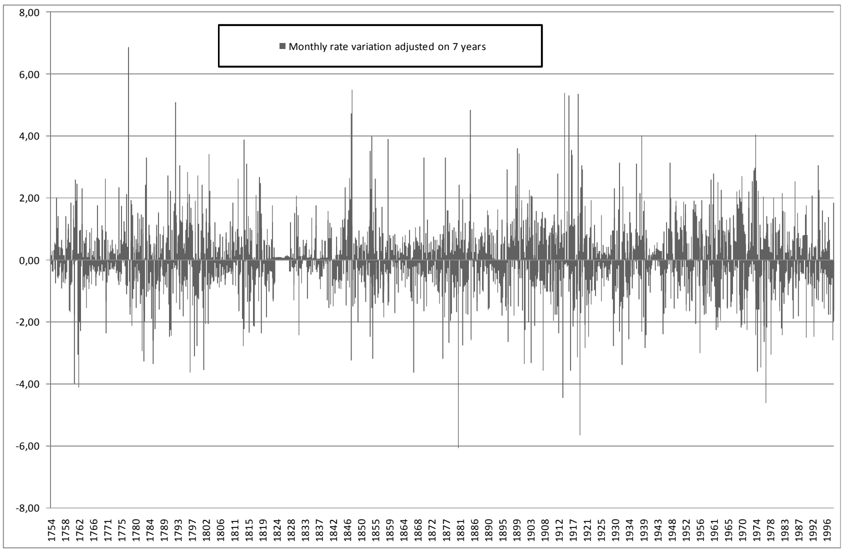
US daily stock price variations, 1898-2008





UK monthly bond rates variations, 1754-2008





Chapitre 6, Les entreprises de service dominent la cote dans la durée « La France peut elle se développer sans industrie ? Une réponse dans l'histoire boursière. »[104]

Résumé : Le développement économique signifie une création de richesse supplémentaire. Le profit indique une création de richesse car la valeur des biens et services vendus est supérieure à celle de ceux consommés par l'entreprise. La création de richesse est ainsi mesurée en permanence par la bourse qui valorise les profits futurs des entreprises. L'étude de long terme des capitalisations boursières fournit donc un indicateur irremplaçable sur les entreprises créatrices de richesses selon les époques. Depuis 1854, la capitalisation boursière des différents secteurs est mesurée chaque année. Il apparaît que l'industrie a presque toujours été minoritaire. Sous cet angle, l'« ère industrielle » semble récente et de courte durée. La sidérurgie n'a jamais dépassé les 10 % de la capitalisation totale et le reste de l'industrie progresse seulement à partir des années 1920 et régresse depuis les années 1960. A l'inverse, les banques ou les « utilities » dominent sur le long terme. Depuis le milieu du XIX^ème^ siècle, il n'apparait pas de corrélation entre la croissance économique et la part des entreprises industrielles. Cet épisode industriel doit pouvoir toucher à sa fin sans pour autant que la croissance française ne soit remise en cause.

[104] Suite à sa nomination pour le grand Prix de la Réflexion Impertinente, ce chapitre a été publié à la Documentation Française dans la collection *Impertinences*, 2009, p. 159-182.

Il semble généralement admis que l'économie française connaît une évolution progressive de l'industrie vers les services. Le XIX^{ème} siècle apparaîtrait ainsi comme celui de l'industrie et la fin du XX^{ème} correspondrait à un passage graduel à l'ère des services. De là l'image convenue de l'économie française d'avant 1914 comme reposant sur de très puissantes entreprises industrielles, notamment sidérurgiques dont Creusot-Schneider serait l'exemple emblématique. Or, aujourd'hui, et en conséquence de ces représentations traditionnelles, la disparition de certaines activités industrielles, et des emplois qui vont avec, suscite un certain émoi.

Pourtant, la France doit pouvoir continuer à créer des richesses supplémentaires avec moins d'entreprises industrielles. Pour mesurer cette création de richesse, l'étude en longue durée de la bourse fournit un indicateur irremplaçable. En effet, la bourse s'emploie chaque jour à mesurer les profits futurs des entreprises. Un profit indique que les biens et services vendus par l'entreprise ont une valeur supérieure aux biens et services consommés : une richesse supplémentaire est créée par l'activité de l'entreprise. La bourse valorise les profits futurs des entreprises cotées et indique ainsi des capitalisations boursières variant en fonction de l'ampleur de la création de richesse. L'étude de la bourse permet donc d'apprécier le fonctionnement économique d'une époque en mesurant les entreprises et les secteurs économiques qui créent le plus de richesses, c'est-à-dire ceux dont la capitalisation boursière est la plus élevée.

En retenant une définition large de l'industrie, soit tous les fabricants de produits, l'étude des capitalisations boursières à travers le temps donne une image très différente de l'opposition binaire entre une ère industrielle et une ère des services qui lui aurait succédé. Creusot-Schneider a toujours été un « nain » en termes de capitalisation boursière comparée à de grandes entreprises de services. De même, l'industrie en général ne pèse que très peu en bourse avant l'entre-deux-guerres. Sur le long terme, les services financiers, l'énergie ou les services publics sont les sources majoritaires de profits.

L'essor de la part des capitalisations industrielles après la Seconde Guerre Mondiale découle d'abord de l'inflation et des nationalisations de 1945, qui ont presque fait disparaître ces activités de services et de réseaux de la cote boursière. Si l'on conjugue cela à la maturité des entreprises de la seconde révolution industrielle réalisée durant les « Trente Glorieuses », on comprend mieux pourquoi l'industrie atteint son apogée, en termes de capitalisation boursière, au début des années 1960. En revanche, depuis quelques décennies, les services financiers retrouvent leur place de long terme dans la création de richesses alors que les services publics exigent probablement une plus grande stabilité retardant un déploiement plus large qu'aujourd'hui. Parallèlement, depuis la Seconde Guerre Mondiale, de nouveaux services s'affirment et doivent pouvoir continuer à créer des richesses supplémentaires.

I Signification de la capitalisation boursière

La capitalisation boursière, valeur actuelle des profits futurs, est une bonne indication des profits générés dans l'économie française. Identifier l'origine sectorielle de la capitalisation permet de distinguer les secteurs les plus créateurs de richesse au cours du temps. La concentration de la capitalisation sur quelques grandes valeurs qui dominent la cote permet d'en mesurer environ 80 % en étudiant seulement les quarante plus grandes entreprises ; lesquelles, bien évidemment, varient au cours du temps.

1.1 La capitalisation boursière représente les profits générés dans l'économie

La capitalisation boursière est une mesure de la création de richesse. Fondée sur la valeur actuelle des profits futurs, elle représente l'estimation par les investisseurs des richesses que l'entreprise doit créer ultérieurement. Le profit constitue une création de richesse car il indique que les biens et services vendus par l'entreprise ont une valeur supérieure aux biens et services consommés. Cette valeur supplémentaire constitue une création de richesse. Selon la règle générale *qu'un actif ne vaut que ce qu'il rapporte*, la capitalisation reflète uniquement les profits réalisés par l'entreprise ou plus précisément les anticipations de profits (Sharpe *et al.*, 1999). La valeur boursière intègre aussi bien les profits distribués que ceux mis en réserve et la politique de dividende ne semble avoir qu'un impact limité sur la valeur d'une entreprise (Miller et Modigliani, 1961). Le fait qu'une part importante des actions soit concentrée dans quelques mains ne modifie pas non plus la valeur globale de l'entreprise.[105] En effet, c'est le nombre total des actions qui est utilisé pour calculer la capitalisation boursière et pas uniquement le « flottant », c'est-à-dire la part des actions qui sont effectivement échangeables sur le marché boursier. Le mode de financement

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[105] Une faible décote existe aujourd'hui pour les entreprises dont le contrôle est verrouillé.

des investissements (extérieur ou autofinancement, action ou dette, marché ou banques) n'a pas d'influence sur la valeur d'une entreprise. La capitalisation boursière n'a ainsi qu'un faible rapport avec la nature plus ou moins capitalistique de l'entreprise. Par exemple, la compagnie du Canal de Suez devient dans les années 1920, la première capitalisation boursière française alors que l'essentiel de ses investissements ont été réalisés 60 ans plus tôt. Cette très forte capitalisation boursière représente uniquement les gigantesques profits dégagés par ses opérations. Il parait également difficile de retenir l'idée selon laquelle certaines grandes entreprises sont tellement rentables qu'elles se dispensent de la bourse. En effet, en moyenne et sur le long terme, les actionnaires d'une entreprise rentable ont intérêt à la faire coter. La cotation permet de faciliter les transferts de propriétés et surtout de diversifier la structure d'un patrimoine. Les cas comme celui de la famille Mulliez (groupe Auchan, Leroy-Merlin, Kiloutou, Saint-Maclou, Flunch, Décathlon…) aujourd'hui ne doivent être considérés que comme des contre-exemples « qui confirment la règle générale ».

La capitalisation boursière ne donne pas une image du profil économique du pays mais seulement de ses plus grosses entreprises. Il est nécessaire de distinguer la répartition de la capitalisation boursière et le profil économique du pays. Le secteur agricole, longtemps majoritaire en France n'est représenté que de manière anecdotique en bourse.[106] Nombre de secteurs sont trop dispersés pour que des entreprises puissent être cotées. Il existe donc un biais en mesurant les profits par la capitalisation boursière qui consiste à ne pas prendre en compte certains secteurs qui, par nature, se prêtent mal à la concentration. Toutefois, ce biais semble devoir agir en faveur d'une surreprésentation de l'industrie en bourse. Il est probable que les activités de service avec des entreprises dispersées sont plus nombreuses que les activités industrielles dans le même cas. L'industrie tend à la concentration par les économies d'échelle que sa nature autorise. Une indication de cette concentration est donnée par la part des emplois des quatre premières entreprises d'un secteur industriel. En 1969, celle-ci va de 37 % pour les filatures à 94 % pour les turbines ou 90 % pour le verre (Caron, 1955).

Le profit est une bonne mesure du dynamisme économique. Les dividendes sont la part du profit reversée à l'actionnaire. La capitalisation reflète la valeur actuelle des futurs dividendes mais également la valeur des futurs profits réinvestis. Quelles sont les entreprises qui réalisent le plus de profits ? Dans une économie où la concurrence joue, les profits ne peuvent provenir que d'une meilleure adaptation de l'entreprise à son environnement.

[106] Dans l'entre deux guerres, il existe des entreprises comme la Compagnie Agricole de la Crau ou les Vignobles de la Méditerranée.

L'existence de profits importants attire des concurrents qui graduellement font baisser les marges du précurseur. Une forte capitalisation traduit donc un dynamisme de l'entreprise, une meilleure adaptation. Du coté de l'investisseur, ce dernier confie son épargne en fonction des perspectives de profits et ce sont mécaniquement les secteurs les plus porteurs qui sont le mieux valorisés. Une capitalisation boursière élevée reflète donc les entreprises les plus dynamiques d'une époque, celles qui tirent le développement du pays. Toutefois, dans une situation de concurrence imparfaite, des profits importants peuvent provenir d'une rente artificielle. Un monopole légal peut ainsi garantir des profits élevés qui ne peuvent être réduits par l'entrée de nouveaux concurrents. C'est probablement en partie le cas pour certains secteurs importants en bourse comme les chemins de fer.

La financiarisation de l'économie est variable dans le temps. Comme le montrent Rajan et Zingales (2003) pour de nombreux pays, elle suit une courbe en forme de U entre 1914 et aujourd'hui. C'est clairement le cas en France si l'on regarde le rôle joué par la bourse dans l'économie. Mesuré par le rapport entre la capitalisation boursière des quarante premières valeurs et le PIB, ce taux de financiarisation dépasse 36 % en 1882 et reste au-dessus des 20 % à la veille de la Première Guerre Mondiale mais tombe à moins de 2 % à la fin des années 1940. Il connaît une forte ascension depuis vingt-cinq ans et dépassait les 70 % il y a peu. L'étude ici présentée suppose que, quel que soit le degré de financiarisation, la répartition sectorielle de la partie cotée de l'économie n'en est pas affectée. Cette éclipse du rôle de la bourse dans l'économie provient notamment des nationalisations. Les entreprises nationalisées continuent d'éxister et de générer des profits lorsque l'Etat en devient actionnaire mais en tenir compte devient impossible ici puisqu'elles ne sont plus cotées en bourse. De plus, ces entreprises ont tendance à être moins créatrices de richesses, même lorsque les structures antérieures sont conservées. En réponse à cette baisse, les contemporains constatent qu' « une entreprise avec l'Etat comme actionnaire ressemble à un châssis sans le moteur, le moteur de l'entreprise privée étant la recherche du profit et la crainte de la faillite ».[107]

[107] *La Vie Française* du 19 avril 1946.

1.2 Le HCAC 40 capte l'essentiel de la capitalisation boursière

L'utilisation de « seulement » quarante valeurs capte l'essentiel de la capitalisation boursière française. La détermination de l'origine sectorielle des profits est réalisée à travers une nouvelle base de données sur la bourse française depuis 1854. A l'image de l'actuel CAC 40, cette base contient les quarante premières capitalisations boursières au début de chaque année. En 1988, la Société des Bourses Françaises (ancêtre de NYSE-Euronext) a choisi de limiter le nombre d'actions dans son indice de référence à 40. Aujourd'hui, le CAC 40 représente environ 70 % de la capitalisation boursière totale. Ce pourcentage augmente lorsque l'on remonte dans le temps à près de 90 % au milieu du XIX^{ème} siècle.

La pertinence de se limiter à quarante valeurs est confirmée par le poids nécessairement faible d'une 41ème action. De 1853 à 2007, la première capitalisation pèse en moyenne 12,72 % et la quarantième 0,69 %. Cette distribution est stable dans le temps, les deux extrêmes sont actuellement[108] très proches de leur moyenne historique : la première capitalisation (Total) pèse 12,48 % lorsque la dernière (Air France) seulement 0,54 %. Les dix premières pèsent plus de 60 % alors que les dix dernières seulement 8 % (voir figure 4 du chapitre 1). Cette concentration est d'autant plus surprenante que la France apparaît souvent comme le pays de la petite entreprise. Ainsi, en 1912, la France ne compte que 10 entreprises employant plus de 10 000 personnes contre 23 en Allemagne et 39 en Angleterre (Cassis, 1997). La distribution du poids des entreprises semble, y compris en France, obéir à une loi de puissance. Ce type de distribution a été mis en évidence pour la première fois par Pareto (1965) dans le cas de la distribution des fortunes. « De telles distributions ultra-étirées se manifestent fréquemment en économie. » (Samuelson, 1972).

II Origine sectorielle des profits

La capitalisation boursière est une mesure des profits c'est-à-dire de la création de richesses dans l'économie. Mesurés en termes relatifs par rapport aux services, l'industrie ne commence à générer d'importants profits que depuis les années 1920. Cette part des profits provenant de l'industrie décroît depuis les années 1960. A l'inverse, sur le long terme, quand

[108] Au 05 février 2008.

une stabilité suffisante règne, les services (banques, services publics) et l'énergie sont les principaux créateurs de richesses.

2.1 Une industrie fortement capitalisée n'est qu'un phénomène récent

Ce n'est qu'avec l'entre-deux-guerres que l'industrie voit sa capitalisation boursière (c'est-à-dire ses profits) s'affirmer et elle décline depuis les années 1960. L'industrie est ici entendue au sens large comme toutes les entreprises qui fabriquent des produits par opposition à celles qui les vendent ou qui vendent des services. Entre l'émergence d'un marché financier moderne et la Première Guerre Mondiale, et malgré l'image traditionnelle de maîtres de forges,[109] et les multiples conséquences de l'industrialisation (Barjot, 1997), l'industrie est quasiment absente de la bourse. Le poids de l'industrie dans la capitalisation boursière totale est très limité (inférieur à 7 %) jusque dans les années 1920. Alors seulement, avec ce que l'on nomme la « seconde révolution industrielle », l'industrie entame une phase ascendante continue qui culmine en 1961 avec un poids de plus de 69 %[110]. Depuis cette date, et conformément à la vision classique de la désindustrialisation, la part des sociétés de services augmente progressivement. Le caractère en partie artificiel de la désindustrialisation que cache le recours accru à la sous-traitance par les entreprises industrielles ne peut être que marginal par rapport à l'ampleur du mouvement.

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[109] Le Comité des Forges est fondé en 1864 pour défendre les intérêts des sidérurgistes français.
[110] Voir en Annexe A, la composition du HCAC 40 en 1961.

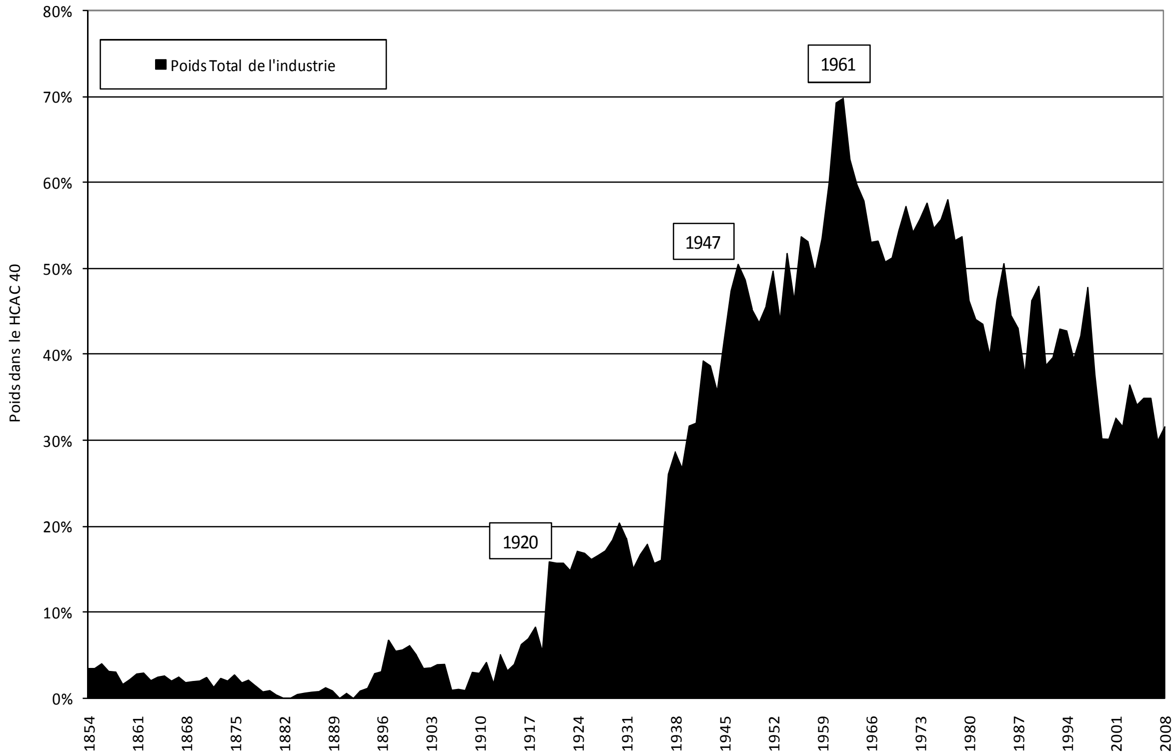

Figure 1, Poids de l’industrie (capitalisation boursière du secteur industriel sur la capitalisation totale).

Quels sont les secteurs qui ont porté l’industrie vers des valorisations boursières élevées ? Pour l’analyse, les entreprises industrielles sont grossièrement réparties en cinq groupes : sidérurgie-métallurgie-constructions mécaniques, équipements électriques, automobile, chimie-électrochimie-pharmacie et un groupe divers essentiellement composé des entreprises agroalimentaires et plus récemment du luxe et de l’hygiène. Le secteur emblématique de l’industrie, la sidérurgie, a toujours été faiblement valorisé. Au XIX^ème^ siècle, ce secteur ne dépasse pas 4 % de la capitalisation boursière. La sidérurgie atteint un sommet en 1960 avec plus de 16 %. Toutefois, ce record est probablement en partie artificiel car il correspond à une période où la sidérurgie est politiquement favorisée.

C’est avec la chimie et l’électro-chimie que l’industrie s’impose véritablement en bourse à partir des années 1930. Un secteur particulièrement profitable est celui de l’aluminium avec trois grosses capitalisations : Péchiney, Kuhlmann et Ugine. Aujourd’hui, ce sont des entreprises pharmaceutiques qui maintiennent le niveau de ce secteur. Les entreprises de constructions électriques s’affirment progressivement au cours du siècle. Elles pèsent plus de 10 % de la capitalisation française des années 1970 aux années 2000 ;

Alcatel[111] était la première capitalisation boursière française en 1993. Elles sont depuis sur le déclin. Conformément à sa diffusion chez les Français, l'automobile n'émerge que dans l'après-guerre et atteint ses sommets dans les années 1970 où ce secteur représente plus de 10 % du HCAC 40. Enfin, le groupe divers qui regroupe les autres entreprises industrielles (notamment alimentaires et luxe) entame lui aussi sa croissance dans les années 1920 et décroît depuis 1985 sans jamais avoir dépassé les 25 % de l'indice. Au final, l'industrie n'a représenté plus de 50 % de la capitalisation boursière française qu'entre 1948 et 1978.

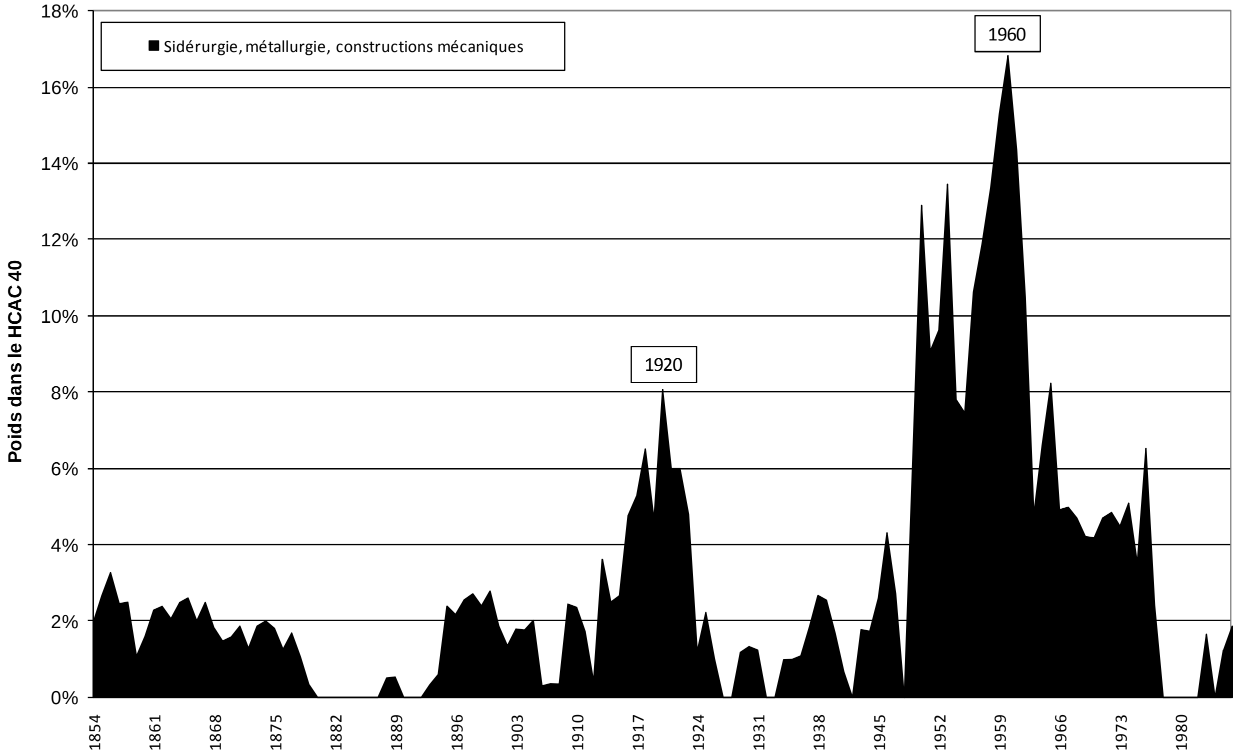

Figure 2, Poids de la sidérurgie dans le HCAC 40.

111 Voir Marseille (1992).

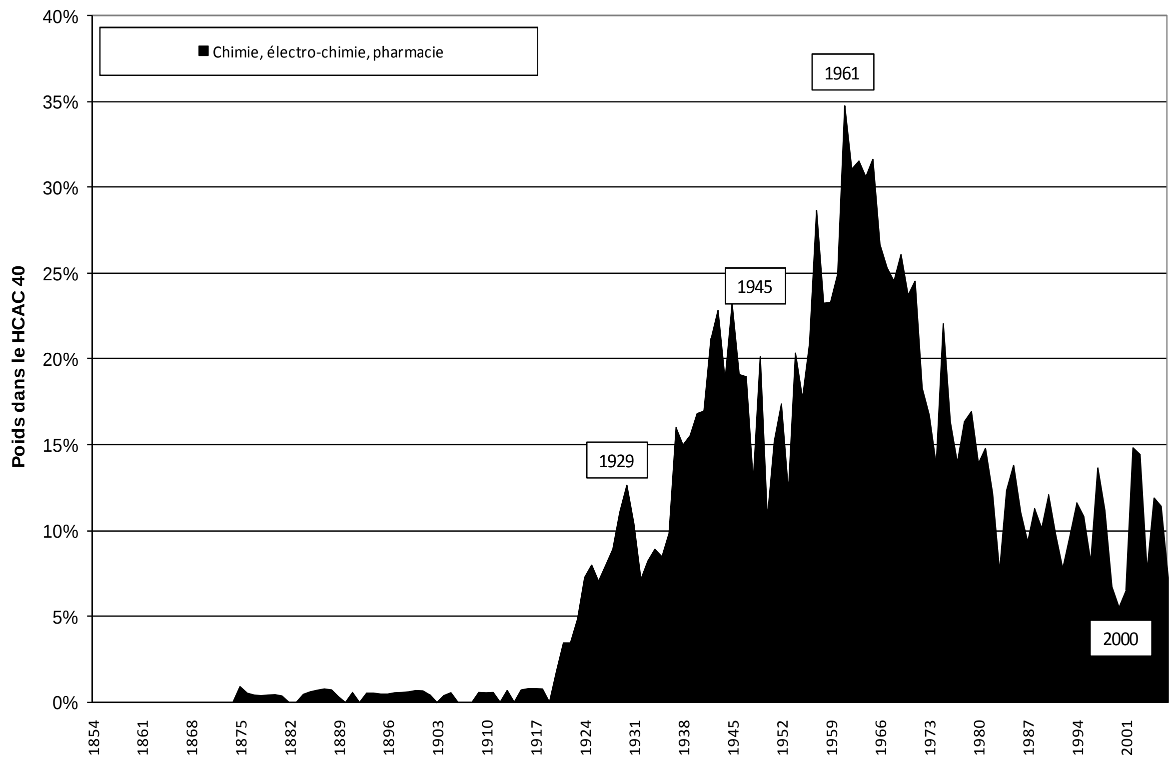

Figure 3, Poids de la chimie, électro-chimie, pharmacie dans le HCAC 40.

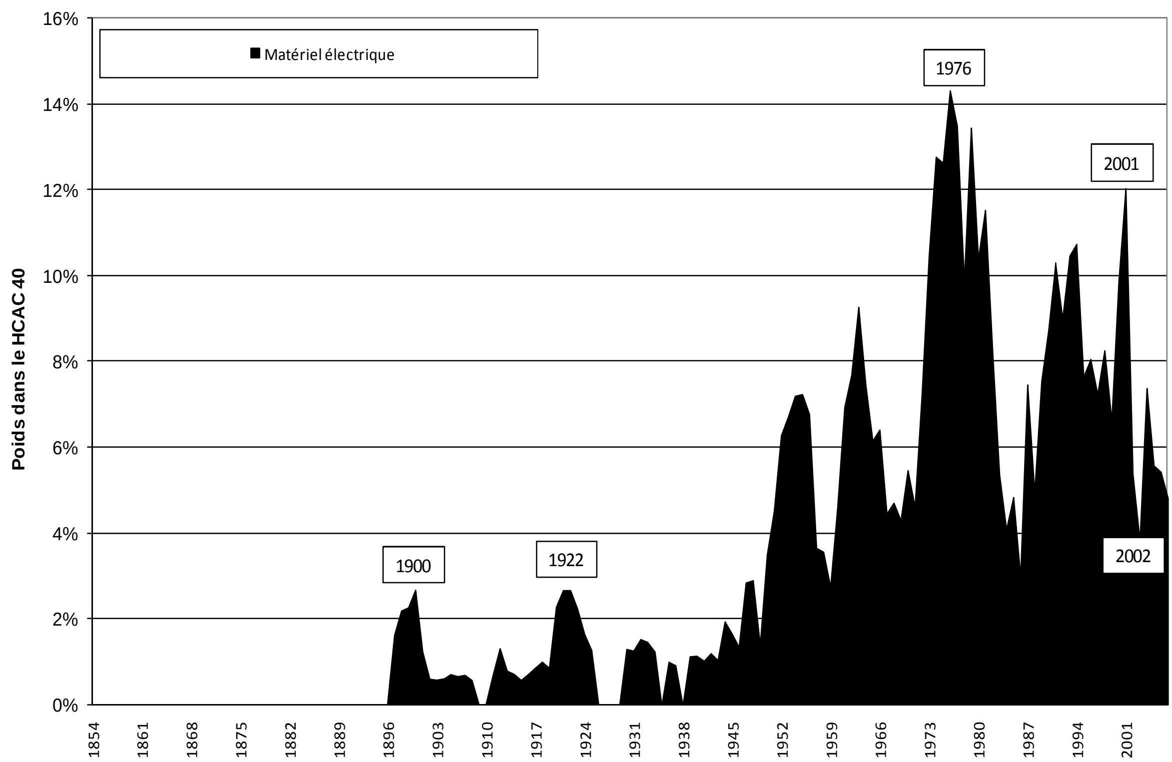

Figure 4, Poids des constructeurs de matériels électriques dans le HCAC 40.

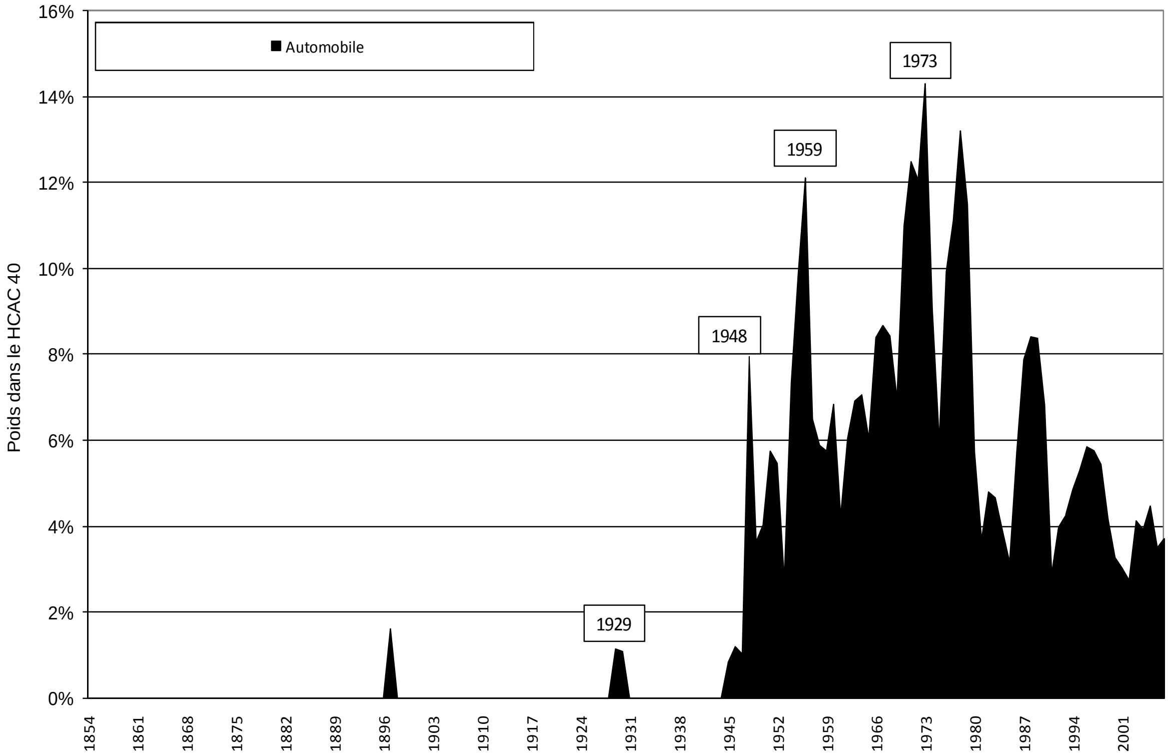

Figure 5, Poids du secteur automobile dans le HCAC 40.

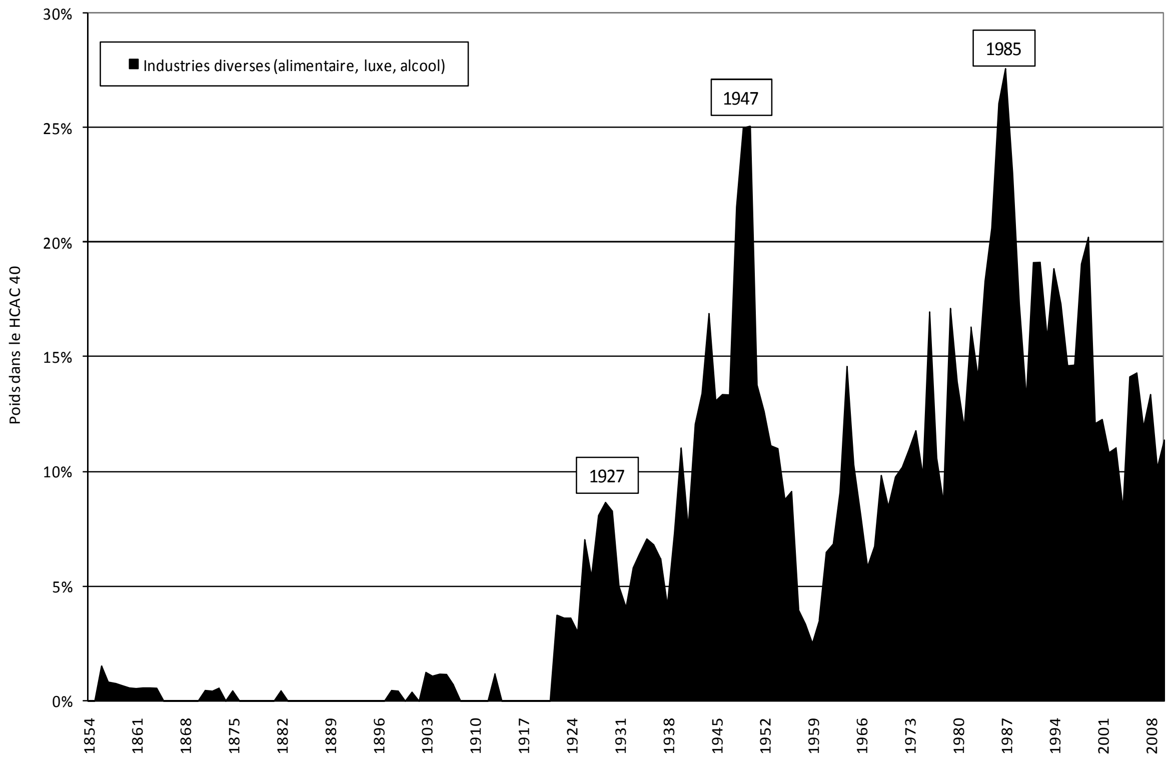

Figure 6, Poids des industries diverses (alimentaire, luxe, alcool…) dans le HCAC 40.

La faible création de richesse de l'industrie avant 1914 ne semble pas être un phénomène purement français. « La France est un pays industrialisé mais pas industriel » ? Pour la seule sidérurgie, le « géant » français, Schneider, est bien loin de ses homologues étrangers. En 1907, en termes de capitalisation boursière, Krupp pèse quatre fois plus lourd et US Steel est vingt fois plus important. Dans le secteur de la chimie pourtant bien représenté dans l'industrie française, Rhône–Poulenc fait figure de grosse PME avec 4 000 employés en 1929 contre 110 000 pour IG Farben ou 50 000 pour Imperial Chemical Industries en Grande-Bretagne (Bussière, 1998). Toutefois, en Angleterre, marché le plus comparable et le seul pour lequel des données détaillées existent avant 1914, la faiblesse de l'industrie est identique à celle observée en France (Grossman, 2006). En 1870, la capitalisation boursière anglaise est en majorité constituée par les chemins de fer (76 %), suivis des banques (11 %), du secteur gaz et eaux puis de l'assurance, l'industrie étant une part du groupe « divers » qui ne représente que 7% de la bourse de Londres. En 1913, ce groupe « divers » est à 18 % tandis que la capitalisation boursière anglaise est dominée par les banques (19 %), les chemins de fer (16 %), les mines (15 %) et l'assurance (7 %).

2.2 La banque, les services publics et l'énergie dominent sur la longue période

Quelles sont les entreprises qui dominent la bourse jusqu'à l'entre-deux-guerres et à nouveau depuis le début des années 1980 ? L'entreprise de service longtemps prépondérante est la compagnie de chemins de fer. Les chemins de fer constituent l'activité la plus dynamique du milieu du XIX$^{\text{ème}}$ siècle. Certains, comme Fogel (1964), prix Nobel 1993, ont montré le faible impact réel des chemins de fer sur la croissance économique. Sur le plan boursier ce secteur est en revanche incontournable. Il est toutefois probable que sa domination se soit prolongée tardivement par le biais des subventions publiques. Des profits artificiels, car prélevés par l'impôt avant d'être reversés sous forme de subventions, sont obtenus par les compagnies en échange de la construction et de la gestion de lignes déficitaires. L'inflation des années 1920 fait s'écrouler la valeur réelle de ces subventions. Le poids des chemins de fer en bourse diminue à la vitesse à laquelle l'inflation érode la valeur réelle de ces profits garantis et le secteur pèse moins de 6 % de la capitalisation boursière lorsqu'il est nationalisé en 1936.

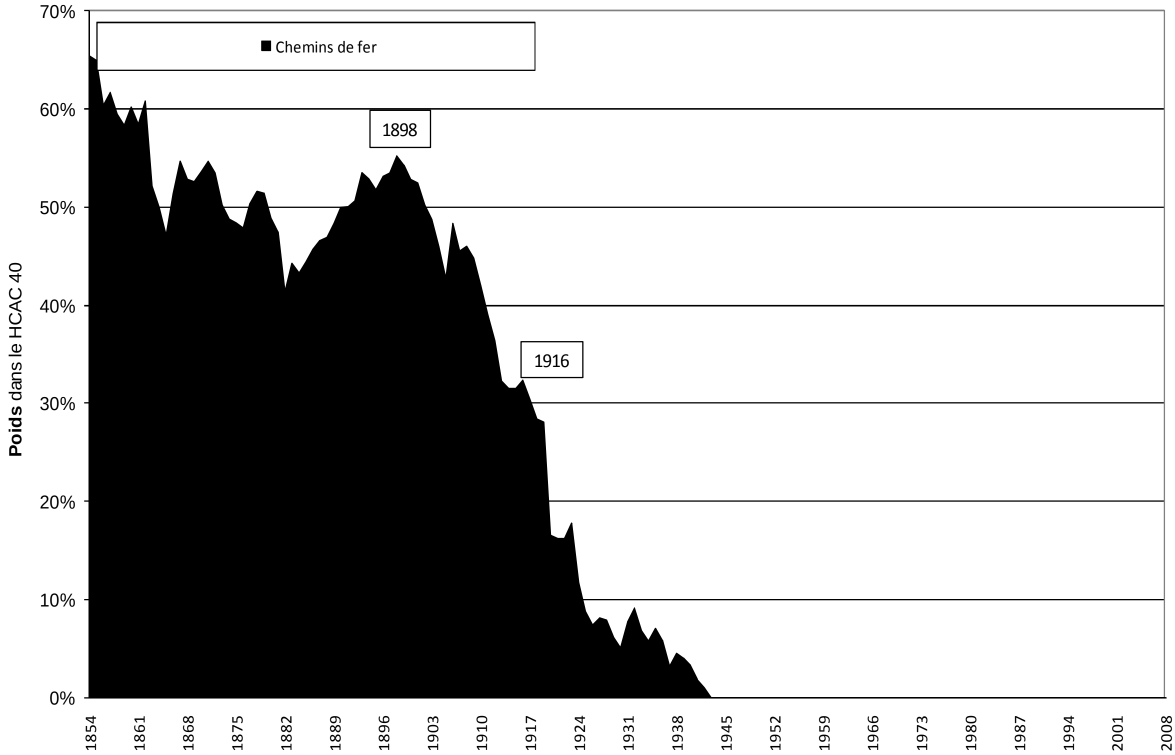

Figure 7, Poids des compagnies de chemins de fer dans le HCAC 40.

Les autres entreprises de service public, essentiellement l'eau et le gaz, pèsent autour de 10 % avant 1914 soit nettement plus que l'industrie. Elles aussi voient leur poids s'écrouler à la suite de la Première Guerre Mondiale à cause de l'inflation qui fait monter leurs coûts alors que leurs prix de vente sont fixés par les contrats de concession. Entre les années 1921 et 1924, le secteur disparaît totalement du HCAC 40. En 1924, dès le retour d'une certaine stabilité monétaire, elles connaissent une nouvelle phase de croissance avec les entreprises de production et de distribution d'électricité. Les nationalisations de la Libération limitent le secteur « services publics » aux deux grandes entreprises de gestion des eaux, et seuls les mouvements de dénationalisation de ces dernières années permettent à ce secteur de retrouver un poids important. L'apparition spectaculaire du « nouveau » service que sont les télécommunications se manifeste clairement en 2000 avec une forte hausse de ce groupe. Ce groupe se maintient à un niveau élevé malgré la chute des valeurs télécom grâce à l'introduction des entreprises que sont devenues EDF et GDF.

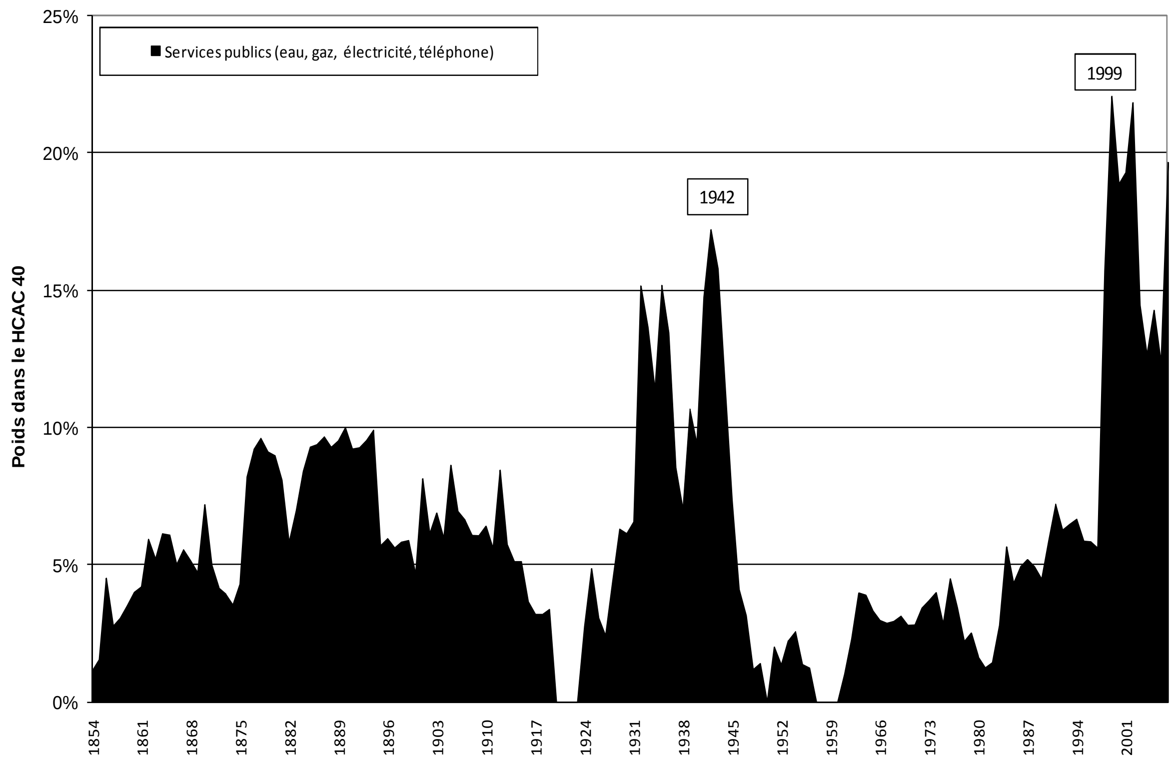

Figure 8, Poids des entreprises de services publics dans le HCAC 40.

Un autre groupe d'entreprises de concessions de services publics est celui des infrastructures. Présent depuis l'origine de la bourse moderne (l'action des Trois vieux Ponts sur la Seine est l'une des trois premières sociétés cotées à Paris), ce secteur connaît son maximum avec le succès du Canal de Suez. Ainsi, en 1936, la réussite du canal conjuguée avec la déprime boursière française font de Suez, la première capitalisation française avec 23 % du HCAC 40. Les nationalisations dans les pays d'accueil font disparaître les infrastructures sorties indemnes des effets de l'inflation (Suez et le Port de Rosario en Argentine). Ce secteur est à nouveau représenté entre 1989 et 1995 avec Eurotunnel. Il est probable que dans l'avenir des réussites boursières se dégagent de la multitude d'infrastructures (autoroutes, aéroports, parkings…) projetées ou déjà sous concessions.

Toutefois, le système financier contemporain n'a pas entièrement retrouvé les capacités de l'époque. S'il est possible depuis les années 1980 de lever des sommes importantes sur le marché obligataire à des taux attractifs, l'amortissement apparaît d'une faible durée par rapport à la situation prévalant avant 1914. A cette époque, il était normal d'amortir un prêt sur plusieurs décennies aussi bien pour des compagnies de chemins de fer que pour un particulier (les prêts du Crédit Foncier étaient amortissables sur 50 ou 80 ans).

Les infrastructures sont des investissements lourds qui ne deviennent rentables que si leur amortissement est étalé sur une durée cohérente avec l'espérance de vie de ces projets. Le canal de Suez n'aurait certainement pas été réalisé s'il avait fallu amortir les travaux sur vingt ou trente ans qui constituent aujourd'hui le maximum qu'une entreprise puisse obtenir. Cette faiblesse actuelle trouve probablement une cause dans le manque de stabilité de la monnaie.

C'est parce que dans la seconde moitié du XIX^{ème} siècle, les épargnants sont capables de s'engager sur des durées longues que les entreprises gestionnaires d'infrastructures se sont multipliées. Il est probable que les investissements en infrastructures réapparaitront dès que les entreprises pourront se financer sur des échéances cohérentes avec la durée de vie de ces projets. En effet, les besoins sont potentiellement illimités, seul le manque de rentabilité limite les créations. En 2010, dans des conditions de marché très particulières caractérisées par la fuite des emprunteurs risqués, les emprunts sur longue durée font leur retour. Rabobank, une banque notée AAA a émis des obligations amortissables sur 100 ans tout comme la compagnie ferroviaire américaine Norfolk Southern pour des montants modestes de 350 et 250 millions de dollars mais surtout à des taux faibles de 5,80 et 5,95 %. Sur des durées de 40 et 50 années, EDF et GDF-Suez ont émis pour des montants bien plus importants. (1 milliard et 700 millions de sterling). Par ailleurs, des emprunts de type perpétuels mais avec des options de remboursement pour l'émetteur assorties d'une révision de taux en cas de non remboursement ont été émises par des sociétés comme Scottish & Southern Energy, Suez Environnement ou RWE.

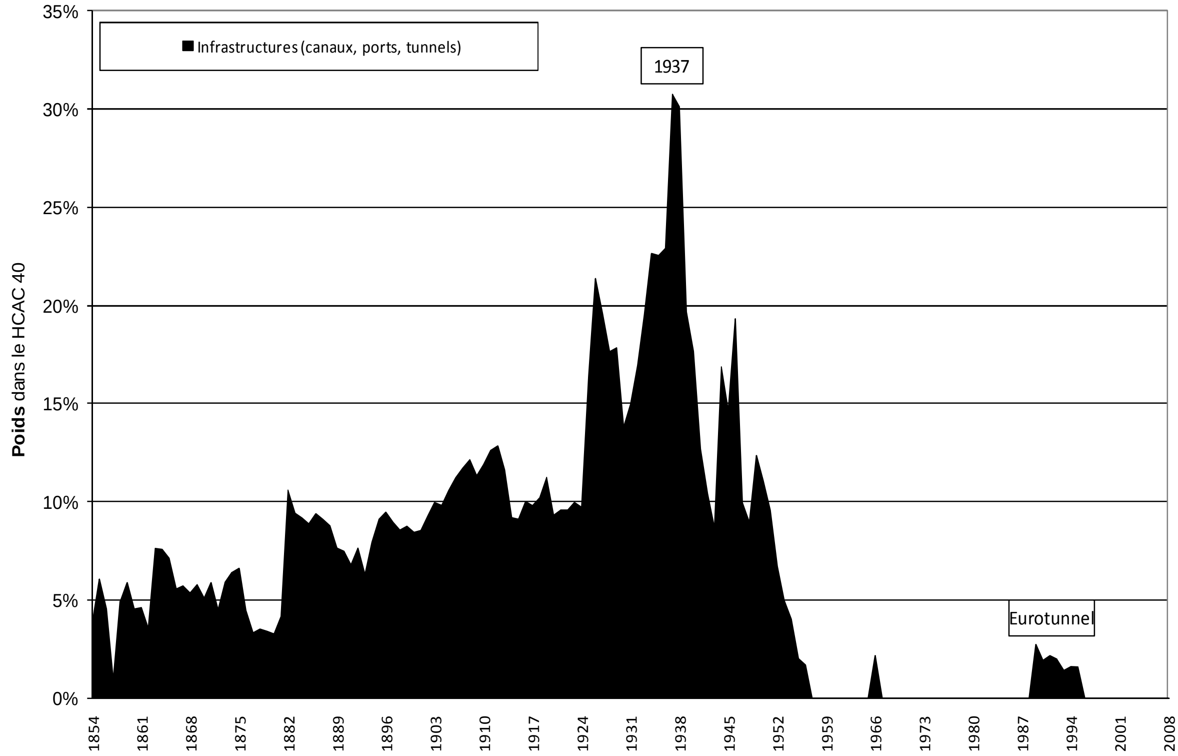

Figure 9, Poids des infrastructures dans le HCAC 40.

L'autre activité fortement créatrice de richesses sur le long terme regroupe les services financiers. Les assurances sont jusqu'aux années récentes trop dispersées pour figurer parmi les quarante premières capitalisations. Ce groupe est donc, pendant longtemps, constitué des seules banques. Avec les infrastructures, c'est l'autre secteur d'origine de la bourse. A Gênes, la Caisse Saint-Georges est cotée depuis le quinzième siècle ; la Banque de France représente à elle seule la majorité de la capitalisation boursière française jusqu'à la naissance des chemins de fer. Le poids relatif de l'entreprise émettrice du billet de banque diminue progressivement jusqu'à la nationalisation de son capital en 1945. Dès 1875, les seules banques commerciales pèsent plus de 15 % de la capitalisation. Ce secteur chute brutalement avec la nationalisation des quatre premières banques commerciales à la Libération. Les banques descendent alors sous les 5 % mais remontent progressivement à la faveur de nouvelles réussites comme la Compagnie Bancaire, Indosuez ou Cetelem. Ainsi, dès 1972, les banques commerciales représentent à nouveau 15 % de la capitalisation boursière. Les nationalisations de 1981 (Paribas et Indosuez et les dernières banques indépendantes comme le CIC, le Crédit du Nord, le Crédit Commercial de France, la Hénin…) ne réduisent que pour quelques années le poids des banques dans la capitalisation. A partir de 1986[112], les dénationalisations, permettent une rapide remontée au-delà des 15 % de la capitalisation boursière avec un sommet de 22 % en 2005 et 2006.

Il est à noter que le poids des banques ainsi mesuré n'apparaît pas exceptionnel à la veille de la crise financière de 2007-2008. Les 22 % que pèse la finance dans l'ensemble des entreprises cotées à la veille de la crise restent très loin des 36 % atteints entre 1921 et 1923. Il n'y a donc pas eu dans les années récentes une hypertrophie du secteur bancaire par rapport aux autres secteurs économiques. Avec la crise de 2008-2009, les cours des valeurs financières s'effondrent. Surtout elles baissent plus que la moyenne des autres entreprises. Ainsi, lors du plus bas boursier enregistré le 9 mars 2009, les banques et assurances ne représentent plus que 9,30 % du CAC 40. Nationalisations mises à part, les banques commerciales n'étaient jamais descendues si bas depuis 1863. Cet épisode extrême est vite effacé car au premier janvier 2010, le secteur représente à nouveau 17 % du CAC 40. Cette rapide reprise n'est toutefois pas uniquement le fruit de facteurs de marché puisque le secteur a fait l'objet de mesures d'aides à travers des prêts publics à taux préférentiels et la mise à disposition par la banque centrale de financements artificiellement bon marché.

[112] La loi d'habilitation du 2 juillet 1986 prévoit le transfert au secteur privé, dans un délai de cinq ans, de 65 entreprises publiques.

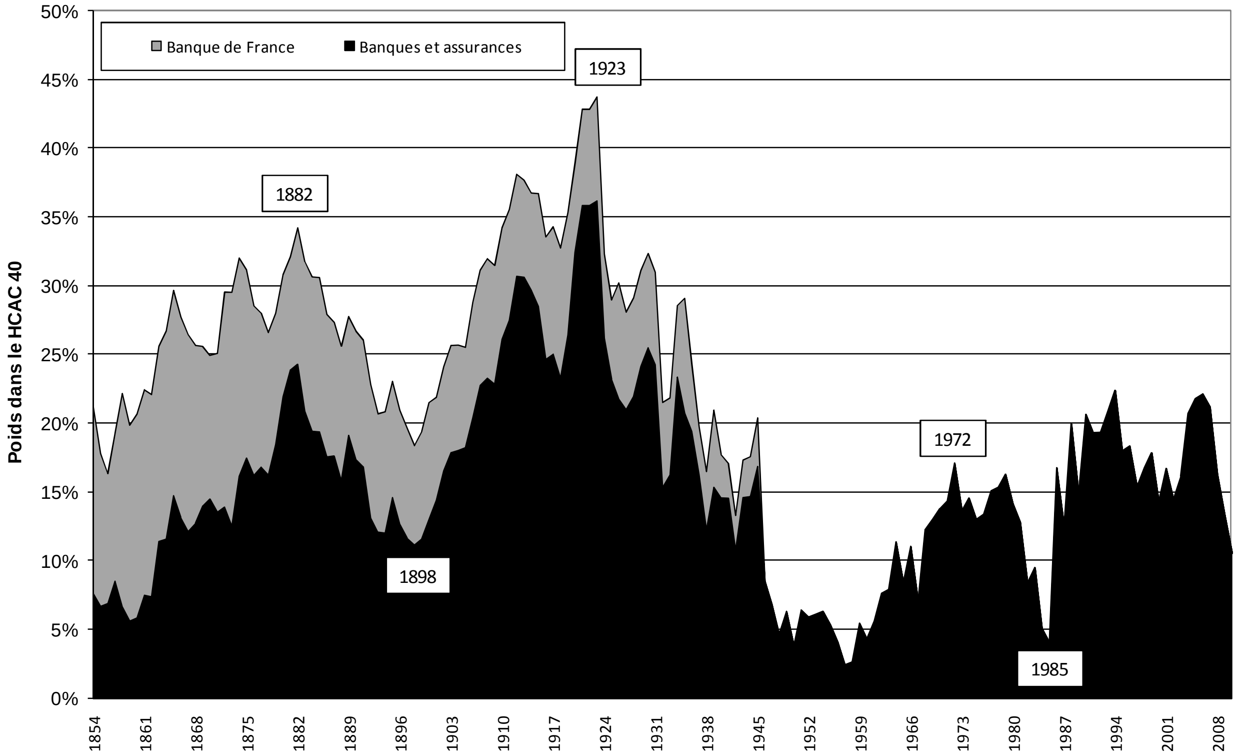

Figure 10, Poids des services financiers avec la Banque de France distinguée.

Le ratio capitalisation boursière des banques sur PIB donne une indication similaire. Compte-tenu du rôle clef des banques dans l'économie et des interrogations que ce dernier peut susciter, la valorisation de ce secteur est également mesurée en pourcentage de PIB. Ce ratio indique le coût du secteur financier pour l'ensemble de l'économie. En effet, la capitalisation boursière est la valeur présente des futurs profits. C'est donc une mesure de la valeur des futurs profits rapporté à l'ensemble des créations de richesse. Rapportée à la production de richesse du pays, la capitalisation des banques épouse une courbe en forme de U encore plus marquée que celle de l'ensemble de la bourse (voir chapitre 1). A partir de 1865, la capitalisation du secteur financier représente plus de 5 % du PIB. C'est en 1916 que ce plancher est enfoncé. Il est tout juste à nouveau atteint en 1929 et 1930. Il faut attendre 1999 pour que le niveau de 1914 soit rattrapé alors que la totalité de la capitalisation boursière dépasse le niveau d'avant-guerre dès 1990 (voir Figure 11). Le récent développement des banques ne s'est pas réalisé au détriment des autres secteurs économiques, et il a crû bien moins vite que les autres en pourcentage de PIB.

Les banques ont donc connu une hausse de leur valorisation moins rapide que l'ensemble de la bourse. Mais la comparaison historique peut être délicate car l'économie actuelle se prête probablement plus à l'introduction en bourse d'entreprises que lorsque l'agriculture occupait une place encore décisive dans le PIB. En tous cas, il est frappant de constater que le secteur financier a connu ces dernières années une pointe à plus de 12 % du PIB, exactement comme en 1882 à la veille d'une grave crise boursière et d'une longue dépression. La chute des valeurs bancaires au printemps 2009 ramène leur prix à 3 % du PIB, un niveau digne des mauvaises années de la première moitié du XX^{ème} siècle. Faiblesse extrême rapidement oubliée avec le retour à d'exceptionnels profits bancaires au cours de l'année 2009.

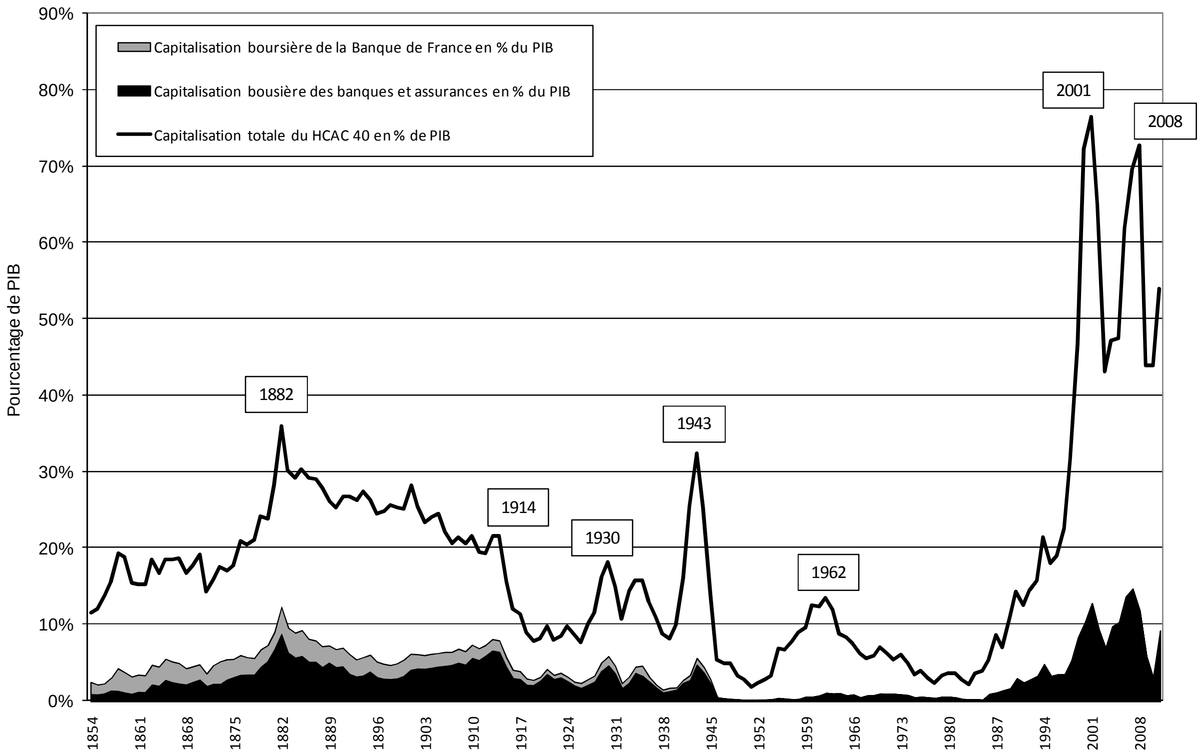

Figure 11, Valorisation en pourcentage de PIB des services financiers avec la Banque de France distinguée et du HCAC 40.

Enfin, les services qui n'appartiennent pas à un groupe suffisamment large sont regroupés dans une catégorie « divers ». Avant 1914, cette catégorie est composée de sociétés immobilières lorsque la conjoncture est porteuse, ou de services maritimes comme la Compagnie Générale Transatlantique et parfois de grands magasins. Malheureusement, ce groupe comprend également quelques cas de sociétés holding et il est impossible de re-ventiler leurs actifs. Depuis la Seconde Guerre Mondiale et notamment depuis les années 1980, de nouvelles activités se sont imposées comme de grandes sources de profit tels les services informatiques avec Cap Gemini, le tourisme avec le Club Med et surtout la grande distribution et le BTP. Ces groupes incarnent la vision traditionnelle de la mutation de l'économie vers les services.

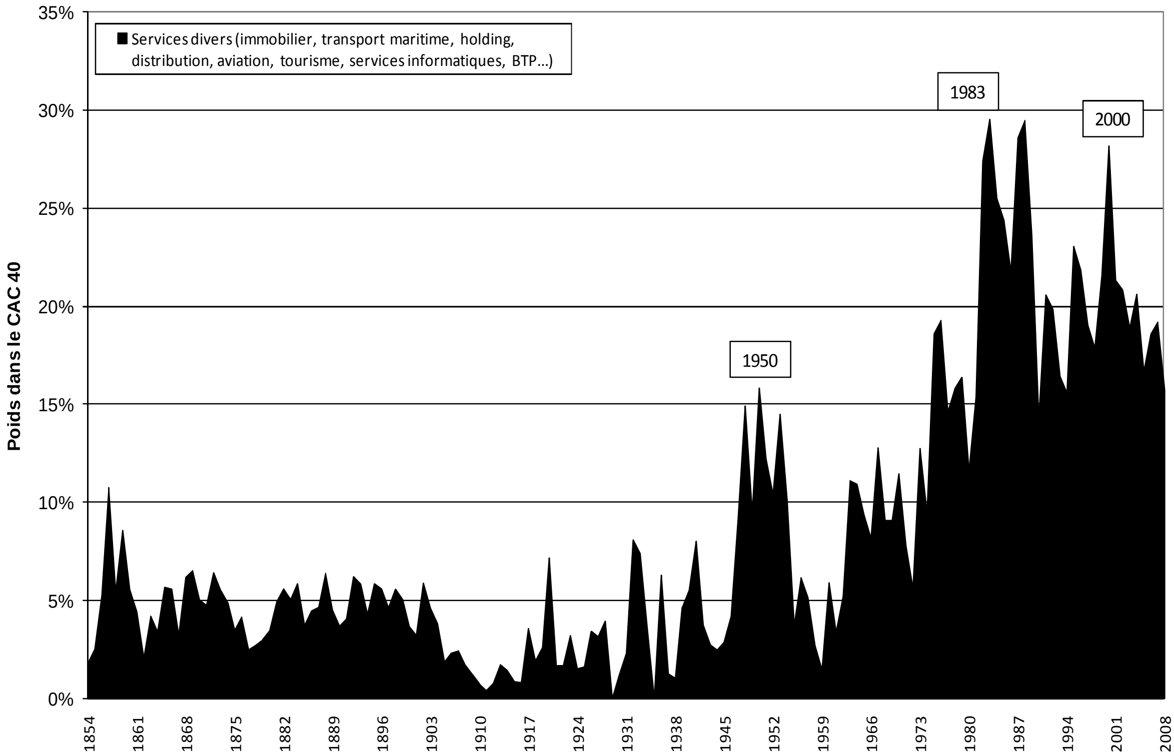

Figure 12, Poids des entreprises de services divers.

Pour finir, le secteur primaire se distingue sur le long terme avec principalement les mines de charbon et le pétrole. Même si les mines, notamment celles de charbon, ont longtemps été à la base de l'industrie lourde, il est important de les distinguer de l'industrie proprement dite. De la même manière qu'aujourd'hui la distinction se fait entre les compagnies pétrolières et les représentants de l'industrie que sont les fabricants d'automobiles. Les valeurs charbonnières décollent après la Première Guerre Mondiale, mais elles sont en même temps productrices d'électricité (les centrales thermiques sont installées à proximité des bassins houillers). Dans l'entre-deux-guerres, quelques autres entreprises minières atteignent une capitalisation boursière importante comme les Phosphates de Gafsa, le

Nickel (actuel Eramet) ou Pennaroya (devenu ensuite Métaleurope). C'est surtout à partir de 1954 que le secteur primaire devient décisif jusqu'à représenter près de la moitié de la capitalisation boursière française. En 1954, les valeurs pétrolières voient leurs cours exploser à la suite de celui de Esso. La filiale française d'Exxon voit son cours multiplié par dix dans l'année suite à la découverte de pétrole à Parentis (dans les Landes). 1954 est également l'année où le nombre de voitures en circulation augmente de près de 30 % ce qui permet à la France d'atteindre le niveau de voitures par habitants dépassé aux Etats-Unis dès 1920 (Rostow, 1997). En 1955, quatre des cinq premières capitalisations sont des valeurs pétrolières (Esso, Française des Pétroles, Shell française et Pétroles d'Aquitaine). Ce secteur qui ne comporte plus qu'une seule entreprise depuis la fusion Total-Elf en 2000, se maintient autour des 10 %.

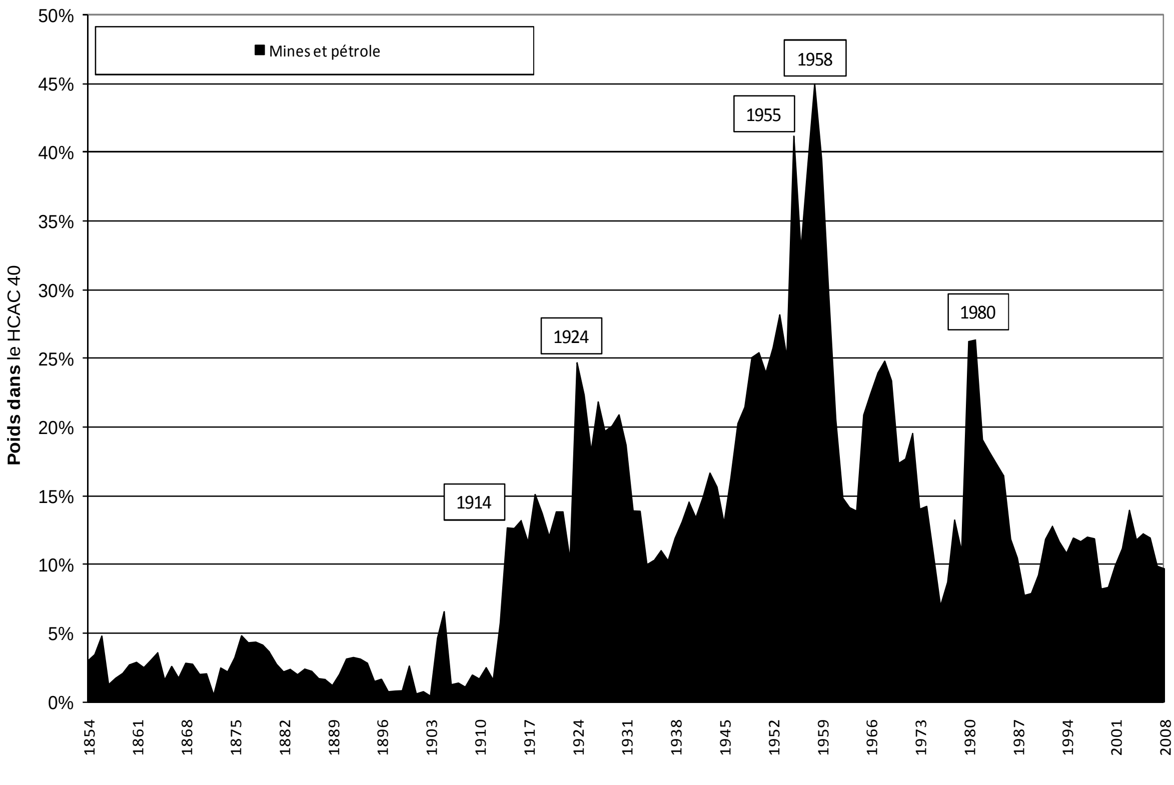

Figure 13, Poids du « secteur primaire » (mines et pétroles).

III Ce que le passé dit de l’avenir

Les capitalisations boursières montrent une baisse des profits générés par l’industrie comparés à ceux des autres secteurs depuis les années 1960. Une étude systématique vérifie qu’il n’y a pas de corrélation entre le poids de l’industrie et la croissance du PNB. Les « services publics » au sens large peuvent redevenir d’importants générateurs de croissance.

3.1 L’absence de corrélation entre industrie et croissance économique

Il apparaît clairement qu’il n’existe aucune corrélation entre le poids boursier de l’industrie et la croissance économique du pays. A la lumière des capitalisations boursières, l’industrie n’a été un important créateur de richesse que durant quelques décennies. Ces décennies sont notamment celles des « Trente Glorieuses » qui constituent pour beaucoup un idéal perdu. Il y a toutefois eu de la croissance avant l’industrialisation telle qu’elle apparaît en bourse et des difficultés économiques avec une industrie forte. Afin de tester avec plus de précision la relation entre industrie et croissance, une simple régression est instructive. Le R^2 très faible indique que le poids de l’industrie n’est pas lié à la croissance économique. Les bonnes années des « Trente Glorieuses » qui apparaissent en haut à droite ne doivent donc pas faire illusion : la croissance économique peut être importante alors que l’industrie ne génère que très peu de profits.

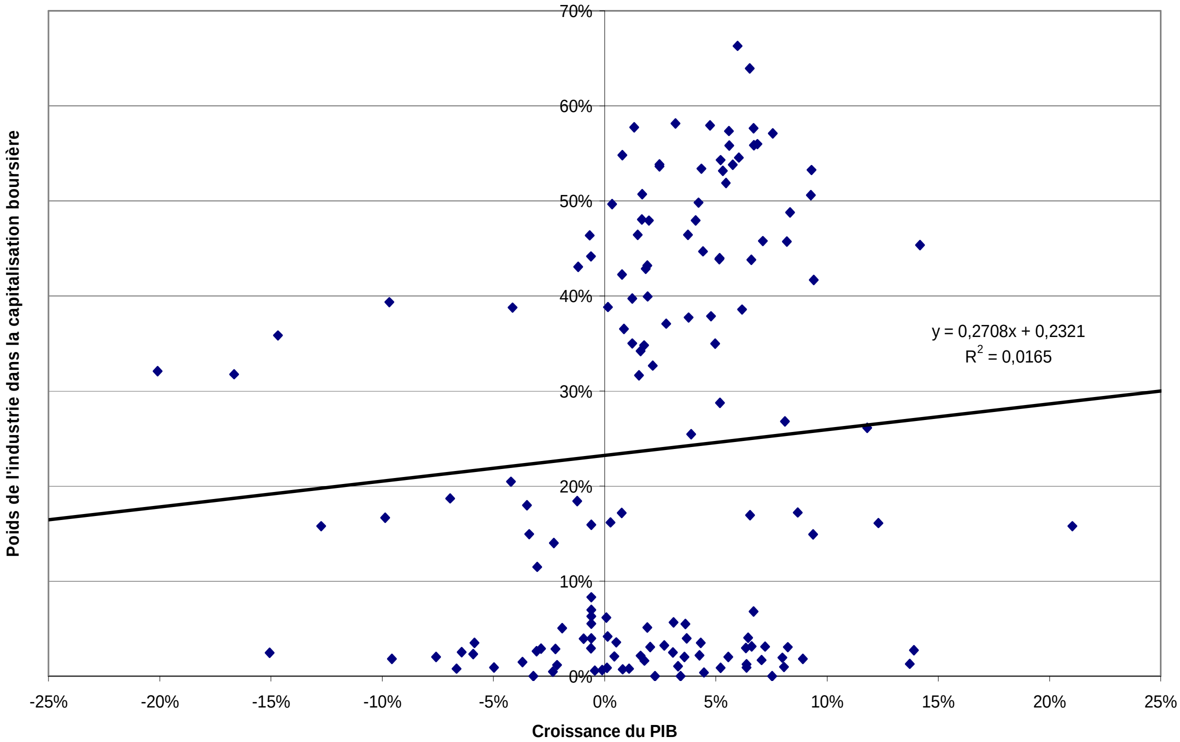

Figure 14, Absence de corrélation entre le poids de l'industrie et la croissance du PIB. Sources : Bourguignon et Lévy-Leboyer, INSEE pour le PIB et auteur.

3.2 La stabilité est nécessaire à l'épanouissement de certains services

Pour exister, c'est-à-dire pour attirer les investissements nécessaires à leur création, certains services exigent une grande stabilité. Les infrastructures ou autres réseaux de services publics sont une sorte de bien « immobilier » en ce sens qu'ils ne peuvent se distinguer du territoire sur lequel les investissements ont lieu. Ces entreprises sont donc totalement soumises au bon vouloir politique. Pour que ces services émergent, la première condition est donc que le risque d'expropriation à vil prix soit très faible. Cela semble le cas en France depuis seulement 20 ans. L'autre condition est une stabilité monétaire suffisante pour pouvoir obtenir des taux d'intérêt réels suffisamment bas pour rentabiliser ces équipements. Ces conditions doivent être garanties sur une durée longue pour que les investissements soient réalisés. Dans ces conditions, ces secteurs peuvent générer d'importants profits.

Loin de constituer des rentes de situation, les entreprises de service public sont souvent sur des secteurs économiques moteurs. Pour certains, la disparition des entreprises sous concession (chemins de fer, tramways, métropolitain, gaz…) dans les années 1920 serait juste l'élimination de vieilles rentes qui, mise à part l'immoralité d'une telle spoliation, est bénéfique à la collectivité. C'est oublier le caractère très novateur de ces activités en leur temps comme l'est aujourd'hui le déploiement de la fibre optique ou les réseaux de téléphonie mobile. Les équipements de services publics ont par nature une durée de vie longue et un amortissement très étalé, indispensable à leur rentabilité. Il apparaît donc que les entreprises de service public ne peuvent se développer que lorsqu'une stabilité économique suffisante règne pour attirer des capitaux vers ce type d'investissement de long terme. Ainsi, dès 1924, avec le rétablissement des équilibres financiers français, un nouveau secteur sous concession se développe de façon très dynamique : la production et la distribution d'électricité.

A l'inverse, il faut éviter l'engouement artificiel pour les services publics. Le poids élevé des chemins de fer dans la capitalisation boursière est en partie artificiel après 1883. A cette date se met en place la convention Freycinet qui subventionne les compagnies privées pour construire le réseau secondaire qu'elles refusaient d'entreprendre faute de rentabilité. Les politiciens s'étaient livrés à une véritable « démagogie ferroviaire » (Caron, 1997) qui visait à établir une sorte d'égalité des français devant le chemin de fer : « à chaque sous-préfecture sa gare ». L'immense réseau non rentable (le réseau double presque de taille, Toutain, 1967) est donc réalisé par les compagnies privées grâce à ces subventions, privant ainsi les secteurs réellement productifs de capitaux. A titre de comparaison, en 1913, les chemins de fer pèsent encore 32 % de la bourse française contre seulement 16 % en Angleterre. Ces lignes seront les premières fermées dans les années 1950, quelques décennies après leur réalisation. Ce ne sont jamais les projets qui manquent mais les capitaux pour les financer et la rentabilité, c'est-à-dire la création de richesse, doit décider des priorités. A cette réserve près, les services publics peuvent grandement contribuer à la croissance.

3.3 La création de richesse peut provenir des services autant que de l'industrie

L'histoire des capitalisations boursières montre que c'est dans un contexte particulier que l'industrie est devenue la principale source de profit en France. Ce sont tout d'abord les entreprises de la « seconde révolution industrielle », notamment la chimie, l'automobile ou les constructions électriques qui atteignent leur maturité dans l'après-guerre, permettant de générer d'importants profits. Ensuite, cette forte présence de l'industrie est en partie artificielle. La montée du poids de l'industrie dans les années 1920, comme sa baisse récente, peuvent être appréhendées comme le résultat de la variation des autres activités. Elle résulte de processus probablement plus politiques qu'économiques.

Des choix politiques, nationalisations et inflation, au XX$^{\text{ème}}$ siècle ont fait disparaître certains types de services. Tout d'abord, les secteurs qui laissent la place à l'industrie sont ceux qui souffrent le plus de l'inflation qui est une forme de décision politique. Ensuite, le programme du Conseil National de la Résistance du 15 mars 1944 est clair, il faut organiser « le retour à la nation de tous les grands moyens de production monopolisés fruits du travail commun, des sources d'énergie, des richesses du sous-sol, des compagnies d'assurance et des grandes banques. » Les nationalisations de la Libération touchent près de 30 % de la capitalisation de 1939 et font disparaître de l'échantillon les profits générés par certains secteurs non industriels (charbon, gaz, électricité, banques). Mécaniquement, la part de l'industrie augmente à la suite de cette décision.

Le retour à la sérénité politique et monétaire autorise l'essor progressif d'activités de services au sein du secteur privé. Les services financiers ont rapidement retrouvé leur place de long terme à la fois par la croissance, notamment sur des activités nouvelles, des entreprises restées privées et par les dénationalisations intervenues à partir du milieu des années 1980. L'exposé des motifs du projet de loi[113] de nationalisation des assurances en 1946 comporte un aveu explicite, sur la nécessité de conserver « un secteur libre assez fort pour pouvoir s'adapter aux branches inédites de l'assurance ». Mais aussi par la conservation intacte des structures antérieures dans les entreprises nationalisées. Pour les banques et les assurances, les entreprises nationalisées à la Libération ou en 1981 conservent leurs raisons sociales, l'Etat se substitue « seulement » aux actionnaires. Ainsi, les dénationalisations des années 1980 permettent une rapide remontée de ce secteur. Les banques représentent aujourd'hui une capitalisation relative à peine inférieure à celle constatée avant la Seconde Guerre Mondiale.

Le secteur des services publics est plus lent à retrouver une part importante dans la génération de profits. Ce sont surtout les télécommunications qui sont à l'origine de réussites récentes et rapides d'entreprises de « services publics ». La fluidité actuelle de ce marché, la rapidité des innovations et l'importance des besoins ne peuvent que susciter de nouveaux succès dans ce domaine. Une autre branche des services publics le secteur de l'énergie, est à

[113] 34 sociétés sont nationalisées par la loi du 26 avril 1946 mais celles dont les primes encaissées sont inférieures à un milliard de francs demeurent libres.

nouveau présente sur le marché par la privatisations d'EDF et de GDF. Mais à la diversité d'avant-guerre se sont substitués trois monopoles depuis les nationalisations de la Libération. 61 sociétés minières disparaissent[114] pour donner naissance aux Charbonnages de France, fusion qui accompagnera la baisse de rentabilité du charbon français. Dans le cas de l'électricité et du gaz[115], 869 sociétés (avec 975 000 actionnaires) sont nationalisées et fondues dans les monopoles de l'Electricité de France et du Gaz de France. Ces deux géants sont encore tellement dominants que peu de sociétés peuvent créer des richesses dans l'énergie mais cette situation est probablement transitoire. Enfin, la demande d'infrastructure ne connaît de limite que leur rentabilité. Des perspectives stables encouragent le développement de nouvelles infrastructures. Des entreprises dédiées d'importance n'existent plus depuis la quasi faillite d'Eurotunnel mais ces activités sont en fait déjà réapparues à travers des entreprises de BTP comme Eiffage avec l'emblématique viaduc de Millau et surtout le succès de Vinci et de ses parkings.

Enfin, le développement de nouvelles entreprises de services auquel on assiste depuis la Seconde Guerre Mondiale devrait se poursuivre. Les nouveaux services comme la grande distribution, les services informatiques ou le tourisme répondent à des attentes nouvelles et parviennent à créer d'importantes richesses supplémentaires. Il n'y a aucune raison pour que cette demande de services supplémentaires s'amenuise.

IV Conclusion

A la question, la France peut-elle se développer sans industrie, la réponse de la bourse est clairement affirmative. Il y a trente ans, Alfred Sauvy (1966) dénonçait déjà les technocrates qui voyaient dans l'industrie la source de toutes les richesses comme avant eux les physiocrates avaient cru l'avoir trouvée dans la terre. Cette vision erronée a provoqué de nombreuses catastrophes dans les pays socialistes et de beaux gâchis en France. Combien de plans de relance industriels depuis cinquante ans[116] alors que c'est un secteur des services, le tourisme, qui devenait dans le même temps la principale source de devises ? La France s'est développée pendant longtemps grâce à d'autres moteurs que les entreprises industrielles. Au contraire, la forte part de l'industrie dans la création de profit ressemble plus à un accident

[114] Loi du 17 mai 1946.
[115] Loi du 29 mars 1946.
[116] Le rapport « Pour une nouvelle politique industrielle » de Jean-Louis Beffa, remis en 2005 s'inscrit dans cette longue lignée.

qu'à un résultat purement économique. L'industrie joue un rôle positif lorsqu'elle est rentable comme le démontre l'Allemagne depuis presque toujours. Mais il ne faut pas s'inquiéter de voir sa place diminuer, surtout si cette diminution est le résultat de gains de productivité. A défaut de nouveaux produits, de nouveaux services, sources de richesses supplémentaires, continueront à apparaître. Les années qui viennent, grâce à un contexte favorable, doivent permettre à des entreprises de services publics, d'infrastructures ou de réseaux de retrouver un rôle majeur. Peut être l'énergie jouera-t-elle demain le rôle que les chemins de fer ont tenu hier ?

REFERENCES

Barjot D. (ed.) (1997), *Industrialisation et Sociétés en Europe Occidentale*, Paris, CNED-SEDES.

Bussière E. (ed.) (1998), *Industrialisation et société en Europe occidentale*, Paris, Armand Colin.

Caron F. (1997), *Histoire Générale des chemins de fer*, Fayard, Paris.

Caron F. (1995), *Histoire économique de la France*, Armand Colin, Paris.

Cassis Y. (1997), *Big Business. The European Experience in the Twentieth Century*, Oxford, Oxford University Press.

Fogel R.W. (1964), *Railroads and American Economic Growth: Essays in Econometric History*, Baltimore, John Hopkins Press.

Grossman R. And S. Shore (2006), “The cross-section of stock returns before WWI”, *Journal of Financial and Quantitative Analysis*, 41, p. 271-294.

Le Bris D. and P-C. Hautcoeur (2010), “A Challenge to Triumphant Optimists? A Blue Chips Index for the Paris Stock-Exchange (1854-2007)”, *Financial History Review*, 27, p. 141-183.

Marseille J. (dir.) (1992), *Alcatel-Alsthom, histoire de la Cie Gale d'Electricité*, Paris, Larousse.

Miller M.H.and F. Modigliani (1961), “Dividend Policy, Growth and the Valuation of Shares”, *Journal of Business*, 34, p. 411-433.

Pareto W. (1965), *Ecrits sur la courbe de la répartition des richesse*s, Genève, Droz (22ème ed.).

Rajan R. and L. Zingales (2003), “The Great Reversal: the Politics of Financial Development in the 20th Century”, *Journal of Financial Economics*, 69, p. 5-50.

Rostow W.W. (1997), *Les étapes de la croissance économique, un manifeste non communiste*, Paris, Economica.

Samuelson P. (1972), *L'économique*, Paris, Armand Colin.

Sauvy A. (1966), *Mythologies de notre temps*, Payot, Paris.

Sharpe W., Alexander G. and J. Bailey (1999), *Investments*, Upper Sade River NJ, Prentice Hall.

Toutain J-C. (1967), « Les transports en France de 1830 à 1965 », *Cahiers de l'ISEA*, série AF n. 8, Paris, Institut de Science Economique Appliquée.

Annexe A,

Composition et poids du HCAC 40 avec l'année record pour l'industrie (1961) et la dernière année sans aucune entreprise industrielle (1892).

1892			1961		
RNG	NOM	POIDS	RNG	NOM	POIDS
1	Paris Lyon Méditérannée	14,10%	1	**Rhône Poulenc**	**8,92%**
2	Nord	11,11%	2	**Saint Gobain**	**7,97%**
3	Orléans	10,90%	3	**Péchiney**	**6,40%**
4	Banque de France	9,72%	4	Esso-Standard	4,80%
5	Canal maritime de Suez	7,13%	5	**Air Liquide**	**4,34%**
6	Est	6,27%	6	**Electro-Chimie d'Ugine**	**4,33%**
7	Cie Parisiennes du Gaz	5,71%	7	Française des Pétroles	3,94%
8	Crédit Foncier de France	4,98%	8	Aquitaine, nom	3,92%
9	Crédit Lyonnais	3,83%	9	**CGE**	**3,80%**
10	Ouest	3,79%	10	**Celtex Textiles du Sud-Est**	**3,38%**
11	Midi	3,78%	11	**Michelin B regr**	**3,26%**
12	Société Générale	1,36%	12	**Beghin F Beg et Cie**	**2,95%**
13	Cie Gale des Eaux	1,35%	13	**Usinor**	**2,95%**
14	Banque de Paris et des Pays-Bas	1,03%	14	**Etb Kuhlmann**	**2,83%**
15	Messageries Maritimes	0,93%	15	Raffinage Cie Fcaise	2,24%
16	Union des gaz	0,92%	16	**Lorraine Escaut**	**2,08%**
17	Montrambert	0,92%	17	Shell Française	2,04%
18	Crédit Industriel et Commercial	0,84%	18	**Wendel et Cie**	**2,03%**
19	Mines de Malfidano	0,81%	19	**Radiotechnique**	**1,92%**
20	Société Foncière Lyonnaise	0,77%	20	Nationale d'investissement	1,62%
21	Grand'Combe	0,70%	21	**Machines Bull**	**1,51%**
22	Cie Gale des Voitures à Paris	0,70%	22	**Sidélor**	**1,49%**
23	Banque de l'Algerie	0,68%	23	Banque de Paris	1,46%
24	Banque d'Escompte de Paris	0,60%	24	France Obligation	1,35%
25	Richer (Ancienne Cie) Fresne et cie	0,55%	25	Pétroles B.P.	1,34%
26	Immobilière marseillaise	0,53%	26	Crédit Foncier de France	1,31%
27	Cie Gale Transatlantique	0,53%	27	**Forges Nord Est**	**1,26%**
28	La Foncière (cie assur mobil)	0,52%	28	**Librairie Hachette**	**1,26%**
29	Docks et entrep Marseille act est	0,52%	29	**Pont-à-Mousson Cie**	**1,21%**
30	Comptoir Nationale d'Escompte	0,50%	30	**TSF Cie Gale CSF**	**1,20%**
31	Gaz de Marseille et mines de Portes	0,48%	31	**Denain Anzin**	**1,19%**
32	Carmeaux	0,47%	32	Suez Cie Financière	1,19%
33	Bone à Guelma	0,47%	33	SOGERAP	1,15%
34	Cie Gale des Omnibus de Paris	0,41%	34	Raff Pétr Berre	1,11%
35	Cie Centrale, Lebon et Cie	0,41%	35	Nouvelles Galeries	1,10%
36	Entrep et magas gaux de Paris	0,39%	36	**Hts fourneaux et aciéries de Chiers**	**1,09%**
37	Mokta-el-adid	0,35%	37	**Schneider et cie**	**1,08%**
38	Est Algérien	0,33%	38	Cie Gale des Eaux	1,04%
39	Sté du Petit journal	0,31%	39	Au Printemps (Laguionie cie) act ord	0,97%
40	Chargeurs Réunis	0,31%	40	**Citroën**	**0,95%**
	TOTAL INDUSTRIE	**0%**		**TOTAL INDUSTRIE**	**69,41%**

PARTIE III DIVERSIFIER EN FRANCE OU A L'ETRANGER ?

La seconde partie a partiellement disculpé la politique, ou au moins les gouvernements de gauche, dans la recherche des causes de la sous-performance des actions françaises. Elle a aussi innocenté les krachs qui, lorsqu'ils sont correctement mesurés, correspondent en grande partie aux évènements politico-militaires. Dans ce contexte tumultueux, ce sont les entreprises de services qui offrent le plus de continuité, si ce n'est dans la performance (nous ne l'avons pas mesuré précisément), au moins dans la valorisation boursière. Mais l'investisseur à la recherche de performances peut aussi faire le choix de la diversification. Autrement, dit ne pas mettre tous ses œufs dans le même panier pour éviter que tous ne soient perdus en cas de choc. C'est cet aspect que la troisième partie explore.

La diversification consiste à exposer une partie de sa richesse à des risques différents afin que les aléas des uns compensent ceux des autres. Et l'un des meilleurs moyens de s'exposer à des risques différents est d'aller chercher des placements dans des pays lointains. C'est le choix que firent des millions d'épargnants français à l'orée du XX^ème^ siècle. La destination privilégiée des capitaux français fut la Russie. Les emprunts russes ont marqué les esprits car ils constituaient la destination favorite de l'épargne française et surtout parce que l'histoire s'est mal terminée : l'emprunteur à décidé de ne pas rembourser. Nombre d'historiens ont cru voir dans le succès des emprunts russes une conséquence de l'alliance diplomatique ou de l'avidité des banques qui empochaient d'importantes commissions sur les émissions de ces titres. Bref, le petit épargnant français aurait été instrumentalisé ou leurré. Le chapitre 7 conteste cette interprétation en montrant qu'il était parfaitement rationnel pour un épargnant français d'investir en titres russes. L'optimisation d'un portefeuille composé au départ d'actifs français (action, emprunts d'Etat, obligations d'entreprises) montre que parmi les emprunts de différents pays, la Russie était un choix particulièrement efficace.

A première vue, l'investissement à l'étranger est guidé par la seule recherche d'une meilleure rémunération. Alors que les taux d'intérêts sont en France, à la fin du XIX^ème^ siècle, à un niveau historiquement bas, les épargnants vont trouver dans de lointaines contrées quelques points de pourcentages supplémentaires. Pourtant, la notion de diversification du risque a elle aussi une valeur. Le chapitre 8 propose une nouvelle méthode pour décomposer le bénéfice total de diversification entre la part provenant de la plus forte rentabilité étrangère et celle venant de la faible corrélation. En l'appliquant aux actions américaines et surtout aux emprunts russes, nous montrons que c'est la faible corrélation qui justifiait l'exportation de capitaux bien plus que la plus forte rentabilité étrangère. En conséquence, l'étude de long terme de la corrélation des marchés entre pays indique l'incitation à investir à l'étranger. Cette corrélation augmente au cours du XX^{ème} siècle. C'est une conséquence logique de l'intégration progressive des économies réelles mais elle aboutit à un résultat paradoxal : avec l'intégration des économies réelles, l'incitation à acheter des titres étrangers diminue.

Mais la première des diversifications est celle que l'on peut faire parmi les seules actions françaises. La diversification est d'abord domestique, à travers un portefeuille composé d'un certain nombre d'actions assurant l'élimination de tout risque spécifique à telle ou telle entreprise. En étudiant jusqu'à présent les performances de l'indice HCAC 40, il a implicitement été considéré que les investisseurs profitaient de cet effet de diversification domestique. Autrement dit, la rentabilité observée sur l'indice correspond à un risque limité à celui du marché. Le dernier chapitre lève cette hypothèse en étudiant le risque avant diversification. Puis, le risque spécifique aux entreprises est dissocié de celui commun à l'ensemble du marché. Cet exercice livre une chronique des risques qui concorde avec l'histoire économique du pays. A partir de 1914, le risque commun connaît une hausse vertigineuse culminant lors de la Seconde Guerre Mondiale. Revenu depuis à la baisse il n'a pourtant jamais retrouvé le niveau antérieur à la Première Guerre Mondiale. Le risque commun est devenu la principale source de risque augmentant ainsi la corrélation entre les actions. Mécaniquement, la diversification devient moins efficace alors qu'un « super effet portefeuille » existait avant 1914. La fin de l'étalon-or, l'inflation et les déficits publics sont identifiés comme liés à cette hausse du risque de marché. Ces facteurs de risque doivent contribuer à expliquer pourquoi le risque supporté par l'actionnaire demeure moins bien rémunéré en France qu'aux Etats-Unis (voir chapitre 2) y compris depuis la Libération. En effet, même en période de paix, la stabilité monétaire et budgétaire aura été bien meilleure outre-Atlantique. Ce supplément de risque observé sur les actions en France n'a pas été rémunéré probablement car tous les actifs français y étaient exposés.

Chapitre 7, La rationalité des investissements en Russie avant 1914 « French Investment in Russia in the late 19th Century: A Modern Portfolio Theory Explanation. »[117]

With Amir Rezaee[118],

Abstract: This paper outlines an analysis of the reasons for French capital export to Russia during the late 19th century. It is shown that Modern Portfolio Theory can explain the behavior of French investors before 1914. In the analysis, optimal portfolios are built for a French investor using a large set of international bonds. Considering the results of this study, Russian bonds were chosen because they offered one of the best opportunities to achieve a high-level of diversification. The optimal level of Russian bonds that theory recommends to French investors is close to the one historically observed. The results also demonstrate, that among the foreign securities, German debt would have contributed to a significantly better level of diversification. However, this security was excluded from French portfolios, which was most likely due to the hostility towards Germany present in France during the period under study.

JEL classification: N23, O16, G11.

Keywords: capital export, Modern Portfolio Theory, international diversification, optimal portfolio.

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[118] University of Orléans and ISG Paris.

Modern home bias investment is a classical financial puzzle. Studying investors choices at the end of the 19th century presents another bias in investment behavior. However, this historical phenomenon is exactly in opposition to the current home bias. That is, before 1914, European savers invested a surprisingly large amount of their wealth in foreign countries.

In this paper, a focal point is an analysis of the reasons for the huge French investments in Russian securities. These investments were widespread since Catin (1927) evaluated the par value of Russian securities held by French investors in 1914 to be at 13.2 billion Francs, or 24 % of the French GDP. At that time, the market capitalization of French securities (stocks and bonds) reached 70 billion (or 126 % of the GDP) and was near equal to the amount of all foreign securities listed in Paris[119]. As a result, the entire capitalization of the securities market represented near to 250 % of French GDP (Moreau-Néret, 1939). The large amounts invested in Russian securities by French investors are even more puzzling given the dramatic default of 1917-1918.

A test is conducted, scrutinizing a classical hypothesis proffered by historians: French investments in Russia were not rational. The hypothesis implies that French investments in Russia were, in fact, abnormally high. Thus, an attempt is made to ascertain whether the investments in Russian securities, in question, could be justified, not only by political causation, or by high benefits for issuer banks on foreign bonds, but by the propositions of Modern portfolio Theory (MPT). The core question of this paper asks whether the behavior of investors was really irrational for them to invest in Russian securities because they were influenced by cordial political relations between the French government and Russia, or under the influence of French banks? The consistency of investment decisions by French investors, with a rational decision-making framework, could explain the extent to which French investors improved the diversification of their portfolios by making investments in international securities.

Financial investment before the First World War has been the subject of many studies. Flandreau and Flores (2009) argue that, at the beginning of the rise of the international bond markets (1820-1830), "capitalists turned to intermediaries' reputations to guide their investment strategies". Flandreau and Zumer (2004) have shown that in the late 19th century

[119] Assessing the amount of foreign securities listed in one country is always difficult since it is not possible to know the part hold by resident investors or the part of the exchanges realized in one market.

investors possessed the financial knowledge and acumen to price bonds that reflected fundamentals. London-Lane and Oosterlinck (2006) suggest a moral hazard (an implicit potential caution of the French state on Russian bonds) effect for foreign bond holding.

One stream of research applies MPT to address international financial market history. Accordingly Edelstein (1982) find, for a British investor, a higher return on foreign assets compared to domestic ones, but also a consistently higher risk. Edelstein demonstrates, that after risk adjustment the difference in return is not highly significant. Goetzmann and Ukhov (2006) test the extent to which MPT explains investment of vast sums in the overseas markets made by British investors. They found that diversification (and not only the higher returns of the foreign investments) played an important role in the decision made by British investors to allocate a significant fraction of their portfolio to overseas securities. Chabot and Kurz (2010) confirm the rationality of large British investments overseas, drawing upon a database of monthly returns for 4,059 securities listed in London and the US.

As regards French investments, Parent and Rault (2004), using an econometric methodology, investigate the influences affecting French assets abroad, prior to 1914. They show that the destination of French financial flows were consistent with rational economic behavior. Le Bris (2009) finds that although, by WWI, the foreign investments return was higher than domestic investment, the main incentive, pushing the investors to buy foreign assets, was the low international correlations, and not the higher foreign returns. Given these results, one can ask: what is the reason behind the high concentration of French investments in Russian securities? In other words, why were Russian securities chosen by the French investors?

Utilizing original data sets for French securities, mixed up with various foreign debt data series, several optimal portfolio was run for a typical French investor. Over the period from 1870 to 1913, the rationality of the investor’s choices is tested, focusing only upon foreign government bonds because of their large size in the French portfolios. According to Martin (1919), just before WWI, the percentage of foreign government and municipal debt was twice other foreign private issues. Hence, the creation of an optimal portfolio based on French securities and foreign government debts should be closer to the historical reality.

The results suggest that Russian debt provided satisfactory diversification for French investors’ portfolios. Compared to the complete set of investment opportunities, the optimal weight of Russian bonds is close to what was historically observed in French portfolios. Then, we look for the best foreign bond to add to a French portfolio. The Sharpe ratio of portfolios increases significantly when Russian bonds are added to a purely domestic portfolio. Nevertheless, the test applied to other foreign assets indicates that Russian bonds were not the best in all respects. The portfolio in which Russian bonds were replaced by German bonds offers even higher performances. We suggest that this phenomenon could be explained by the fact that mean-variance optimization does not take in to account all the factors that influence investment choices. Nevertheless, the basics of investor behavior can be correctly explained by modern portfolio theory.

Hence, firstly, in order to understand the French investments in Russian debt, a proposal is made to undertake a bird's eye view of the complete size and value of the Russian debt market in Paris. Secondly, several optimal portfolios have been created, which are composed among the three main French domestic securities and the foreign bonds. Based on the performance of each portfolio, foreign public bonds will be graded as improving a pure French portfolio. Finally, an explanation is made of the grade of the portfolio composed by Russian debt, compared to the other portfolios.

I Historical context

While the theoretical demonstration of international diversification, which improves portfolio performances, was proposed officially by Markowitz (1952), the premise was developed by several financiers in the late 19th century. In an article publication,[120] Alfred Neymarck, the founder of one of the most influential financial journals of that time, writes: "many of the investors, either by calculation or as a precaution, desire not to develop their portfolios with domestic securities alone" (translation by the author). Neymarck repeats his idea of diversification in his guide to investing, stating "What Should you do with your Money?"[121] He advises investors to diversify their portfolio by investing in geographically different countries. Another economist, Emile Leroy-Beaulieu, in his book "The Art of Invest and Manage Wealth"[122] explicitly entitles a chapter "The principle of fragmentation of investments: geographical division and distribution of investments"[123], begins with "One

[120] *Le Rentier* on January 7, 1878.
[121] Neymarck A. (1913), *Que doit-on faire de son argent?*, Marchal et Godde, Paris.
[122] Leroy-Beaulieu P. (1906), *L'art de placer et gérer sa fortune*, Paris, Delagrave, p. 89, available online : http://gallica.bnf.fr/ark:/12148/bpt6k54907671
[123] « Le principe du morcellement des placements. La division et la distribution géographique des placements. »

principle dominates all the others, it is the fragmentation of investments." [124] This principle is explained thusly: "Dividing investments is like an insurance against risks: if we have ten, fifteen, or twenty securities, especially which are not similar and from different countries, it is very rare, if ever it can, they are all affecting at the same time, by a cataclysm. It exists, in this case a compensation of risks, and, then, a diversified portfolio can not experienced a violent fall (...)." Goetzmann and Ukhov (2006), and Chabot and Kurz (2010), provide other examples of British financiers, who, at the time, recommend geographical diversification to investors.

The value of foreign securities quoted on the Paris bourse was constantly rising in the late 19th and early 20th century. Although, at that time, individual investors made, without intermediaries, almost all the investments at the French Bourse, they choose to hold foreign securities. The high level of savings in France permitted large amounts of capital to be exported to foreign countries. As an example, thanks to this high level of savings, which was estimated at between 2 and 2.5 billion francs per year just before the Franco-Prussian war in 1870, the tribute demanded by Germans (5 billion French francs or 25 % of the French GDP according to Occhino *et al.*, 2007) had been subscribed[125] and paid during the 2 years following the war. As shown in figure 1, the 5 billion francs war tribute subscriptions cause the investment in foreign securities to fall down to the previous level of the late 1860s. Nevertheless, the 1870s see the start of the continuous development of foreign values at the Paris Bourse for a 45-year period. The financial crisis in 1882, with the crash of one of the major French banks "Union Générale", is the only event that causes a reduction in the steady development of the foreign securities market at the Bourse. As a result of this short sharp development, just before WW1, the nominal value of foreign securities, listed in Paris, reached 45 billion francs. This sum is composed roughly of half the market capitalization of the Paris bourse.

Value of securities listed in one place can be different from value of securities hold by residents.[126] Owner nationality and the first-origin of the capital are never known. We are never able to distinguish between securities listed in one place and securities owned by the

[124] « Un principe domine toute la matière, c'est celui de la division des placements. »
[125] Not only by French investors.
[126] The problem is similar if one studies the market capitalization of securities listed in London.

resident.[127] We just found one indication about the case of Russian securities in France; according the data provided, by the authorities in 1918, 1,600,000 Frenchmen were declared holders of Russian securities[128], representing about 14 % of the households. Thus, if we are unable ascertain the exact portion of the foreign securities owned by French residents, it is known, however, that a large set of foreign securities was available and that France was the second largest capital exporting country in the world after Britain.

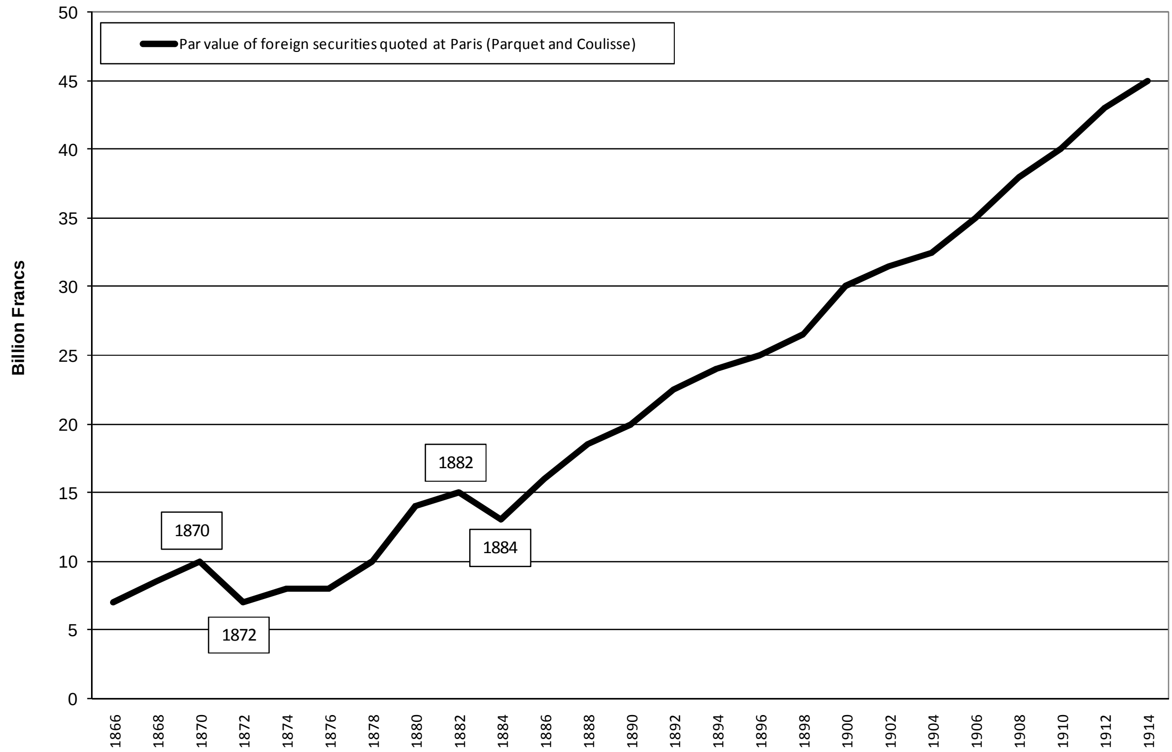

Figure 1, Nominal Value of foreign securities listed in Paris. (Parquet and Coulisse). Data are from Catin (1927).

As indicated by the Table 1, French investors had the opportunity to invest in a variety of foreign government bonds. Even if during the time period studied, the issues of foreign corporate companies rise, the government bonds percentage remains unchanged[129]. This large

[127] We have one exceptional measure in 1887 on the Russian bonds 4 % 1867 and 1869 upon renewal of coupon sheets: 47.3 % was addressed in Paris, Amsterdam: 34.5 %, London: 8.9 %, Berlin: 1.9 % according to the "Service des études" of the Crédit Lyonnais (Dossier Dette Russie).

[128] The "Office des Biens et Intérêts Privés" was created in 1918 to identify and defend the French claims on the new Soviet government.

[129] In this paper we borrow constantly the data given by Catin simply because in his thorough Ph.D. thesis he made a vast analysis of the previous work (Neymarck, Rafflovich, Leroy-Beaulieu) on foreign securities listed on the Paris market and he proposed a high quality view of the subject. He assesses the value of bonds listed in Parquet from the year book (annuaire) published by market authorities and the value of bonds quoted in Coulisse from the financial journals.

array of opportunities is similar to what was available to British investors. But, French investors mainly chose to invest in Russian debt at the end of the century, whereas it was probably not the case in 1870 (Table 1). Neymarck (1911) demonstrates that investment in Russian securities began to gain popularity among French investors as early as the 1870s, and, then, had become massive during the last decade of the century. Figure 2 depicts the nominal value of Russian government and municipal bonds admitted to the Paris market per year (Parquet and Coulisse). Even if this data set includes the conversion of older issues, the total amount of issues compared to the other foreign bonds clearly remains high. This choice of investment is frequently presented as the result of either the Franco-Russian alliance (against Germany), or of the high profits gained by French banks during the issue of Russian debts.[130]

Table 1, Nominal value of foreign securities listed on Paris markets in 1870 measured by countries. (Parquet and Coulisse). Data are from Catin (1927).

	Million francs	%
American	3,032.8	11.68%
Spanish	2,712.0	10.45%
Turkish	2,225.5	8.57%
Russian	**2,196.7**	**8.46%**
Italian	1,892.7	7.29%
Austrian	1,641.1	6.32%
Mexican	570.0	2.20%
Egyptian	560.3	2.16%
Portuguese	502.0	1.93%
Belgian	484.4	1.87%
Vatican	402.4	1.55%
Peruvian	298.0	1.15%
Hungarian	150.0	0.58%
Honduras	103.7	0.40%
Tunisian	76.0	0.29%
Bavarian	60.0	0.23%
Danubian Principalities	46.6	0.18%
Grand Duchy of Baden	31.0	0.12%
Haitian	30.0	0.12%
Prussian	8.7	0.03%
Switzerland	7.2	0.03%
Total Government securites	**17,031.1**	**65.60%**
Railway	7,284.1	28.06%
Miscellaneous	831.9	3.20%
Bank	665.4	2.56%
Mining	149.7	0.58%
Total Private securities	**8,931.1**	**34.40%**
ALL	**25,962.2**	**100%**

[130] For more information about this subject see: Renouvin (1951) and Girault (1973).

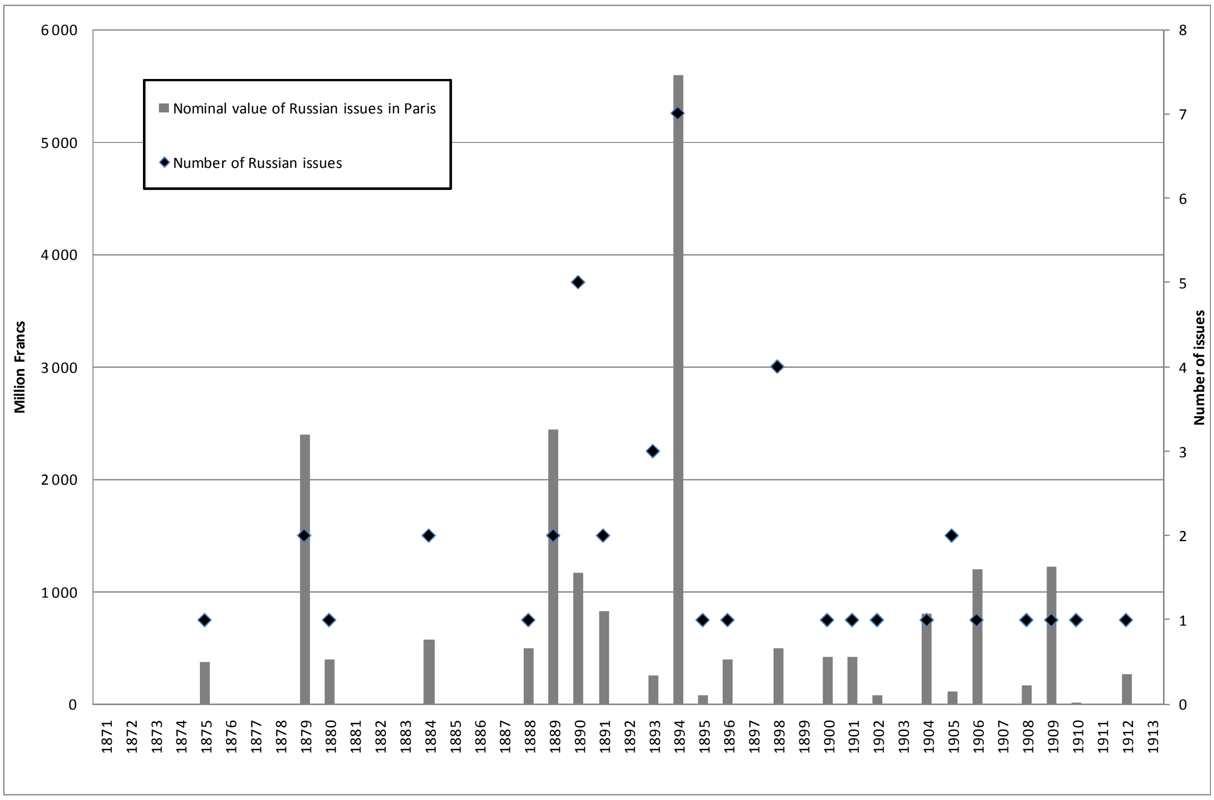

Figure 2, Nominal value of Russian government and municipal bonds admitted to the Paris market. (Parquet and Coulisse). Measured each year. Data is from Catin (1927)

II Data

Optimal portfolios are built for a French investor in the period 1870-1913 (527 months). Taken from two recently created indices on 19th century French asset prices: the French stock returns, measured by a historical CAC40 index, is borrowed from Le Bris and Hautcoeur (2010); the French Corporate bond returns come from the index constructed by Rezaee (2010). The French bond returns are calculated by the French Rente 3 % (a perpetual government bond) series quoted in Paris. Since no data set is available for the price of foreign securities quoted on the French market during the 19th century, the foreign data set used here comes from the London market, with the exception of US bonds coming from New York.[131] With the exception of the US, other bond returns series are computed with use of the monthly spread compared to the UK Consol, mentioned in Ferguson and Batley (1999) and originating in the *Investor's Monthly Manual*. For each month, the rate of these bonds, is formulated, as the UK Consol rate (from Klovland, 1994) added on the individual spreads for each country

[131] Details of data sets in Appendix A.

(from Ferguson and Batley, 1999). The computation of total return from monthly bond rates is presented in Appendix B. It is important to mention, that at that time, foreign bonds were quoted in local currencies, but always with a kind of guarantee of parity with one of the main gold currencies (French franc or sterling). As the Gold Standard created stability of prices and exchange rates among these main currencies, use is made of nominal data sets, only. In addition, Ferguson and Batley (1999), also, provide the spread for the French Rente 3 %.

In order to ensure the application of London's foreign bonds market prices for the case of a French investor, the integration between the London and Paris bond markets have been tested. The series of French government bonds quoted in London (from Ferguson and Batley, 1999) allow the integration between Paris and London markets to be tested. First, a regression is made of the French Rente 3 % in London on those in Paris. The measure used is the annual change of the rate observed each month.[132] Figure 3 depicts the relation between the French Rente 3 % quoted in Paris and London. As shown, the correlation coefficient between the French bond prices in Paris and London is quite high ($R^2 = 0.9498$). A Student T-test between these two series indicates the probability of an equal mean to be 95.28 %.

[132] Annual price variation is used in spite of monthly price variation for two reasons. Firstly, since not all data was collected on the same day (first Wednesday for French Rente in Paris and the last day of the month for the others), the bias can be strong on a monthly change, but is insignificant on annual movement. Secondly, to avoid the effect of coupon payments: the rate used to provide the spread from *Investor's Monthly Manual* comes from prices, without taking account the accrued coupon (only the coupon rate as a percentage of the quoted price). Since the schedule of payments remains constant, one annual change price confronts two prices with a similar accrued coupon. To exploit monthly data, annual changes are measured each month.

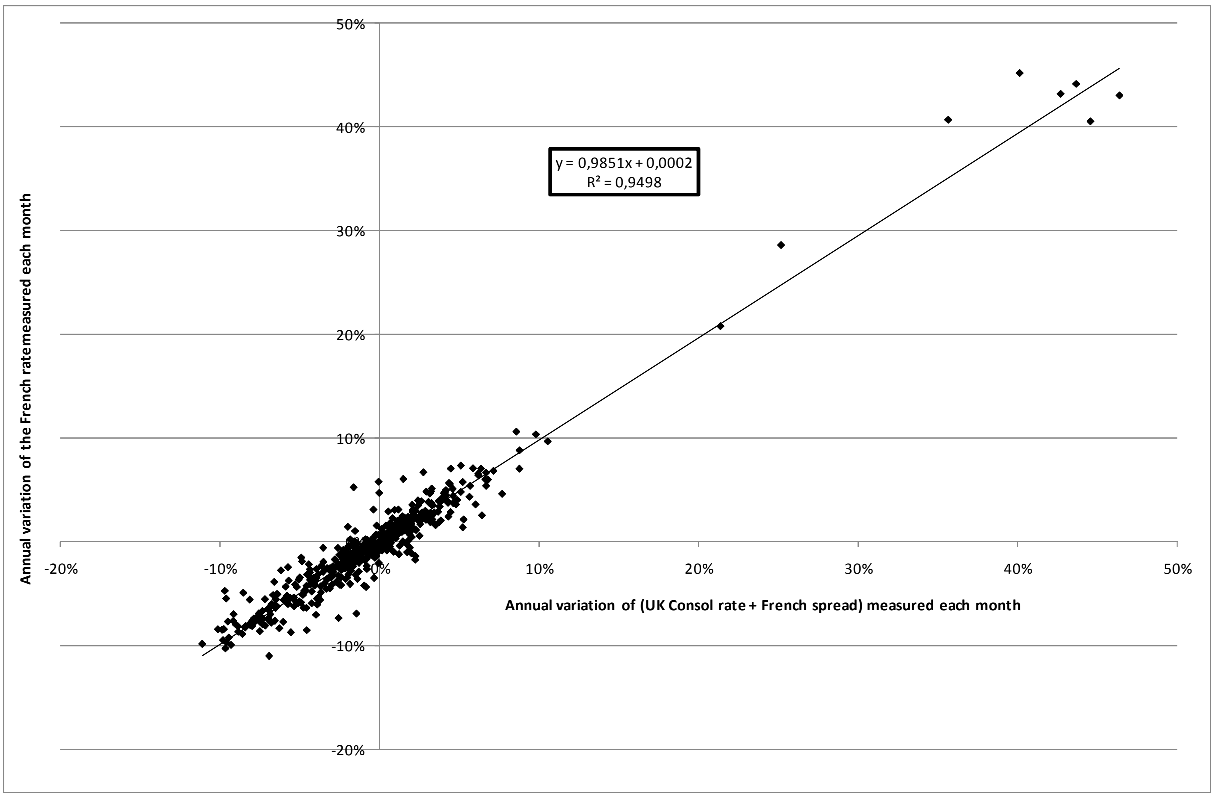

Figure 3, Robustness of the data mentioned in Investor's Monthly Manual. For data, see Appendix A.

Secondly, the Johansen co-integration tests have been applied on the two sets of French Rente 3 % prices quoted on Paris and London. The Johansen (1995) Maximum Likelihood (ML) procedure is a multivariate test that is based on a VAR approach to co-integration. There are two test statistics produced by the Johansen ML procedure, namely the Trace test and the Maximal Eigenvalue test. Here, both have been used to determine the number of co-integrating vectors present. The test relies on the relationship between the rank of a matrix and its eigenvalues, or characteristic roots. Given the results (Table 2), for both tests, the test statistic exceeds its critical value (5 %), when the null is r=0, so it can be concluded that at least one co-integrating vector is present. Nevertheless, for more than one co-integrating vector, the test statistic is less than the critical value, so it can be concluded that only a single co-integrating vector is present between the two variables. The results in table 2 depict the co-integration between Paris and London; multiquoted securities confirm previous observations that show a strong financial integration between the Paris and London bond markets during the Gold Standard era, especially after the development of the telegraph[133].

[133] On the integration between Paris and London markets, see, also, Homer and Sylla (1991).

Table 2, Johansen ML tests. The Trace test is a joint test, the null hypothesis is that the number of cointegrating vectors is less than or equal to r, against a general alternative hypothesis that there are more than r cointegrating vectors. The Maximal Eigenvalue test conducts separate tests on each Eigenvalue. The null hypothesis is that there are r cointegrating vectors present against the alternative that there are r+1 present.

a. Trace tests		λtrace	5% critical value	Result
H0: r=0	Ha: r=>1	293.76	15.49	two series are
H0: r=<1	Ha: r=2	1.50	3.84	cointegrated
b. Maximum Eigenvalue tests		**λmax**	**5% critical value**	**Result**
H0: r=0	Ha: r=1	292.26	14.26	two series are
H0: r=1	Ha: r=2	1.50	3.84	cointegrated

Table 3 depicts some individual characteristics of the assets considered in this study, as well as the correlation between them. Surprising results are the rather low coefficient of correlation between international bonds compared with the average coefficient observed today between emerging bond markets (0.77 according to Mauro *et al.*, 2002). The table dissipates the idea that French investment in Russia was motivated simply by higher rates of return. Table 3 shows that Spanish, Argentinean and US municipal bonds offered better returns than Russian bonds. Nevertheless, Russian bonds were the most popular.

Table 3, Asset characteristics. For data, see Appendix A.

Assets characteristics

	French stocks	French bonds	French corp. bonds	Russian bonds	German bonds	Spanish bonds	Argentine bonds	Italian bonds	UK bonds	US bonds	US mun. bonds
Return	5.40%	4.35%	4.20%	6.33%	4.62%	9.40%	7.95%	7.31%	2.81%	4.55%	6.17%
Standard deviation	6.92%	5.58%	3.42%	6.88%	2.38%	17.04%	12.23%	6.32%	3.41%	4.00%	9.91%
Correlation coefficient											
French stocks	1										
French bonds	0.57	1									
French corporate bonds	0.41	0.76	1								
Russian bonds	0.14	0.11	0.10	1							
German bonds	-0.09	0.04	-0.05	0.29	1						
Spanish bonds	-0.06	-0.15	0.01	-0.16	0.14	1					
Argentine bonds	-0.06	-0.09	-0.14	0.04	0.15	0.34	1				
Italian bonds	0.26	0.17	0.24	0.23	0.44	0.21	0.04	1			
UK bonds	0.18	0.18	0.33	-0.08	-0.48	-0.12	0.03	-0.02	1		
US bonds	0.34	0.33	0.42	0.08	0.01	0.09	0.06	0.21	0.28	1	
US municipal bonds	0.13	0.14	0.01	0.02	-0.08	-0.09	0.01	-0.04	0.11	-0.07	1

III Optimal portfolios

A portfolio is defined by allocating fractions of initial wealth to individual assets[134]. The sum of the fractions (or weights) must equal 1; some of these weights may be negative if short selling is allowed. The return on a portfolio is the weighted sum of the returns of its individual assets, with the weights being those that define the portfolio. The expected return

[134] A main part of this section is borrowed from the very pedagogical book by Luenberger (1998).

of the portfolio is, likewise, equal to the weighted average of the expected returns for individual assets. The risk (*i.e.* the variance) of the portfolio is determined by a more complicated formula: $\sigma^2 = \sum^n_{i\,,\,j=1} \omega_i \, \omega_j \, \sigma_{ij}$, where ω_i denote the weights, and σ_{ij} the co-variances.

From a given collection of *n* risky assets, the results provide a set of possible portfolios made from all possible weights of the *n* individual assets. If the mean and standard deviation of these portfolios are plotted on a diagram, with a vertical axis, the mean, *r*, and as the horizontal axis the standard deviation ,*σ*, the region thus obtained is called the feasible region. Two alternative feasible regions are defined: one allowing short selling and the other not.

It can be argued, that investors who are risk adverse, and have non-satiation property, when measuring the value of a portfolio, in terms of its mean and its standard deviation, will select portfolios on the upper left-hand portion of the feasible region; namely, the efficient frontier (Figure 3).

Points on the efficient frontier can be characterized by an optimization problem originally formulated by Markowitz (1952). This problem seeks the portfolio weights that minimize the variance for a given value of mean return. Mathematically, this is a problem with a quadratic objective and two linear constraints. If shorting is allowed (so that the weights may be negative as well as positive), the optimal weights can be found by solving a system of *n+2* linear equations and *n+2* unknowns. Otherwise, if shorting is not allowed, the Markowitz problem can be solved by special quadratic programming packages.

In the case that shorting is allowed, an important property of the problem posed by Markowitz, is that, if two solutions are possible, then any weighted combination of these two solutions is also a solution. This leads to the fundamental *two-fund* theorem: investors seeking efficient portfolios need only invest in two master efficient funds.

It is appropriate to assume that, in addition to *n* risky assets, a risk-free asset is available, with a fixed rate of return, r_f . The inclusion of such an asset allows the Capital Allocation Line to be built. The straight line touches the original feasible region (the region defined by the risky assets only) at a single point, namely the optimal portfolio. This leads to the important *one-fund* theorem: investors seeking efficient portfolios need only invest in one master fund (the optimal portfolio) of risky assets and in the risk-free asset. Different investors may prefer different combinations of these two.

The optimal portfolio, *F*, can be found by solving a system of *n* linear equations and *n* unknowns. When the solution to this system is normalized so that its components sum to 1, the resulting components are the weights of the risky assets in the master fund (optimal portfolio).

The risk-return trade-off of a portfolio can be found by the Sharpe ratio computed as

$$S_p=(r_p-r_f)/\sigma_p$$

where r_p is the expected return on a given portfolio, r_f is the risk-free interest rate, and σ_p is the standard deviation of the return of the given portfolio. Portfolios with higher Sharpe ratios offer more attractive risk-return trade-offs.

Another interesting combination is the creation of the portfolio providing the minimum risk or minimum variance portfolio. Whatever, the degree of risk aversion of the investor, and, therefore, the level of risk he is looking for, the investor has to hold at least a proportion of risky assets presented by the minimum risk portfolio. These have been calculated since these two specific combinations (Maximum Sharpe ratio and Minimum Risk portfolio) help form a better understanding of the investor's behavior.

Before developing the mean-variance portfolio optimization, used here, the developed robustness test is first presented. The sensitivity of mean-variance optimization to small differences in expected returns is well known by researchers in Finance (Jorion, 1985). As the reliability of deductions is dependent on the robustness of the calculated weights, a bootstrapping test has been applied to examine the robustness of the portfolio characteristics. Hence, from the return data series, a new sample is drawn by replacement (each month of the original series has *1/n* chance to be chosen for each month of each new sample), and an estimation is made for the vector of expected returns and the variance-covariance matrix; and given these two parameters, a computation is made of the optimal portfolio characteristics (weights, Sharpe ratio and etc.). This procedure is repeated *N* times, and using these *N* observations a standard error of all characteristics of the portfolios is constructed.

IV Evidence from optimization of domestic and foreign bonds portfolios

To evaluate the role of the foreign assets, at first, a minimum variance portfolio is constructed with only French assets (stocks, government bonds, corporate bonds). Foreign assets are then included in the investment opportunity set to construct a second minimum variance portfolio. This procedure is followed to quantify the improvement in the risk-return trade-off that is due to the inclusion of foreign investments for each level of risk. As a result, two efficient frontiers are built: one for a pure domestic (French) portfolio (grey curve on Figure 4) and the other for an internationally diversified portfolio (black curve). All optimizations remain in a classic short-sale constrained optimal portfolio.[135]

Table 4 depicts the considerable improvement for the investor's portfolio when it passes, from a purely French, to an internationally diversified portfolio. The Sharpe ratio of diversified portfolios is substantially higher than the domestic one. And even in the case of the optimal portfolio, it reaches three times the French one (0.98 points).

The results obtained by pure domestic, as well as international diversification, show that in order to achieve the best performances, an investor has to exclude French government bonds from their portfolio. These results are not consistent with previous historical observations[136] of concrete portfolios: at least one quarter of French portfolios was composed of French government bonds. The same inconsistency is found by Goetzmann and Ukhov (2006) when considering UK railway bonds: despite their popularity among British investors, UK railway bonds are excluded from optimal portfolios. As all the incentives to hold public debt are probably not well measured by the mean-variance model, and in order to approximate our results with historical facts, new portfolios have been constructed with a constraint of a minimum of 25 % of government bonds even though this constraint decreases the performance of the portfolios. Figure 4 represents both the constrained and non-constrained efficient frontiers; and this lower performance appears on the dashed curve.

[135] Although short-selling has been practiced in the Paris Bourse since the 19th century, considering the portfolio of a typical French investor with long-term investment horizon, it seems less likely that the investor will be attracted to the short selling strategy. So, henceforth, only short-sale constrained portfolios have been constructed.
[136] See Bourguignon and Levy-Leboyer (1984) and Rezaee (2010).

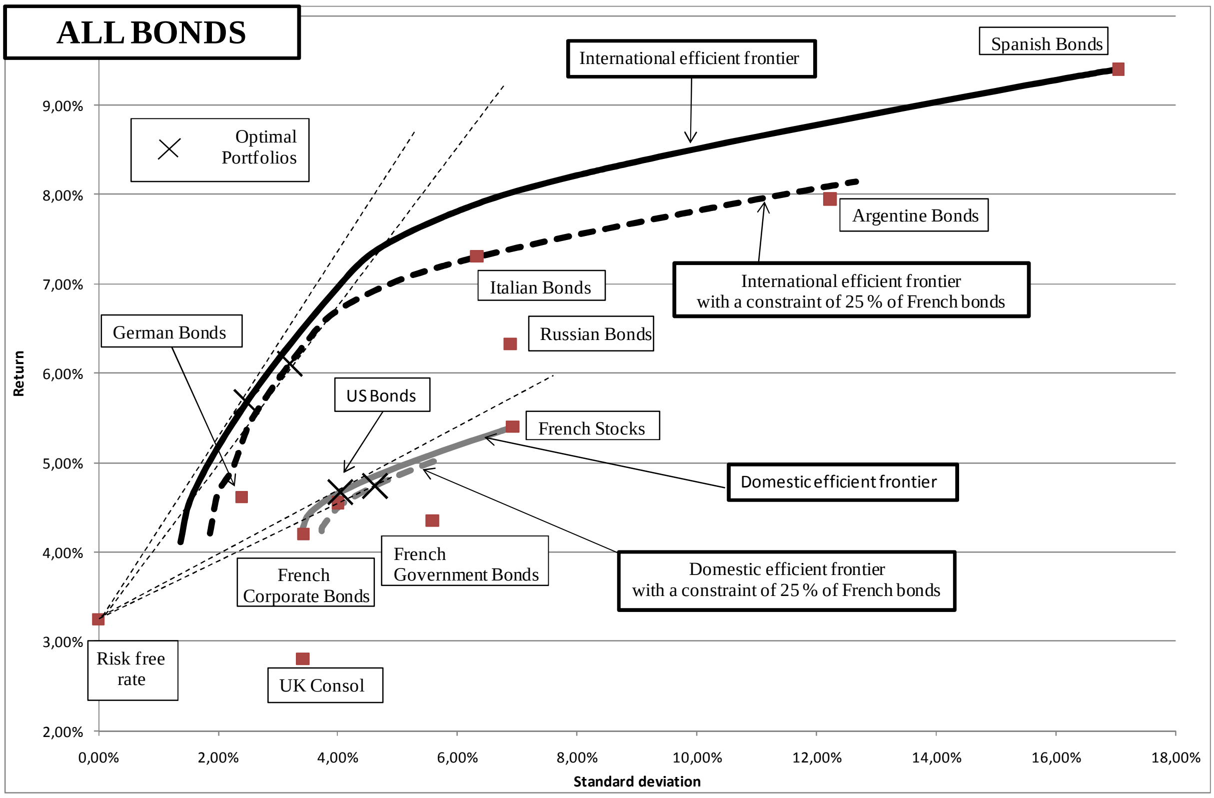

Figure 4, Domestic versus international efficient frontiers. ***All assets.*** For data, see Appendix A.

Table 4, Optimized portfolios: domestic versus international diversification. ***All assets***. For data, see Appendix A.

	Free allocation				French Bonds weight > 25 % constraint			
	Minimum risk		Maximum Sharpe		Minimum risk		Maximum Sharpe	
	domestic	international	domestic	international	domestic	international	domestic	international
Components								
French stocks	5% (2.4)	1% (1.0)	39% (8.9)	4% (2.4)	0%	0%	42%	0%
French bonds	0% (0)	0% (0)	0% (2.2)	0% (0)	25%	25%	25%	25%
French corporate bonds	95% (2.4)	6% (2.1)	61% (9.1)	8% (4.6)	75%	0%	33%	0%
Russian bonds		0% (0.1)		10% (3.2)		0%		14%
German bonds		57% (1.7)		38% (5.7)		47%		15%
Spanish bonds		2% (0.2)		5% (0.94)		2%		8%
Argentine bonds		0% (0)		4% (1.9)		0%		6%
Italian bonds		0% (0)		14% (3.7)		0%		22%
UK bonds		33% (1.4)		0% (1.1)		25%		0%
US bonds		0% (1.2)		8% (4.1)		0%		1%
US municipal bonds		2% (0.5)		9% (1.9)		0%		9%
Performances								
Standard deviation	3.41% (0.12)	1.37% (0.05)	4.04% (0.36)	2.48% (0.20)	3.74%	1.87%	4.61%	3.20%
Return	4.26% (0.16)	4.12% (0.05)	4.67% (0.20)	5.68% (0.22)	4.24%	4.21%	4.74%	6.11%
Sharpe ratio	0.30 (0.04)	0.63 (0.04)	0.35 (0.04)	0.98 (0.04)	0.26	0.51	0.32	0.89

Bootstrap standard errors are in the parentheses(5000 draws for each result)

As the results show, due to the high correlation between the three domestic securities, when an important weight is imposed to one of them, in an internationally diversified portfolio, the two other securities are automatically replaced by one foreign bond with a lower correlation. These quite surprising results, in Table 4, concern the international diversified portfolios. As mentioned earlier, considering the important amount of French investments in Russia, it would be expected that a large proportion of portfolios would be allocated to Russian debt. In the optimal portfolio, the weight of Russian bonds (10 % in free allocation and 14 % with a constraint of 25 % share investment in French Rente) comes after the Italian and German bonds. But these figures are highly consistent with the exact allocation of the French portfolio invested in Russian debt (about 10 %) in the 1900s[137].

This result is all the more interesting considering the weights of each of the foreign bonds in the minimum risk portfolio. In the portfolio preferred by investors with high risk-aversion, the two Russian and Italian bonds are abandoned in favor of German bonds. The bottom line of the results found here, is that the best foreign debt that contributes to an effective increase in the performance of portfolios of both, risk-averse and high-return oriented investors, was German debt. Hence, German bonds should be considered as the most attractive security when choosing between all foreign assets.

V Evidence from optimization of one French portfolio diversified by solely one foreign bond

As has been shown in the previous section, using a classical optimization for the portfolio leads to results, which are not totally consistent with the historical facts: investor does not hold numerous lines of foreign bonds. In this section, the hypotheses that French investors diversified their portfolios with only one foreign bond, is tested. The study by Daumard (1973) on French inheritance during the 19th century shows that an important proportion of French investors were middle-class, and not wealthy investors. Consequently, it is difficult to imagine that they were able to hold a highly diversified portfolio. Also, it is probably expensive to hold a high number of lines of foreign bonds, since the cost of transaction (mainly informational costs) was considerably higher at the time. Additionally,

[137] See Des Essars (1897) and Office National des Valeurs Mobilières (1914).

Barber and Odean (2000) show that, now a days in the US, the average individual investors' portfolio is composed by only 5 assets.

Considering the previous studies, and in order to simulate the most probable French investment portfolio, the optimal portfolio for domestic assets is tested with only one foreign bond.[138] Therefore, the influence of each foreign security is clearly isolated. In addition, this procedure allows a comparison to be made between the effects of each country's debt on the French diversified portfolio. Here also a completely free optimization leads, in many cases, to an optimal weight of French bonds close to zero (Table 5). Once again, these calculations are performed with a minimum of 25 % weight constraint for French government bonds (see Table 6). These results are more likely to be close to historical reality.

Table 5 and 6 indicate the characteristics of minimum variance, as well as optimal portfolios composed with the three French assets plus one foreign bond. Regarding the Sharpe ratios as a ranking benchmark, the portfolio composed with German bonds takes first place, outperforming the other portfolios by far. It is then followed by Italian and Argentinean portfolios, and down in fourth place by the Russian portfolio. Nevertheless, the bootstrap tests do not indicate a significant difference between the Sharpe ratios of the portfolios composed with Russian, Italian and Argentinean bonds. In fact, the confidence intervals found by the bootstrap test for these bonds overlap, so that the hypothesis implying that they are significantly different is rejected. As a result, after the portfolio diversified with German bond (see Figure 6), the portfolio diversified with Russian bonds (see Figure 5) offers the second best choice (tied with Italy and Argentina).

[138] Ukhov (2006) provides a theoretical study of the changes of the mean-variance frontier when a new risky asset is added to the set of existing risky assets.

Table 5, Optimized portfolios: domestic versus international diversification. *With one foreign bond.* For data, see Appendix A.

Maximum Sharpe									
	domestic	international diversfication							
	only	Russia	Germany	Spain	Argentina	Italy	UK	US	US mun.
Components									
French stocks	39%	20%	12%	35%	24%	12%	39%	25%	25%
	(8.9)	(5.6)	(2.2)	(7.5)	(5.3)	(5.4)	(8.7)	(7.1)	(6.8)
French bonds	0%	0%	0%	0%	0%	0%	0%	0%	0%
	(2.2)	(0.93)	(0)	(5.5)	(0.69)	(3.1)	(2.5)	(0.9)	(0.06)
French corporate bonds	61%	35%	16%	44%	51%	19%	61%	28%	51%
	(9.1)	(9.0)	(3.7)	(10.1)	(7.1)	(9.3)	(9.0)	(11.3)	(8.9)
Russian bonds		44%							
		(7.6)							
German bonds			72%						
			(3.3)						
Spanish bonds				20%					
				(3.1)					
Argentine bonds					25%				
					(4.2)				
Italian bonds						68%			
						(8.4)			
UK bonds							0%		
							(0)		
US bonds								47%	
								(12.0)	
US municipal bonds									24%
									(6.5)
Performances									
Standard deviation	4.04%	4.01%	1.99%	4.73%	3.94%	4.85%	4.04%	3.54%	3.92%
	(0.36)	(0.32)	(0.07)	(0.43)	(0.32)	(0.39)	(0.34)	(0.23)	(0.30)
Return	4.67%	5.39%	4.64%	5.68%	5.43%	6.47%	4.67%	4.66%	4.97%
	(0.20)	(0.26)	(0.08)	(0.28)	(0.24)	(0.31)	(0.20)	(0.17)	(0.24)
Sharpe ratio	0.35	0.53	0.70	0.51	0.55	0.66	0.35	0.40	0.44
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.05)
Minimum Risk									
	domestic	international diversfication							
	only	Russia	Germany	Spain	Argentina	Italy	UK	US	US mun.
Components									
French stocks	5%	2%	3%	6%	4%	2%	2%	0%	2%
	(2.4)	(1.9)	(1.4)	(2.3)	(2.2)	(1.9)	(1.8)	(1.2)	(2.0)
French bonds	0%	0%	0%	0%	0%	0%	0%	0%	0%
	(0)	(0)	(0)	(0)	(0)	(0)	(0.1)	(0)	(0)
French corporate bonds	95%	81%	30%	91%	86%	83%	48%	63%	87%
	(2.4)	(2.3)	(2.8)	(2.3)	(2.3)	(2.7)	(3.8)	(3.6)	(2.2)
Russian bonds		17%							
		(2.1)							
German bonds			66%						
			(2.2)						
Spanish bonds				4%					
				(0.9)					
Argentine bonds					10%				
					(1.3)				
Italian bonds						16%			
						(2.6)			
UK bonds							50%		
							(3.6)		
US bonds								37%	
								(3.7)	
US municipal bonds									10%
									(1.1)
Performances									
Standard deviation	3.41%	3.18%	1.90%	3.35%	3.14%	3.26%	2.78%	3.09%	3.24%
	(0.12)	(0.12)	(0.05)	(0.11)	(0.11)	(0.10)	(0.07)	(0.10)	(0.11)
Return	4.26%	4.59%	4.52%	4.47%	4.63%	4.71%	3.53%	4.33%	4.43%
	(0.16)	(0.15)	(0.08)	(0.15)	(0.15)	(0.15)	(0.13)	(0.14)	(0.16)
Sharpe ratio	0.30	0.42	0.67	0.36	0.44	0.45	0.10	0.35	0.36
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)

Bootstrap standard errors are in the parentheses (5000 draws for each result)

Table 6, Optimized portfolios: domestic versus international diversification. ***With one foreign bond. French bonds weight > 25 % constraint.*** For data, see Appendix A.

	domestic only	Russia	Germany	Spain	Argentina	Italy	UK	US	US mun.
Maximum Sharpe									
		international diversfication							
Components									
French stocks	42% (6.7)	18% (4.6)	6% (2.2)	34% (6.3)	23% (2.3)	4% (6.1)	42% (9.3)	23% (4.1)	26% (8.6)
French bonds	25%	25%	25%	25%	25%	25%	25%	25%	25%
French corporate bonds	33% (8.6)	5% (8.4)	0% (7.0)	17% (9.1)	23% (6.1)	0% (3.9)	33% (10.9)	0% (10.8)	22% (7.5)
Russian bonds		52% (6.6)							
German bonds			69% (4.4)						
Spanish bonds				24% (6.2)					
Argentine bonds					29% (6.4)				
Italian bonds						71% (9.4)			
UK bonds							0% (6.2)		
US Bonds								52% (6.1)	
US municipal bonds									27% (8.8)
Performances									
Standard deviation	4.61% (0.63)	4.60% (0.22)	2.35% (0.72)	5.28% (0.22)	4.55% (0.57)	5.05% (0.12)	4.61% (0.66)	3.93% (0.12)	4.57% (0.09)
Return	4.74% (0.19)	5.55% (0.55)	4.60% (0.10)	5.89% (0.23)	5.61% (0.26)	6.50% (0.47)	4.74% (0.36)	4.69% (0.39)	5.08% (0.13)
Sharpe ratio	0.32 (0.08)	0.50 (0.07)	0.57 (0.08)	0.50 (0.07)	0.52 (0.05)	0.64 (0.03)	0.32 (0.01)	0.37 (0.07)	0.40 (0.03)
Minimum Risk									
	domestic only	Russia	Germany	Spain	Argentina	Italy	UK	US	US mun.
		international diversfication							
Components									
French stocks	0% (1.4)	0% (2.0)	0% (1.9)	0% (3.2)	0% (2.2)	0% (2.0)	0% (1.7)	0% (0.9)	0% (2.6)
French bonds	25%	25%	25%	25%	25%	25%	25%	25%	25%
French corporate bonds	75% (2.1)	57% (3.3)	6% (2.1)	70% (2.3)	64% (2.3)	58% (2.0)	20% (2.9)	36% (2.6)	66% (2.1)
Russian bonds		18% (3.4)							
German bonds			69% (1.9)						
Spanish bonds				5% (2.1)					
Argentine bonds					11% (3.0)				
Italian bonds						17% (2.4)			
UK bonds							55% (1.4)		
US bonds								39% (2.0)	
US municipal bonds									9% (1.1)
Performances									
Standard deviation	3.74% (0.10)	3.50% (0.10)	2.30% (0.09)	3.63% (0.09)	3.47% (0.11)	3.57% (0.07)	3.03% (0.05)	3.40% (0.12)	3.61% (0.11)
Return	4.24% (0.13)	4.61% (0.17)	4.53% (0.03)	4.50% (0.12)	4.64% (0.17)	4.77% (0.19)	3.47% (0.10)	4.37% (0.16)	4.42% (0.16)
Sharpe ratio	0.26 (0.02)	0.39 (0.02)	0.56 (0.03)	0.34 (0.04)	0.40 (0.04)	0.43 (0.02)	0.07 (0.04)	0.33 (0.04)	0.32 (0.04)

Bootstrap standard errors are in the parentheses (5000 draws for each result)

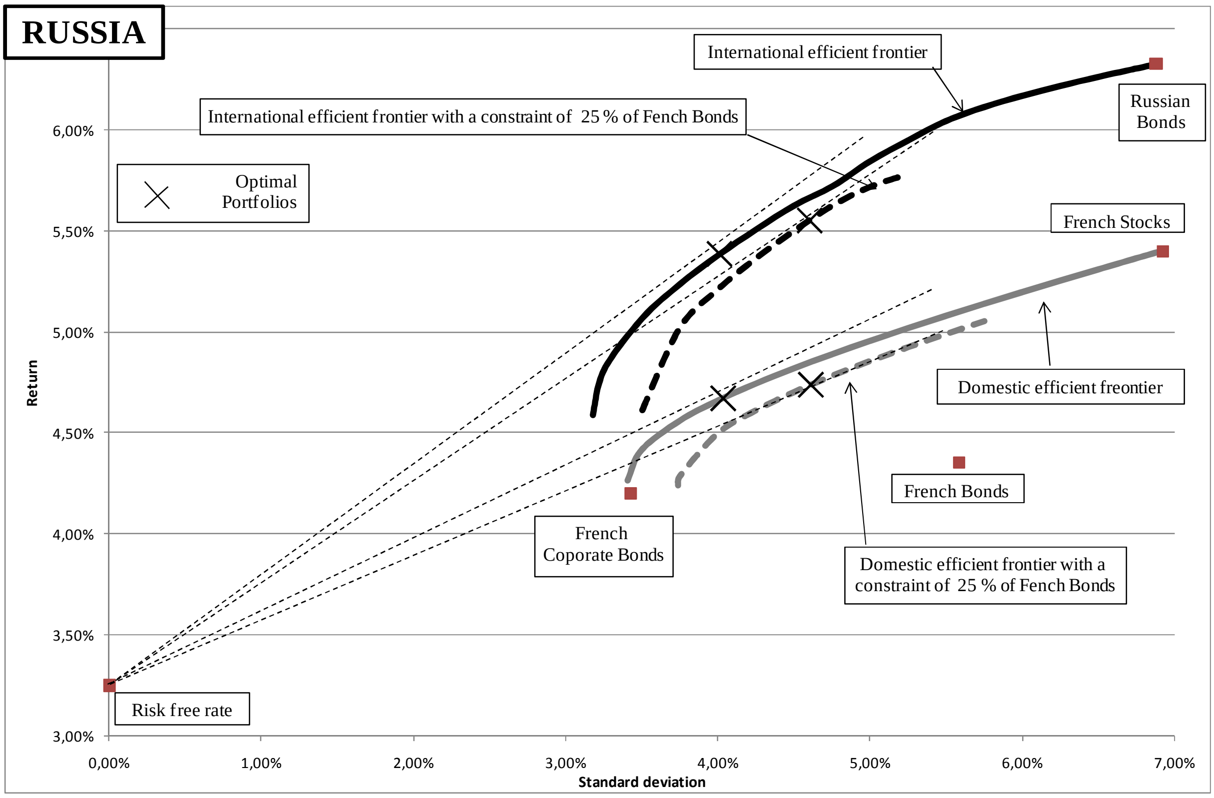

Figure 5, Efficient frontiers: domestic versus Russian diversification. For data, see Appendix A and Tables 5 and 6

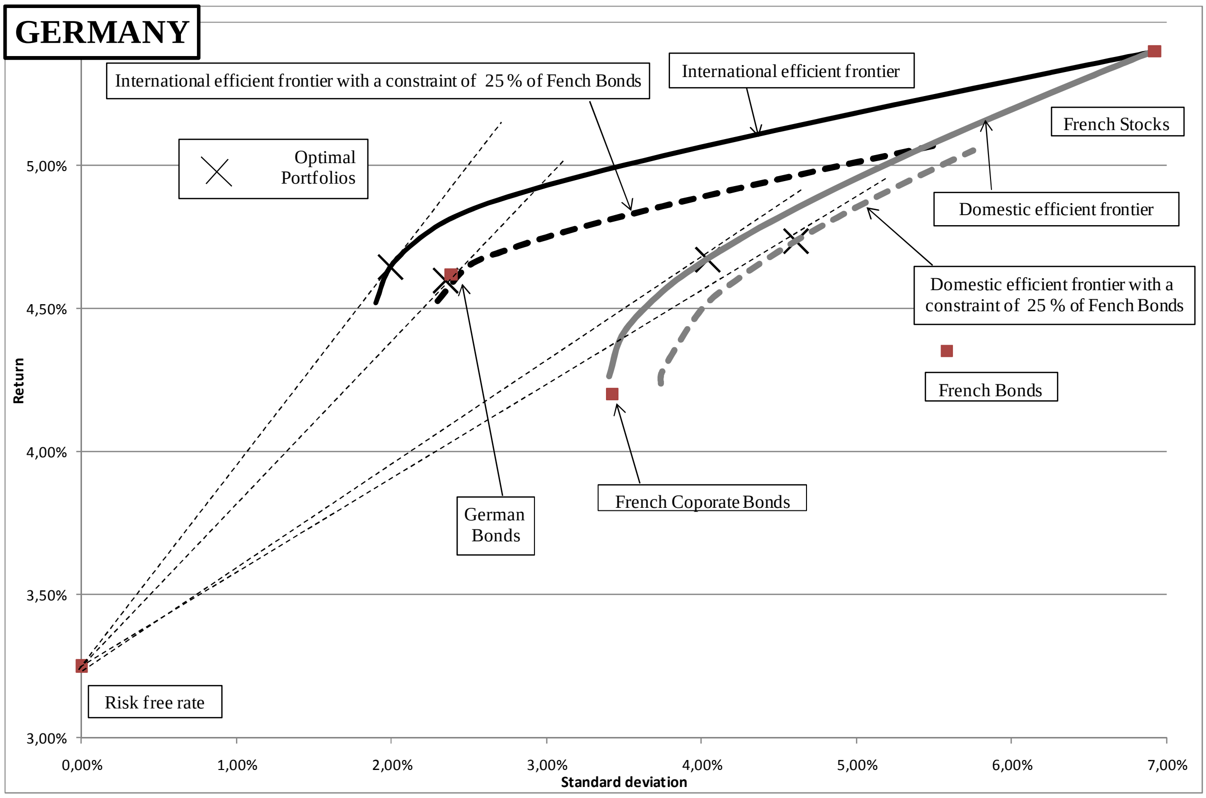

Figure 6, Efficient frontiers: domestic versus German diversification. For data, see Appendix A and Tables 5 and 6

VI Complementary checks: low hypothetical returns for Russian bonds and monthly versus annual data

A further step required for in-depth analysis of investment in Russian debt, artificially provides the same return for French bonds to the Russian, as suggested by Goetzmann and Ukhov (2006), the optimal portfolios are then recalculated. The objective is to find out, that even if there was no incentive, in terms of return, should the Russian bonds be held in an optimal portfolio? In this hypothetical case, the incentive should come only from the low correlation with domestic assets. Despite this hypothetically similar return, the results of this optimization imply a high-weight (at least 16 %) mainly because of their low correlation with the French bonds.

A second test is then performed to measure the influence of using only annual data, and not monthly, on the risk-return model. As a result, the low frequency data (annual *vs.* monthly) has no clear effect on the optimal weight of Russian bonds, but, however, causes a large divergence among optimal weights of the French securities, and an underestimation of the standard deviation (this leads to an overestimate of the Sharpe ratio). The difference observed between the results of monthly and annual data attests to the importance of using monthly data for this kind of analysis.

Table 7, The effects on optimization of hypothetically low Russian returns and of monthly *vs.* annual data. 1 In order to test the effect of correlation between French and Russian debt on the optimal portfolio the returns on Russian debt and the corresponding domestic debt (French Rente) are set to be same. Yet it is still optimal to include Russian debt in the portfolio and take advantage of the diversification opportunity that investing in russia offers. 2 Optimization using monthly data is compared to optimization using annual data only to test the importance of frequency of the observations. The results show that the frequency of observations has no influence on the final portfolio performance.

Short sale constrained optimization				
	Domestic	Russian diversification		
	only	*monthly*	*hypothetical* [1]	*annual* [2]
French stocks	39%	20%	32%	10%
French bonds	0%	0%	0%	0%
French corporate bonds	61%	35%	51%	48%
Russian bonds		44%		
Russian bonds hypothetical return			16%	
Russian bonds annual data				42%
Standard deviation	4.04%	4.01%	3.70%	3.63%
Return	4.67%	5.39%	4.61%	5.22%
Sharpe ratio	0.35	0.53	0.37	0.54
Short-sale and French Bonds weight > 25 % constrained optimization				
	Domestic	Russian diversification		
	only	*monthly*	*hypothetical*	*annual*
French stocks	42%	18%	34%	4%
French bonds	25%	25%	25%	25%
French corporate bonds	33%	5%	24%	18%
Russian bonds		52%		
Russian bonds hypothetical			17%	
Russian bonds annual data				53%
Standard deviation	4.61%	4.60%	4.23%	4.46%
Return	4.74%	5.55%	4.67%	5.42%
Sharpe ratio	0.32	0.50	0.34	0.49

VI Interpretations and limits of mean-variance optimization

While mean-variance optimization is a powerful method to provide a theoretical optimal portfolio, as, however, it relies on the theory of rational beliefs, it cannot explain some investment decisions influenced by factors like feelings, conservatism, anchoring and so on[139]. As Markowitz (1952) tried to simplify the reality in his theory, he ignored other elements that can play a role in the composition of portfolio.

Considering our previous results, it can be deduced, that, the German bonds would have maximized the performance and brought a better portfolio diversification than other foreign bonds. Nevertheless, in reality, the German debt comprised few portions of French portfolio at the time. Portfolio selection was influenced by the French national atmosphere of the late of 19th century. At that time, France was still suffering from the humiliating defeat of

[139] For a complete list see Kahneman and Tversky (2000).

the Franco-Prussian war of 1870. As mentioned earlier, in order to liberate the territory from the occupying German army, France had to pay a huge tribute of 5 billion Francs. France was also forced to cede the Alsace-Lorraine region to the freshly created German Reich.[140] During the period that separates this defeat from WWI, which covers time period studied here, France was experienced many sultry feelings of revenge. As a consequence, it is difficult to imagine that French investors would have chosen German debt in order to diversify their portfolios.

After removing the German debt, among the possible security choices, Russian debt could offer the next best diversification, mainly because, firstly, the portfolio composed of Russian bonds offered the highest performance, but one (considering Bootstrap standard error), compared to the other foreign bonds, and; secondly, in order to develop its giant territory, is was necessary for Russia to attract a large amount of foreign capital. Russia floated a huge amount of financial securities and was the largest borrower in the world capital markets (Ukhov, 2003). Obviously, it was not exactly the case for Italy and Argentina. Hence, in order to obtain an optimal performance for a portfolio composed of French assets and foreign debt, a French investor had to invest at least 18 % of their wealth in Russian bonds, which leads to the least risky portfolio (Table 6). This level of allocation is the highest after the German one, and could justify the significant French investment in Russian debt.

VII Conclusion

In this paper, an attempt has been made to find out why, in the late 19th century, French investors allocated a large proportion of their portfolios to Russian debt. It has been demonstrated that the choice of Russian bonds was consistent with Modern Portfolio Theory. Hence, the results show that when Russian bonds are added to a purely French portfolio (composed of French stocks, public and corporate bonds), its performance is higher than other portfolios composed of other foreign debt, with the exception of German ones. But, the German bond was not truly considered by the French investor after the French defeat of 1870. The German case depicts that all of the historical investment decisions could not be explained by the MPT. Nevertheless, we can conclude that French investment in Russia could have only been led by the financial incentives, rather than political links or issuer banks benefit, as explained by historians.

[140] Officially created in the “Galerie des Glaces” in the Versailles palace.

REFERENCES

Barber B. M., and T. Odean (2000), "Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors", *Journal of Finance,* 55, p. 773-806.

Bourguignon F. and M. Levy-Leboyer (1984), "An Econometric Model of France during the 19th Century", *European Economic Review,* 25, p. 107-141.

Catin R. (1927), *Le portefeuille étranger de la France entre 1870 et 1914,* PhD., Faculté de droit de l'université de Paris.

Chabot B. and C. J. Kurz (2010), "That's Where the Money Was: Foreign Bias and English Investment Abroad, 1866-1907", Economic Journal, 120, p. 1056-1079.

Daumard A. (1973), *Les fortunes françaises au XIX^{ème} siècle,* Mouton, Paris.

Des Essars P. (1897), "Les dépots de titres à la Banque de France", *Journal de la société de statistiques de Paris,* 38.

Edelstein M. (1982), *Overseas Investment in the age of High Imperialism: The United Kingdom, 1850-1914,* Methuen & Co., London.

Ferguson N. and R. Batley (1999), "Event Risk and the International Bond Market in the Era of Classical Gold Standard", *Working Paper*, Oxford University.

Flandreau M. and J.H. Flores (2009), "Bonds and Brands: Foundations of Sovereign Debt Markets, 1820–1830", *Journal of Economic History,* 69, p. 646-684.

Flandreau M. and F. Zumer (2004), *The Making of Global Finance,1880-1913,* OECD, Paris.

Girault R. (1973), *Emprunts Russes et Investissement Français en Russie, 1887-1914,* Armand Colin, Paris.

Goetzmann W. and A. Ukhov (2006), "British Investment Overseas 1870-1913: A Modern Portfolio Theory Approach", *Review of Finance,* 10, p. 261-300.

Homer S. and R. Sylla (1991), *A History of Interest Rates,* Rutgers University Press, New-York.

Johansen S. (1995), *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models,* Oxford University Press, New York.

Jorion P. (1985), "International Portfolio Diversification with Estimation Risk", *Journal of Business,* 58, p. 259-278.

Kahneman D. and A. Tversky (2000), *Choices, Values and Frames*, Cambridg University Press, London.

Klovland J.T.(1994), "Pitfalls in the Estimation of the Yield on British Consol, 1850-1914", *Journal of Economic History,* 54, p. 164-187.

Le Bris D. (2009), "Why did French Savers buy Foreign Asset befor 1914? Decomposition of the International Diversification Benefit", *Eurohistock April 2009*, Madrid, University Carlos III.

Le Bris D. and P-C. Hautcoeur (2010), "A Challenge to Triumphant Optimists? A Blue Chips Index for the Paris Stock Exchange, 1854-2007", *Financial History Review,* 17, p. 141-183.

London-Lane J. and K. Oosterlinck (2006), “Hope Spring Eternal – French Bondholders and the Soviet Repudiation (1915-1919)”, *Review of Finance*, 10, p. 507-535.

Luenberger D. G. (1998), *Investment Science,* New York, Oxford University Press.

Markowitz H. (1952), "Portfolio Selection", *Journal of Finance,* 7, p. 77-91.

Martin G. (1919), *Les problèmes du Credit en France*, Paris, Payot.

Mauro P., Sussman N. and Y. Yafeh (2002), "Emerging Marke Spreads: Then Versus Now", *Quarterly Journal of Economics*, 117, p. 695-733.

Moreau-Néret O. (1939), *Les valeurs mobilières*, Paris, Receuil.

Neymarck A. (1911), *Finances Contemporaines*, Paris, Alcan.

Neymarck A. (1913), *Que doit-on faire de son argent?*, Paris, Marchal et Godde.

Occhino F. , Oosterlinck K. and E. N. White (2007), "How Occupied France Financed Its Own Exploitation in World War II", *American Economic Review*, 97, p. 295-299.

Office National des Valeurs Mobilières (1914), *Annuaire 1913-1914*, Paris.

Parent A. and C. Rault (2004), "The Influences Affecting French Assets Abroad prior to 1914", *Journal of Economic History*, 64, p. 328-362.

Renouvin P. (1951), *L'Empire allemand de 1890 à 1918, Paris,*Tournier et Constans.

Rezaee A, (2010), *Le marché des obligations privées à la Bourse de Paris au 19ème siècle: performance et efficience d'un marché obligataire*, Ph.D. Dissertation, University of Orléans.

Ukhov A. (2003), "Financial Innovaton and Russian Government Debt Before 1918", *Working Paper, Yale University*.

Ukov A. (2006), "Expanding the Frontier One Asset at a Time", *Finance Reseach Letter*, 3, p. 194-206.

Appendix A, Data Sources

US Municipal bonds:

1870-1913: monthly data, Macaulay (1938) available online:

http://www.nber.org/databases/macrohistory/contents/chapter13.html

US bonds: 1870-1913: monthly data, Shiller online:

French stocks: 1870-1913: historical HCAC 40, monthly data, Le Bris and Hautcoeur (2008)

French corporate bonds::

1870-1914: Rezaee’s all market index Rezaee (2010)

French treasury long-term rate:

1870-1913: Rente 3 %, monthly data,

French Bills: 1864-1913: NBER and Banque de France,

UK Consols: 1870-1913: monthly data, Kloveland (1994)

UK Bills: 1870-1913: open market rate of discount, annual average interpolated, Homer and Sylla (1998)

German, Argentinean, Russian, Spanish, Italian spread with UK Consols:

1870-1913: Investor’s Monthly Manual, monthly data, Ferguson and Batley (1999)

Appendix B, Bond total return computation

We can use the rate of perpetual or long-term bonds to measure the total return of a bond investment. More formally we have: r, the annual total return between t and $t+1$, P *is* the price of the bond, C is the amount of the coupon and T is the rate of the perpetual bond (C/P):

$$r = \frac{P_{t+1}}{P_t} - 1 + T_t$$

In the case of a perpetual bond, we have $P = \frac{C}{T}$. Thus:

$$r = \frac{\frac{C}{T_{t+1}}}{\frac{C}{T_t}} - 1 \ + T_t$$

Since $\frac{\frac{a}{b}}{\frac{a}{c}} = \frac{c}{b}$, we have, r, the total return of the bond as: $r = \frac{T_t}{T_{t+1}} - 1 + T_t$

Chapitre 8, L’intégration économique dissuade l’investissement à l’étranger « Why did French Savers buy Foreign Assets before 1914? A Methodological Approach to the Decomposition of the Benefits from Diversification. » [141]

Abstract: This paper examines the question as to whether, before 1914, French savers bought foreign assets to gain higher foreign returns or because of low correlation. A new methodology is proposed to decompose the benefit from international diversification into these two components, using a counterfactual hypothesis of perfect correlation between markets. The argument is put forward that French investors were mainly attracted by weak foreign correlation, rather than higher returns, since a higher risk-return portfolio was achievable in the domestic market. Correlations of French and US markets exhibit a gradual increase over the course of the 20th century; a probable explanation is that the paths follow an increase in GDP correlation. Thus, today, the diversification benefit provided by a foreign investment is relatively limited.

Keywords: portfolio diversification, correlation, 19th century, 20th century.

JEL classification: G11, G15, N21, N23.

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This study aims to explain international diversification over time. Before 1914, European savers invested a large part of their portfolio in foreign securities. However, the cost of holding foreign assets appears to have been higher than current levels. This export of capital, that some have argued to be manifest of European financial imperialism, has often been cited as one of the main causes of the long depression that occurred in France and the UK at the end of the 19th century. Political links have frequently been used to explain the phenomena of capital export countries. Feis (1964), White (1933), Cameron (1961) and Lévy-Leboyer (1977) conclude that French investment abroad was politically driven (for a survey see Parent and Rault, 2002). Foreign issue bank fees have also been presented as a possible explanation (Bouvier, 1961). London-Lane and Oosterlinck (2006) suggest a moral hazard effect for foreign bond holding, since the French government had assumed a part of the debt resulting from the 1867 Mexican default. At least, higher foreign return is the common explanation for this export of capital. A classical counterparty of this higher foreign return is higher foreign risk. But Edelstein (1982) shows that foreign assets for a British investor still achieve a higher return after adjustment for risk.

A recent wave of studies uses the Modern Portfolio Theory (MPT) to understand the rationality of foreign investment from the investor's point of view. Parent and Rault (2004) use 22 annual domestic and foreign price indices (without dividends) to show the rationality of French savings over the 1891-1913 period. Chabot and Kurz (2009) confirm the rationality of large British investment overseas thanks to a database of monthly returns of 4,059 securities listed in London and in the US. British savers were attracted by the low foreign correlations. Goetzmann and Ukhov (2006) focus on diversification benefit for British savers using a panel of securities indices (from Edelstein, 1982). They find a strong incentive to export capital, even if foreign assets have hypothetically the same return as the British ones. Thus, they demonstrate the crucial role of low correlation in explaining British capital export. But, what, respectively, are the roles of the higher foreign return and the low correlation in explaining diversification before 1914?

This study proposes an answer by using tools of MPT to analyze incentives for diversification from the point of view of French investors. The first step for analyzing international diversification is to validate one kind of international market integration at the beginning of the modern stock market era. Facts seem to agree with this hypothesis, but this integration is difficult to prove. Once the integration hypothesis is accepted, the second step is to analyze the incentives of international diversification for a French investor.

A new methodology is proposed to decompose international diversification benefit, and is tested on French-US stocks portfolios and French-Russian bonds portfolios before 1914. Using a counterfactual hypothesis of perfect correlation between foreign and French markets, international diversification profit is decomposed into two components: profit from weak correlation is obviously stronger than profit from higher foreign return. These tests show that French investors bought US stocks and Russian bonds (and probably other foreign assets) mainly for the low correlation effect, rather than for the receipt of higher returns. Before 1914 the diversification effect is large due to a very low correlation between markets.

The third step is to evaluate the change in the incentive to diversify. International correlations are not stable over time, as early studies show (Goetzmann *et al.*, 2005, and Obstfeld and Taylor, 2002). The high level of correlation observed during the last 25 years offers a weak incentive for a French saver to buy US stocks (or the reverse). It is likely, that this increase in stock market correlation follows an increase in French and US GDP correlation. The last 25 years can be conceptually understood as a second era of globalization, the first being before the First World War. But the level of stock correlation during these two eras of globalization clearly differs.

Section I aims at measuring the market integration before 1914 through the price of risk according to different assets. Section II shows that low asset correlation was the main incentive for the holding foreign assets, rather than higher expected returns. Section III measures a gradual increase in stock market correlation and tests an explanation of stock correlation levels using the relationship between the two GDPs. Section IV concludes.

I Market integration before 1914

1.1 Some previous studies

International integration means equalization of prices for identical goods on different markets. O'Rourke and Williamson (1999) focus on two kinds of convergences: productions factors (capital, work, land) follow prices products. They show a first convergence movement until 1914 followed by a regressive period which stops at the end of the 1950s. The spread in price of wheat between London and Chicago decreases from 57.5 % in 1870 to 15.6 % in 1913. British and Ukrainian markets for the grains are fully integrated in 1906. Same movements are observed for textile or cotton. US and UK prices gaps fall for cotton textiles from 13.7 % to -3.6 %, for iron bars from 75 % to 20.6 %, for pig iron from 85.2 % to 19.3 % and from 32.7 % to -0.1 % for cooper (O'Rourke and Williamson, 1994). It was the same between Europe and Asia, with the London-Rangoon rice price gap falling from 93 % to 26 %, or the Liverpool-Bombay cotton price spread falling from 57 % to 20 % (Findlay and O'Rourke, 2001). In Europe, between Germany and Britain, this fall happened for most of the commodities studied by Klovland (2005). This equalization of prices for these products is clear. But how is it possible to measure international financial integration?

The price equalization of two identical securities, quoted in different markets, is not enough to qualify for international financial integration. This easy arbitrage does not need significant capital flows. Arbitrage can be realized with weak international exchanges. Equality of prices for identical securities is only demonstrative of a free market and correct information flow. At the middle of 19th century, communication means the telegraph (Garbade and Silber, 1978). By 1860, three lines were in operation between England and the Continent. The first fully successful Atlantic cable was completed in 1866. In one single day, in December 1886, ten thousand messages were communicated between the London and New York exchanges. The price lag between London and New York for the same stock (New-York and Erie Railroad) decreased from ten to zero days just a few months after the first transatlantic cable had been wired (Hoag, 2006).

International market integration can be understood from a macro-economic point of view. Feldstein and Horioka (1980) find a strong relationship between investment and savings accross different countries in 1960s and 1970s. The relationship implies low capital mobility: investment in a given country is dependent upon the domestic saving level. Before the First World War, this relationship between domestic investment and saving (called “Feldstein and Horioka test”) is not observed. A panel of countries shows that low domestic saving rates accompany high investment rates. This difference results from imports of capital. According to Obstfeld and Taylor (2002), foreign asset values were 7 % of World GDP in 1870, and 20 % before WWI; the ratio falling to a low point of 5 % in 1945. After a few decades, this ratio rose quickly: 25 % in 1980, and then dramatically to 62 % in 1995. However, this macroeconomic observation does not only measure international market integration, since the economic role of financial market (measured by the ratio market capitalization on GDP) varies across time. The role of financial markets in the economy respects a perfect U-shape curve, as demonstrated by Rajan and Zingales (2003) with a panel of countries. For example, in France, the ratio of stock market capitalization to GDP was above 20 % in 1914, but less than 2 % in 1950, and only more than 20 % again since 1997 (Le Bris and Hautcoeur, 2010 or chapter 1). Thus, the "foreign assets / World GDP" ratio, measures both financial market integration and the role of the financial market in the economy.

Others authors have analyzed the returns for the same class of assets around the world. Obstfeld and Taylor (1999) find a low spread between US and British Bills. Flandreau and Zumer (2004) use the spread between foreign and British bonds as an indicator of financial integration. Mauro *et al.* (2002) compare state bond spreads in emerging countries today with the spreads observed during the first period of globalization. Ferguson and Schularick (2006) argue that members of the British Empire benefited from substantially reduced interest rates due to their colonial status. Edelstein (1982) uses a set of 566 common and preferred stocks and bonds, domestic, colonial, and foreign annual quotes, between 1870 and 1913 and computed realized rates of return. He finds a higher risk adjusted return (1.58 %) for overseas investments compared to investments made within England.

Another way to measure international integration is to analyze the part of portfolios invested in foreign assets. According to Edelstein (2004), British investors held about 32 % of their investments in overseas assets. According to Michalet (1968), French investors had about one third of their wealth invested in financial markets, in the form of foreign securities. Goetzmann and Ukhov (2006) provide historical evidence for strategies of diversification projected before the First World War, and before the formalization of modern portfolio management (see Lowenfeld, 1907).

1.2 Data

High quality data are necessary to avoid bias, which can be particularly deep if a small methodological default is relied upon (see for example chapter 1 on SGF-INSEE method used to build the French stock index). High quality data involves dividend-coupon series since dividends were the major source of return before 1914 (Siegel, 1992) and monthly prices. Unfortunately, this kind of data is not easily available. Consequently, this study focuses only on few markets and assets where there is high quality data, such as: US and French stocks since 1854, and mainly French and Russian bonds between 1870 and 1913. Monthly total returns are measured using price variation and dividend-coupon for stocks and bonds. One short-term rate is used as a proxy of the risk free asset. All series are presented in Appendix A, with the most cited detailed below.

A new historical CAC 40 (HCAC 40) index is used to study the French stock (Le Bris and Hautcoeur, 2010 or Chapter 1). The HCAC 40 is, basically, a monthly index of the 40 largest market capitalizations among French firms. All French firms are ranked at the beginning of each year, thus, avoids survivor's bias. The index is weighted by market capitalizations. The 40 firms represent the major part of the total capitalization in the market. Today, the Euronext's CAC 40 represents about 70 % of French market capitalization, and was approximately 90 % at the beginning of the studied period. The US stock data are taken via the Old NYSE (Goetzmann *et al.*, 2000) between 1854 and 1870, Cowles (1936) between 1871 and 1924, and Shiller's S&P since 1925.

Russian bonds are computed from the monthly spreads, compared against the UK Consol rate, as indicated in the *Investor's Monthly Manual* cited by Ferguson and Batley (1999). The authors present additional spreads for Germany, Italy, Argentina, Spain and France between 1870 and 1913. Monthly rates for these perpetual bonds are obtained by adding the spreads to the UK Consol rate, taken from Klovland (1994).

For example: $Russian\ bond\ rate = UK\ Consol\ rate + Russian\ spread$

No adjustment is realized for exchange rates during this period of Gold Standard. During this period, inflation did not really exist and foreign exchange between the franc, dollar and sterling were almost stable. As explained by Ferguson (2006), only France, the UK and Germany were able to borrow in their own currencies. However, the US gradually gains this capacity[142]. Other countries are obliged to link the interest of their bonds to one of the gold currencies. Therefore, all returns are computed as nominal in their respective currencies.

It is the spread observed on the London market since no data is available on the French market. But as has been explained before, many studies have shown there to be a strong financial integration for identical securities quoted in several markets in the period after the introduction of the telegraph. As a result, the data from London can be used to represent foreign investment for a French investor.

[142] The Mint Act of 1792 put the United States on a bimetallic (gold and silver) standard, which prevailed until the suspension with the civil war. Convertibility is restored in 1879, but only into gold.

Anyway, in order to test the quality of these data[143], the rate obtained through 3 % Consol rate majored by the French spread is compared with the French rate really observed on the price of the Rente 3 % on the French market.[144] Figure 1 shows the annual[145] change of these rates ($\Delta T_t = \frac{T_t}{T_{t-12}} - 1$) measured each month in Paris and in London between 1870 and 1913.

The calculated R² of the regression is very high (0.95). A T-test between these two series indicates a probability of 95.28 % of an equal mean. The difference between the two series is most likely due to slightly asynchronous relationship between data sets. In fact, the UK and French rates and French spread are not observed on exactly the same day of each month. As a result, a small gap exists between the two series, but the quality of the data obtained using the UK Consol rate majored by the French spread appears very high. We assume that it is also true for the spread with other countries.

[143] See in Chapter 7 for another test of integration.
[144] A similar study is realized by Ferguson (2006) with a "comparison of the prices and yields on 5 % *Rentes* in London and Paris between 1873 and 1883 (…) indicates that arbitrage minimized differentials between the two quotations. The spreads between the two prices were very small (on average three basis points) and the correlation between the two prices was very high (the correlation coefficient for the period is 0.997)."
[145] Annual price variation is used in spite of monthly price variation for two reasons. Firstly, since not all data was collected on the same day (first Wednesday for French Rente in Paris and the last day of the month for the others), the bias can be strong on a monthly change, but is insignificant on annual movement. Secondly, to avoid the effect of coupon payments: the rate used to provide the spread from *Investor's Monthly Manual* comes from prices, without taking account the accrued coupon (only the coupon rate as a percentage of the quoted price). Since the schedule of payments remains constant, one annual change price confronts two prices with a similar accrued coupon. To exploit monthly data, annual changes are measured each month.

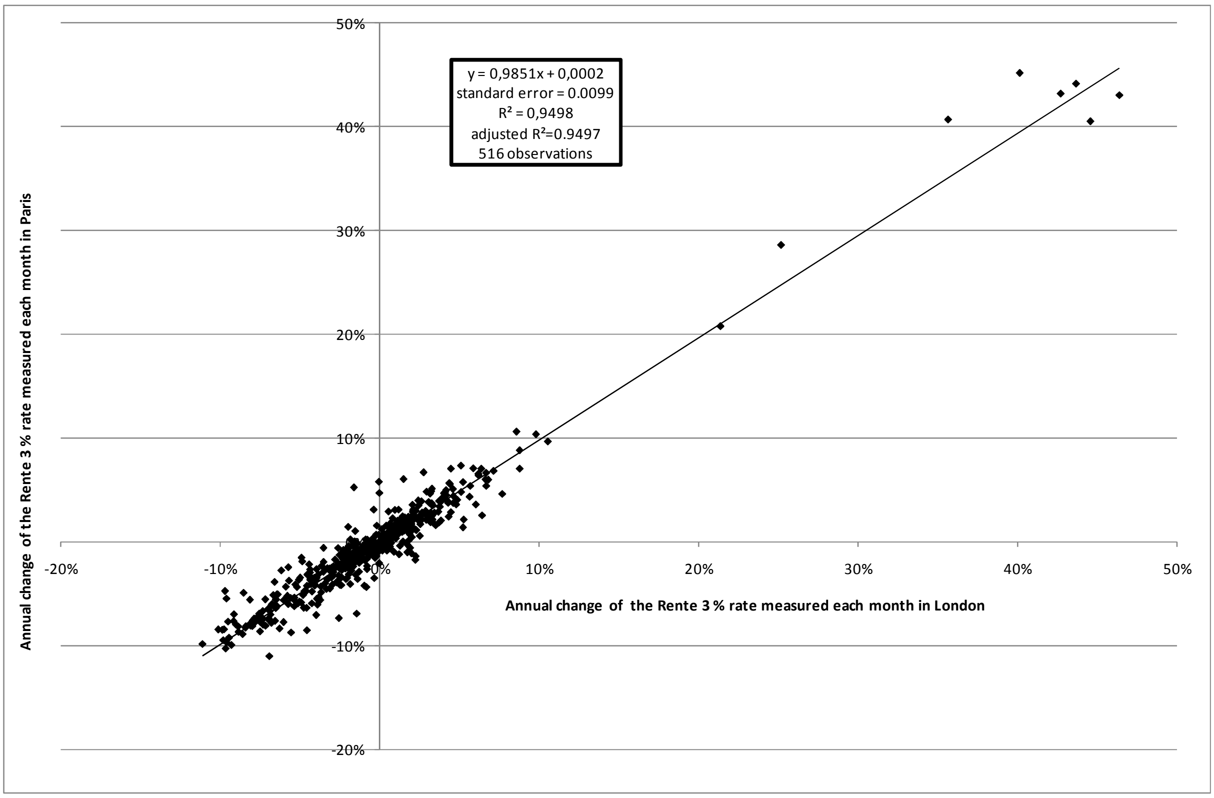

Figure 1, Robustness of the data mentioned in Investor's Monthly Manual. This figure displays a test of robustness for the data of the *Investor's Monthly Manual* comparing two rates for the French Rente 3 % between 1870 and 1913. The first one (X) comes from the sum of the spread (compared to the UK Consol rate) coming from *Investor's Monthly Manual* (mentioned in Ferguson and Batley, 1999) to the UK Consol rate (Kloveland, 1994). The second one (Y) is computed by the author from market prices in the French press. Annual changes of these two rates are calculated each month and presented on this scatter-plot.

The use perpetual bond rates enables total return provided by the investment to be measured.

$$total\ bond\ return = bond\ price\ variation + coupon\ rate \tag{1}$$

With, *r* is the annual total return between *t* and *t+1*, *P* is the price of the bond, *C* is the amount of the coupon and *T* is the rate of the perpetual bond (*C/P*) we have:

$$r = \frac{P_{t+1}}{P_t} - 1 + T_t \tag{2}$$

In the case of a perpetual bond, we have $P = \frac{C}{T}$; thus:

$$r = \frac{\frac{C}{T_{t+1}}}{\frac{C}{T_t}} - 1\ + T_t \tag{3}$$

Since $\frac{\frac{a}{b}}{\frac{a}{c}} = \frac{c}{b}$, we have, *r*, the total return of the bond as:

$$r = \frac{T_t}{T_{t+1}} - 1 + T_t \tag{4}$$

For example, in November 1892, the Russian bond offers a rate of 4.8413 % (T_t). One year later, this rate decreases to 4.7692 % (T_{t+1}). As a result, the annual total return of this bond is 6.3531 % including 4.8413 % coming from the coupon rate augmented by 1.5118 % (4.8413 %/4.7692 % -1) set of from the price variation.

1.3 The long-term price of risk in various assets

The product traded on financial markets is risk. An integrated market means an equal price for the same product traded on different places. Therefore, to test the integration of financial markets before 1914, the price of risk within different markets has to be measured. The relationship between risk (measured by the standard deviation of returns) and the average return of various assets can be shown graphically as the risk line. Since the study by Black *et al.* (1972) on NYSE stocks over 1931 to 1965, different studies have found a consistent risk line. Arithmetic mean can't be used to test the relation between risk and return because the arithmetic mean depends on the level of standard deviation. Therefore, an artificial correlation exists between arithmetic mean and standard deviation.[146] Consequently, returns used in this test are the geometric mean of the total annual returns. The test of this international risk line is realized with monthly data on various assets and periods before 1914.

Using the standard deviation, but not the beta, this risk line respects Equation (5):

$$r^i = \alpha_i + \gamma\widehat{\sigma_\iota} + \epsilon_i \tag{5}$$

where r^i is the annual return (measured each month on a 12-months rolling window) of the asset *i* measured by its geometric mean, α_i is the risk free rate, γ is the price of the risk, $\widehat{\sigma_\iota}$ is the level of risk measured by the standard deviation of the returns and ϵ_i is an error term.

[146] As example of this relationship between arithmetic mean and risk, we know that we can approximate the arithmetic mean by the sum of the geometric mean and one half variance.

1.3.1 Nine International Assets, 1854-1913

Using data between January 1854 and December 1913, a clear international security market line exists. Total returns are calculated with dividend-coupon series and 720 monthly price variations.

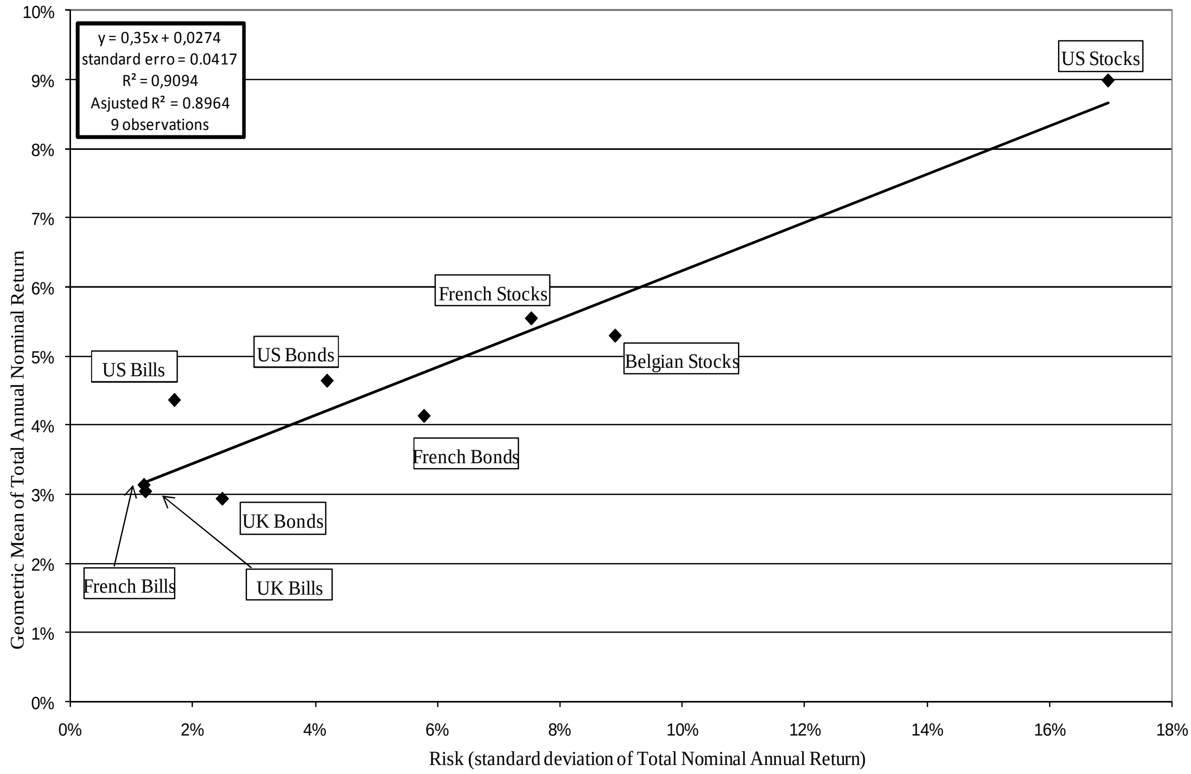

Figure 2, Risk line for various French, British, Belgian and US assets over 1854-1913. This figure plots the geometric average of the total return (Y) and risk (X) measured by the standard deviation of these returns. These assets are consistent with each others in terms of risk-return. For data, see Appendix A and Appendix C for values**.**

The coherence of this international risk line has three consequences. Firstly, this observed line constitutes a validation of the theory, linking risk and return with the correct approximation of the risk by the standard deviation of the total return, several decades before the first development of the method of risk calculation by standard deviation. Secondly, French, US, Belgian and British financial markets appear integrated throughout this period. Thirdly, French, US and Belgian stocks appear to provide a return consistent with their level of risk; in other words, these stocks returns are without any excessive risk premiums. Despite the weak signification of the regression, since only 8 assets are used, it is interesting to note the high level of R^2 (0.91). Other international assets could be close to this line; however, there is no data available that can offer confirmation.

1.3.2 Seventeen International Assets, 1870-1913

The same analysis is provided for a shorter period, but with more assets from more countries. The *Investor's Monthly Manual* provides 528 monthly data for 5 foreign bond markets in addition to the monthly series used in the prior section, and Macauley (1938) provides data on three kinds of US bonds. Series on French corporate bonds measured by Rezaee (2008) is also used. As a consequence, the relevance of the regression increases thanks to seventeen assets from eight international markets (Figure 3). The R^2 remains high at 0.61. All these assets are consistent with one other despite some special situations. For example, Spanish bonds were riskier than US stocks, but provided a consistent higher return. During this period Spain suffered from the last Carlist war as well as from a foreign war against the USA in 1898; at each time the Spanish bond rate was above 10 %. Argentina had debt repayment problems between 1888 and 1893, and again in 1893 (see Goetzmann and Ukhov, 2006).

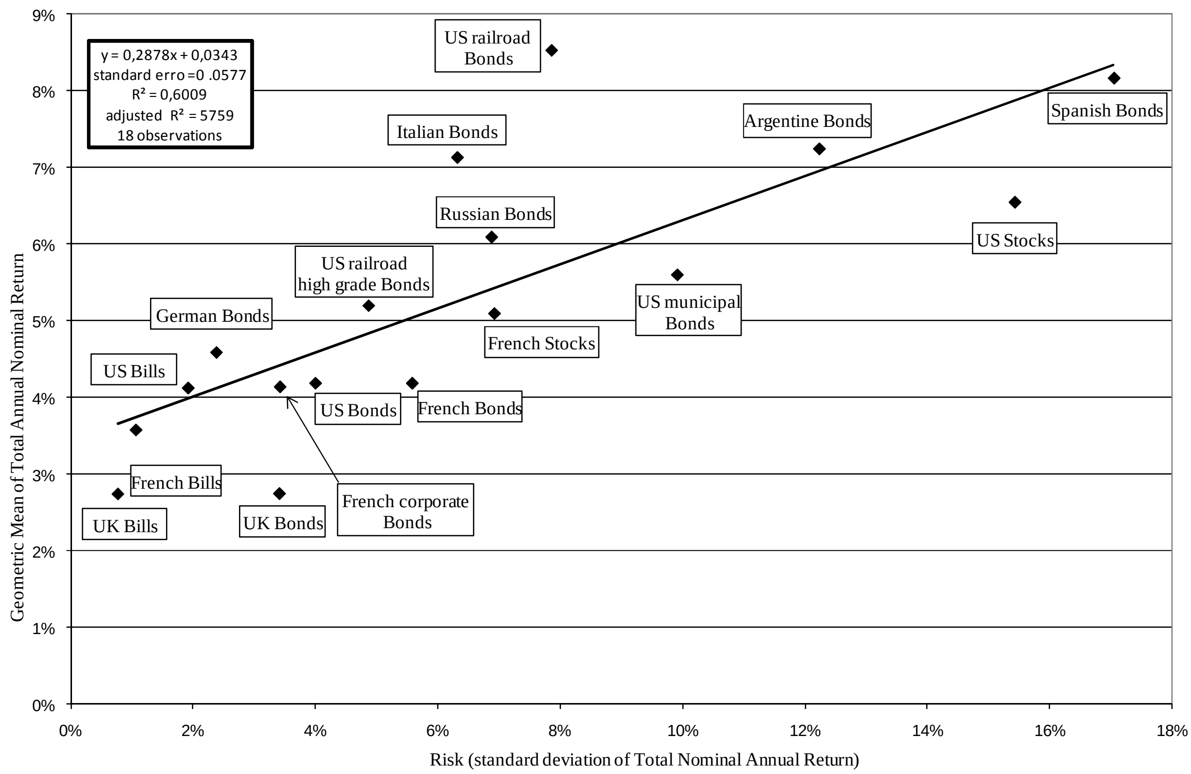

Figure 3, Risk line for various assets from eight countries over 1870-1913. This figure plots geometric average of total return (Y) and risk (X) measured by the standard deviation of these returns. These assets are consistent with each others in terms of risk-return. For data, see Appendix A and Appendix E for values.

II Foreign assets allow for a better diversification rather than better returns

2.1 Decomposition of diversification benefits between weak correlation and higher return

Were European investors only attracted by higher foreign returns? Goetzmann and Ukhov (2006) address the issue by calculating optimal portfolios after having arbitrarily imposed return values for foreign assets that are similar to that for domestic assets. As the optimal portfolio still includes foreign assets, they conclude that the low correlation also plays a role. We propose a new method to clearly distinguish what part of this global benefit comes from higher foreign return, and what part comes from the low correlation.

Assuming strong international market integration (and thus an equalization of the price of risk) the exportation of capital, before 1914, might well be mainly motivated by the achievement of low international correlation. The profit of international investment for the French savers is decomposed between profit from low correlation and profit from higher foreign returns.

A general explanation of diversification is “not to put all the eggs in one basket”, *i.e.* spreading the wealth between different assets reduces the risk associated with the portfolio. The MPT (Markowitz, 1959) is built upon this idea, using mean-variance optimization. Investing in low correlated assets reduces the volatility of the portfolio and leads to a better risk adjusted portfolio return. Diversification cannot achieve a better return, since the portfolio return is the weighted average of the return of each asset. But diversification allows a decrease in the risk level. Consequently, the remuneration of risk increases, and, for a given level of risk, a better return is achieved.

The effect of this diversification depends on the correlation between the returns of the two assets. Graphically, if the correlation is perfect (ρ=1), all combinations draw a line between the two assets (the doted line on Figure 4). Progress of risk and return occurs in a linear way. Return for such a portfolio increases only with the rise of risk. In case of a hypothetically perfect correlation (*hyp*) between the two assets, the return and standard deviation of any combination respect the following formulas. Let X be the weight (in %) of one market with $X_a + X_b = 1$, *r*, is the total return and σ is the standard deviation of this total return.

Total Return of the Hypothetical Portfolio: $r_{hyp} = X_a r_a + X_b r_b$ (6)

Standard Deviation of the Hypothetical Portfolio: $\sigma_{hyp} = X_a \sigma_a + X_b \sigma_b$ (7)

With a correlation < 1, the possible combinations draw a curve (see black line on Figure 4). All possible combinations between pure domestic and pure foreign asset allocation (if short sale does not exist) are represented by this curve. In this standard case, return and standard deviation of any combination respect the following formulas where σ_{ab} is the covariance between the returns *a* and *b*.

Total Return of the Portfolio: $r_P = X_a r_a + X_b r_b$ (8)

Standard Deviation of the Portfolio: $\sigma_P = \left[X_a^2 \sigma_a^2 + X_b^2 \sigma_b^2 + 2 X_a X_b \sigma_{ab}\right]^{1/2}$ (9)

But in practice, a higher risk-return portfolio does not require foreign asset allocation. A higher risk-return portfolio can be achieved on the domestic market. From a micro-economic point of view, an investor can choose the level of risk he is willing to take. If he looks for a high risk-return portfolio, he can choose to increase the weight of risky assets. For instance, he can concentrate his portfolio allocation on risky domestic stocks rather than domestic bonds. The investor can also invest on future markets, which were very liquid at that time (Viaene, 2005). Another way to increase the portfolio risk-return level is to use leverage, and buy assets for a total amount that exceeds the value of initial wealth. The macroeconomic result of this latter strategy should be a rise, in the price of the domestic assets, and, the general level of debt.

A leveraged investor obtains better average return but supports a higher volatility. Since average return on the asset is higher than the cost of debt, a better portfolio performance is achieved using that debt. However, the fixed amount of interest to pay for the debt causes a worse performance when the asset return is inferior to the cost of debt. Accordingly, the volatility (standard deviation) of returns of the leveraged portfolio is higher than with pure asset investment (without leverage). A study of this possibility for an investor to become indebt on the domestic market is the easiest way to build a comparative model.

To design a leveraged strategy (*LS*), it is necessary to select an interest rate to finance the buying of more assets than 100 % of the investor's wealth. This interest rate is defined as the short-term rate and supposed risk free (*rf*). The grey line on Figure 4 illustrates the risk and return of the leveraged strategy. All possible combinations of leveraged portfolios are on this line; the end of the line is only the end of the "bank's credit" of the investor. Formally, the return of this leveraged strategy is obtained as the return of one portfolio, with one negative weight for the short-term rate and more than 100 % for French asset. For example, for a 25 % debt portfolio, X_a = 1,25 and X_{rf} = -0,25, with *rf* for short-term rate. With always $X_a + X_{rf} = 1$

Thus,

$$r_{LS} = X_a r_a + X_{rf} r_f \tag{10}$$

$$\sigma_{LS} = X_a \sigma_a \tag{11}$$

As Figure 4 indicates, for a given portfolio (or level of risk), one decomposition of the benefit obtained through international diversification is proposed.[147] The total diversification benefit is the difference in return between what is obtained on diversified portfolio (black curve) and what can be obtained on domestic market thanks to leverage (grey line). This total diversification benefit is decomposed between higher foreign return and low correlation. In case of perfect correlation the benefit of the diversification comes only from higher foreign return. The difference in return between the hypothetically perfect correlation and the leveraged strategy (*LS*) on the domestic market, measures this gain from higher foreign return only. The rest of the total diversification benefit (the difference between the real diversified portfolio and the hypothetical perfect correlation one) indicates the gain from low correlation.

In other words, a French investor can select his level of risk on his domestic market: his portfolio is on the grey line. The investor can diversify with a foreign asset with a higher risk-return level. The rise of his risk-return level is achieved thanks to the low correlation

[147] The same analysis can be realized with the decrease of the risk for a constant level of return.

between foreign and domestic assets (*ω1*) and only through a higher foreign return in case of perfect correlation (*ω2*). For a given level of risk:

$$\omega_1 = r_p - r_{hyp} \quad \text{(low correlation part)} \tag{12}$$

$$\omega_2 = r_{hyp} - r_{LS} \quad \text{(higher foreign return part)} \tag{13}$$

To determine which portfolio (combination) on the curve is decomposed, it is assumed that the optimal portfolio (higher Sharpe ratio) is the best choice. The optimal portfolio, *O*, in a mean-variance analysis is determined. The Capital Allocation Line[148] is built using the French risk free asset (short-term rate is the proxy). All efficient portfolios are on this line joining the risk free asset and the optimal portfolio. This Capital Allocation Line is the tangency between the risk free asset and the efficient frontier on point with the minimum risk. It is the line with the higher slope. This slope is the Sharpe ratio. Thus the optimal proportion of US stocks is obtained through the "target value method", seeking for the higher Sharpe ratio:

$$Sharpe\ ratio = \frac{(r_O - r_f)}{\sigma_O} \tag{14}$$

with r_O is the total return of the optimal portfolio and r_f is the return of the risk free asset.

Formula of the Capital Allocation Line follows:

$$r_P = r_f + \left[\frac{(r_O - r_f)}{\sigma_O}\right]\sigma_P \tag{15}$$

[148] We use the term "Capital Allocation Line" in place of "Capital Market Line" since, in our case, this line connects the risk free rate with an optimal portfolio which is not the "market portfolio".

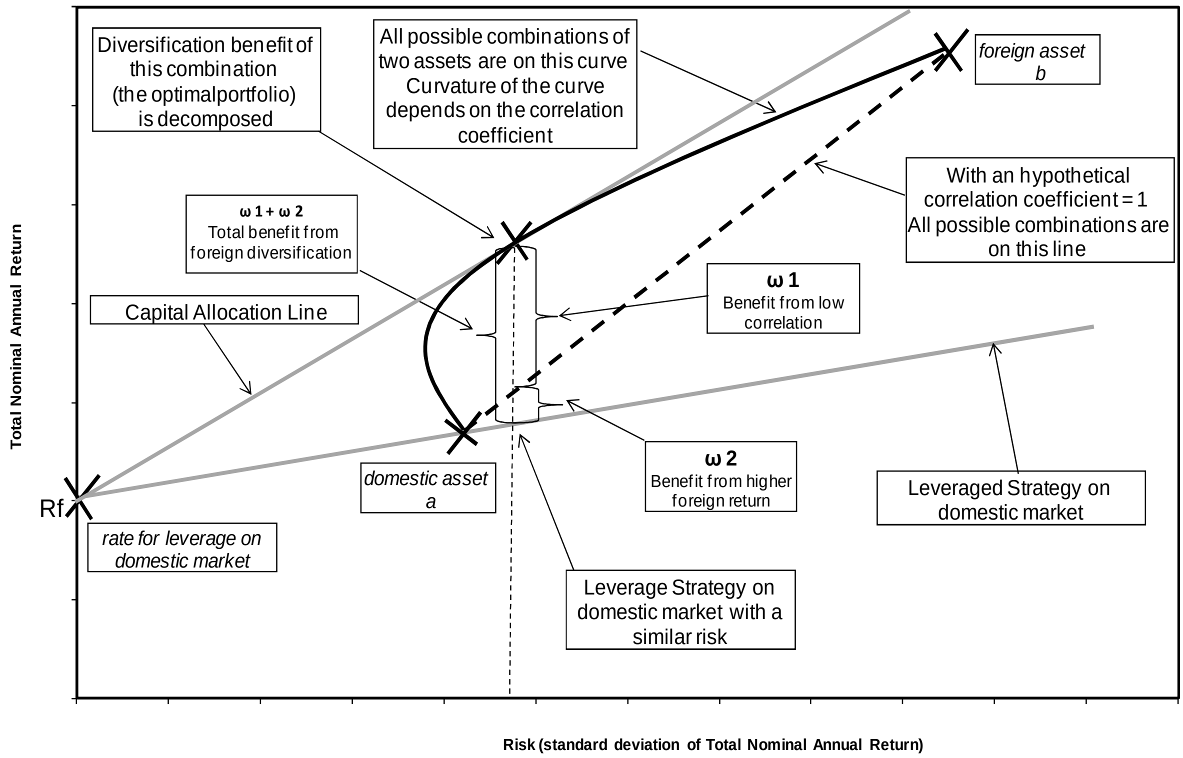

Figure 4, Scheme of the decomposition of the diversification benefit. This figure shows the graphical illustration of the method proposed to decompose the diversification benefit between one first part from higher foreign return and a second part from low correlation thanks to a hypothetical hypothesis of perfect correlation.

2.2 Decomposition of French-US stocks portfolio, 1854-1913

2.2.1 French-US stocks portfolios, 1854-1913

This decomposition of the international diversification benefit is first applied to the French and US stock market data (720 monthly stock prices and 60 annual dividends, see Appendix A). The choice of US stocks to make this decomposition is not really consistent with history since less than 5 % of the French foreign investments were in this country (see Table 2 in Appendix B). But this choice is driven by the availability of high quality data for the US market. Moreover, the US data allows (in Section 3) a long-term comparison of the correlation which is not possible with other countries (either because of lack of data or the extinction of the market).

Performances of international portfolios are measured. Figure 5 shows the risk-return relationship of pure French and US stock portfolios, identical to that on Figure 1. Nine possible portfolios, combining US and French stocks are also calculated following Equations (8) and (9). The first one is constituted by 10 % of US stocks and 90 % of French, the second

20 % of US stocks and 80 % of French and so on. All possible combinations between French and US stocks are on the curve. Risk and return of the nine French-US portfolios are also calculated with the hypothetical perfect correlation following Equations (6) and (7). The decrease of risk resulting from the low correlation appears clearly on Figure 5. For a given proportion of US stocks, actual and hypothetical portfolios present the same return but a very different risk. These same returns can be illustrated by a horizontal line between each point of the same corresponding proportion of US stocks. Finally, according to Equations (10) and (11), five portfolios, between 25 % and 125 % of leveraged strategy are realized.

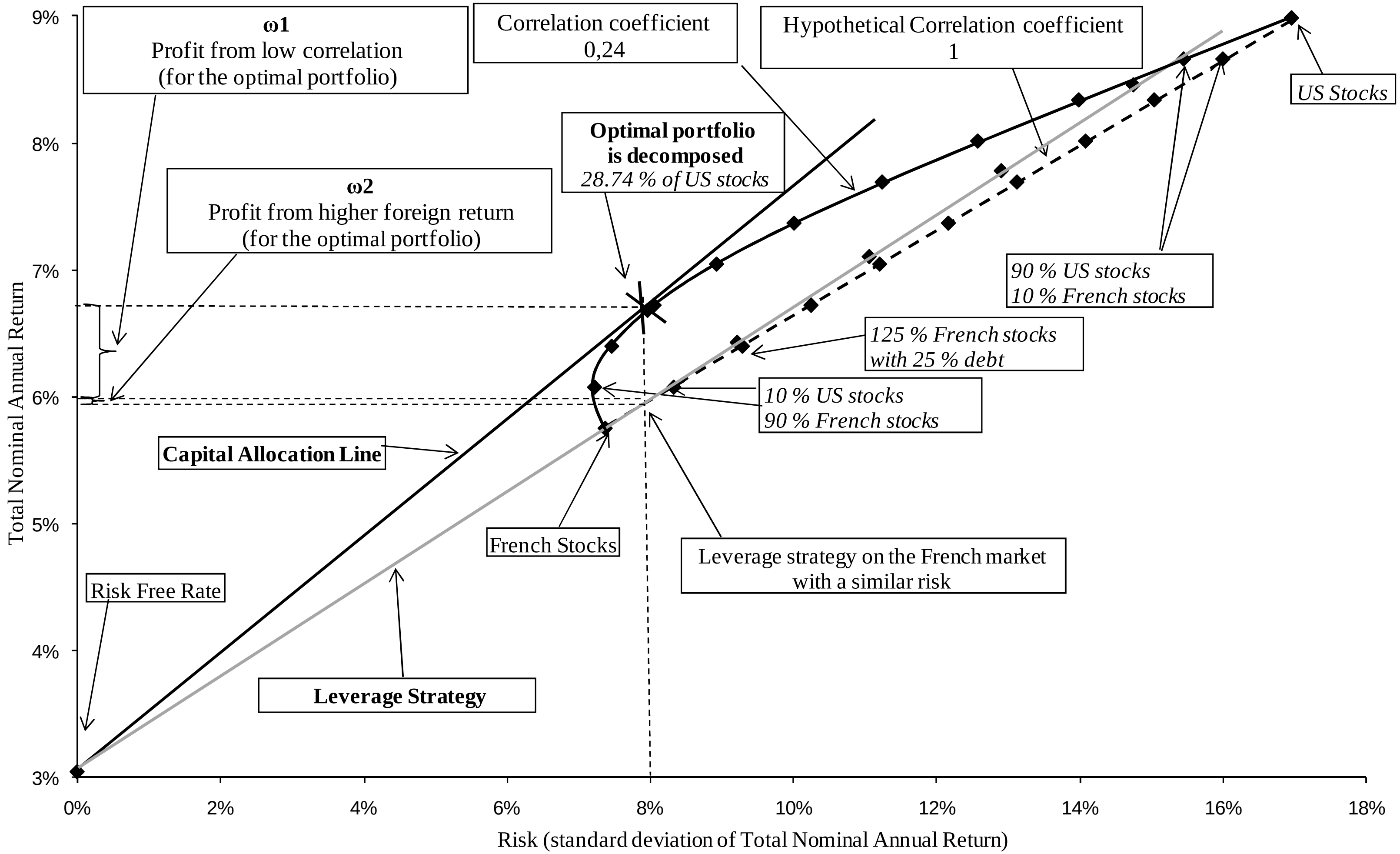

Figure 5, Decomposition of the diversification benefit between French and US stocks. 1854-1913. The plot displays all possible combinations between French and US stocks constructed with short-sale restrictions (black curve), the line tangent to these combinations, with origin at the risk-free rate (black line), indicating the optimal portfolio. The extra return obtained thanks to international diversification is measured as the difference between the return of the optimal portfolio and the return of a leverage French-only strategy (grey line) with a similar level of risk. This extra return is decomposed between one part from higher foreign return and a second part from low correlation thanks to a second combination of French and US stocks with a hypothetical perfect correlation (dashed line). For data, see Appendix A and Appendix C for values.

The optimal portfolio indicates an optimal part of US stocks for a French investor of 28.74 %, with a risk σ_O of 7.96 % (with a return of 6.68 %). This proportion is very close to the observations of foreign securities (stocks and bonds) in actual portfolios at least at the end of the period (Michalet, 1968, see Table 1 in Appendix B). Goetzmann and Ukhov (2006) provide the same kind of analysis for several countries available for British investors and find an optimal portfolio with 38 % of foreign assets.

2.2.2 Decomposition of the benefit from diversification

The decomposition of the diversification benefit is realized by calculation of the return of a leveraged strategy and the return of the portfolio with a hypothetically perfect correlation. These returns are those obtained for the same level of risk as the optimal portfolio:

$(\sigma_{LS} = \sigma_{hyp} = \sigma_O = 0.0796)$.

1. Return of the leveraged strategy: Using formula (11) with a risk level of French stocks equal to 7.37 %.

$X_a = \frac{0.0796}{0.0737}$ = 108.01 %, thus, $X_{rf} = -8.01\,\%$

the weight of French stock (X_a) necessary to achieve a risk level of 7.96 % is 108.01 %, thus the weight of the risk free asset (X_{rf}) is -8.01 %.

According to formula (10), the return of this leveraged strategy on the domestic market is:

$r_{LS} = (108.01\,\% * 0.0575) - (8.01\,\% * 0.0304) = 5.97\,\%$

2. Return of the hypothetical perfect correlation: To achieve a level of risk equal to that of the optimal portfolio, $\sigma_{LS} = \sigma_O = 0.0796$, the weight of French stocks (X_a) is obtained using formula (7).

$\sigma_{hyp} = X_a \sigma_a + X_b \sigma_b$ with $1 = X_a + X_b$

$$\sigma_{hyp} = X_a\sigma_a + (1 - X_a)\sigma_b$$

Therefore, $X_a = \dfrac{\sigma_{hyp} - \sigma_b}{\sigma_a - \sigma_b} = \dfrac{0.0796 - 0.1695}{0.0737 - 0.1695}$ = 93.83 %, thus 6.17 % of US stocks

According to formula (6), the return of a hypothetical perfect correlation is:

$$r_{hyp} = (0.9383 * 0.0575) + (0.0617 * 0.0899) = 5.95\%$$

3. Result of the decomposition: Using these three returns, the part of the diversification benefit from low correlation (*ω1*) and the part from higher US returns (*ω2*) are measured following Equations (12) and (13).

$$\omega_1 = 0.0668 - 0.0595 = 0{,}73\%$$

$$\omega_2 = 0.0595 - 0.0597 = -0{,}02\%$$

Obviously, profit from low correlation is much more important than profit from higher US returns, *i.e.* $\omega_1 > \omega_2$. Using a level of risk equal to that of the optimal portfolio ($\sigma_O = 7.96$ %), the total gain from the international diversification compared to a leveraged strategy on the domestic market is 0.71 % per year (the US diversification provides a return majored by 71 basis points) with ω_1= 0.73 % (low correlation) and ω_2 negative of 0.02 % (higher US returns). This negative term means that it would be preferable, for a French investor, to remain invested in France using the leverage, rather than to invest in the US in the case of one perfect correlation between French and US stock markets. In other words, looking for higher US returns without the low correlation would have led to a lower return than to invest in France with leverage. As a result, we can say that 102.45 % of the benefit achieved by US diversification comes from the low correlation since a leveraged portfolio on the domestic market provides about the same risk-return relationship as a diversification with a hypothetically perfect correlation (see Table 1).

2.2.3 Decomposition for two sub-periods

It is possible that the period covered by the prior case conceals time differences. The same analysis is realized on two sub-periods. The break used is 1890, since this year can be view as a turning point for free trade. During this year, the McKinley tariff has been adopted, therefore, increasing the tariff rate for imports to the US. Two years later, the French Méline Tariff raised the tax on French imports. Thus, the first sub-period used starts in January 1854 and ends in December 1889, when begins the second sub-period, which ends in December 1913.

The first sub-period appears close to the entire period. The optimal portfolio indicates a proportion of US stocks at 34.82 %. But in this sub-period, the return of the leverage strategy is just below the hypothetical return of one diversified portfolio with perfect correlation. As a result, the higher US returns provide 1 basis point, but 88 basis points come from the low correlation (98.75 % of the total benefit of the diversification). Details on calculations are not provided, see Table 1 and Figure 6.

The second period offers a different picture. The optimal weight for US stocks is only 14.18 %. Graphically, the grey line of the leverage strategy is close to the Capital Allocation Line. Thanks to the strong difference between the short-term rate (cost of the leverage) and French stock return during this period, a stock investor can achieve an efficient leverage strategy on his domestic market only. Consequently, with 34 basis points, the total benefit from diversification is weak compared to 89 basis points obtained during the first sub-period. This weak incentive for a French stockholder to hold US stocks is consistent with the low export of capital to the United States from France at the end of that time. The second consequence of the high profitability of the leverage strategy, is, all the profit of diversification comes from the low correlation and nothing from higher US return (see Figure 7 and Table1).

Table 1, Risk, returns and decomposition of French-US stocks diversification.

	1854-1913	1854-1889	1890-1913
	Optimal Portfolio		
Weight of US stocks	28.74%	34.82%	14.18%
Risk	7.96%	9.47%	4.32%
Return (I)	6.68%	7.79%	4.87%
	Hypothetical perfect correlation Porfolio		
Weight of US stocks	6.17%	7.10%	2.55%
Risk	7.96%	9.47%	4.32%
Return (II)	5.95%	6.91%	4.48%
	Leveraged Strategy		
Weight of French stocks	108,01%	106.80%	107.81%
Risk	7.96%	9.47%	4.32%
Return (III)	5.97%	6.90%	4.53%
	Result of Decomposition		
Total benefit (I-III)	0.71%	0.89%	0.34%
Low correlation ω1 (I-II)	0.73%	0.88%	0.39%
Higher foreign return ω2 (II-III	-0.02%	0.01%	-0.05%
% from low correlation	102.45%	98.75%	114.88%

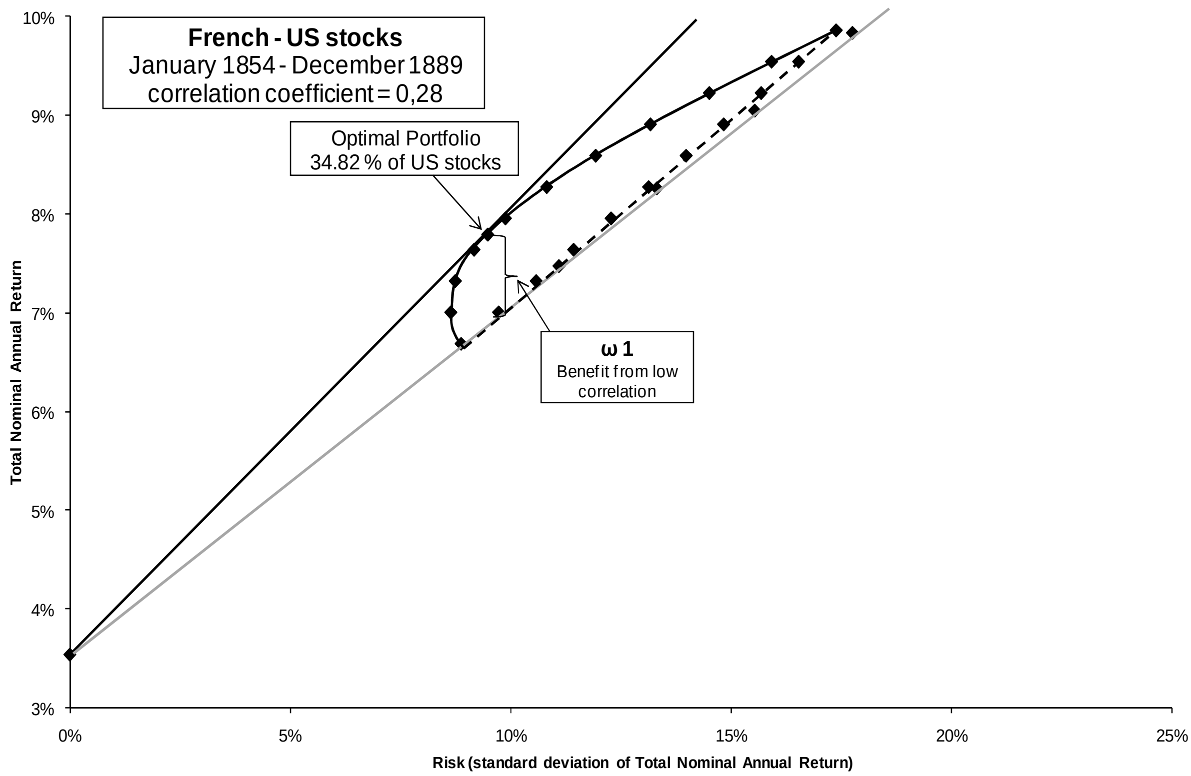

Figure 6, Decomposition of the diversification benefit between French and US stocks. 1854-1889.

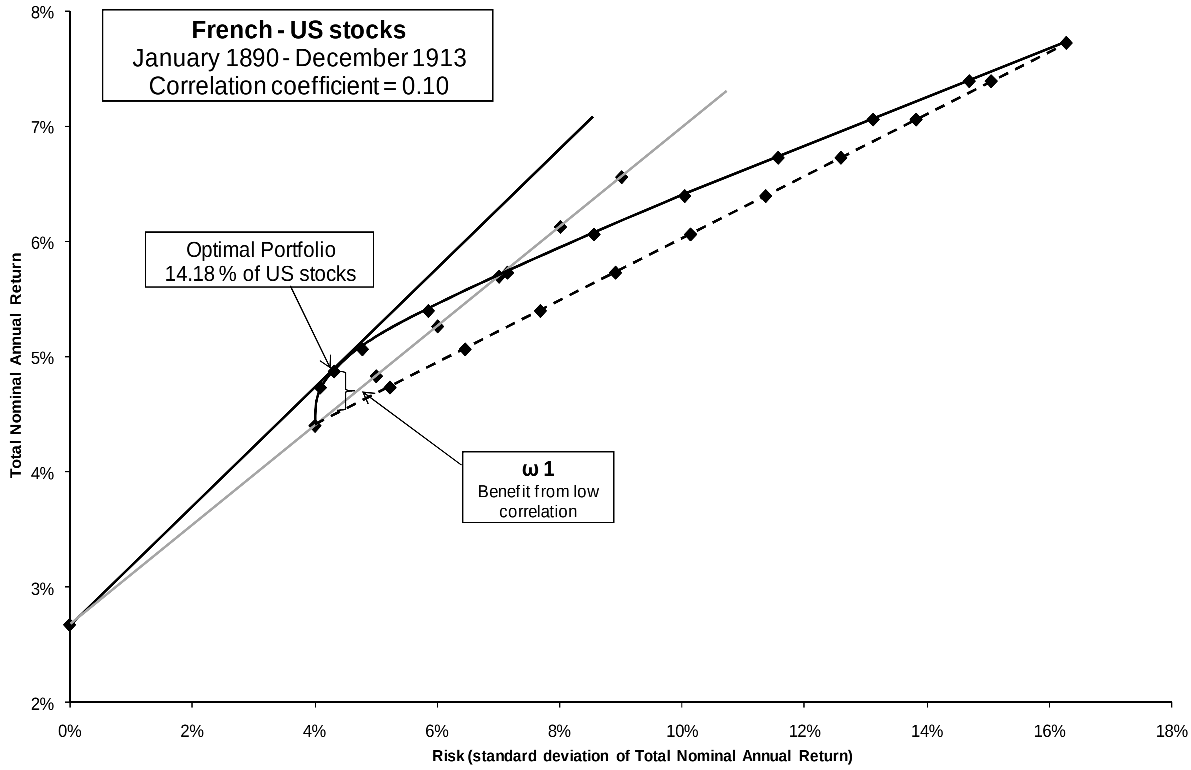

Figure 7, Decomposition of the diversification benefit between French and US stocks. 1890-1913.

2.3 Decomposition of French-Russian state bonds portfolio, 1870-1913

2.3.1 French-Russian state bonds portfolios, 1870-1913

The same analysis as the one carried out above, for French-US stock portfolio is performed for French and Russian bonds. According to Equation (4), total returns of French and Russian bonds are measured by 528 monthly rates (see Appendix A for data). The decomposition of the Russian diversification benefit for French bond investor is very consistent with what was historically observed since about 25 % of the French foreign investment was made in this country. Russia was the largest borrower in the world at the beginning of the 20th century (Ukhov, 2003), and the number one country for French foreign investments. The second French investment destination was "Spain-Portugal", with a proportion of (only) 16 % in 1900 (see Table 2 in Appendix B).

Russian state bonds were the first choice of allocation for French savers. A study of 1,032 French portfolios in 1897 showed that the first investment choice was Russian state bonds which accounted for between 13 % and 38 % of the total portfolio investment (see Table 1 in Appendix B). Another set of important data exists for the end of the First World

War thanks to the *Office des Biens et Intérêts Privés à Recenser* (décret of the September, 10^{th} 1918): 1,600,000 individual declarations were recorded as claims upon Soviet government as a consequence of holding Russian securities. Compared to 11,809,000 households in 1918, it represented about 14 % of them.

The level of correlations measured among international assets is very low at that time compared to current observations. Mauro *et al.* (2002) study correlation coefficients for the bond spreads of emerging markets for the "second globalization" period compared with historical time period of this study. The current average correlation coefficient is 0.77, compared with 0.45 in historical times for the full sample, and 0.42 for the high-quality-data sample (Mauro *et al.*, 2002). During the 19^{th} century, for a saver holding French state bonds, investment in French Corporate bonds provided a bad diversification, since the correlation coefficient between the annual total returns is 0.76. On the other hand, investing in Russian bonds provides a high level of diversification, since the correlation coefficient is only 0.11 ; close to those observed with US Railroad bonds or US Municipal bonds (0.12 and 0.14). Argentine bonds also offered an exceptional opportunity for diversification, thanks to a negative correlation with French bonds. Spanish bonds constituted a special case: a negative correlation, but with a high volatility due to war events. But Argentine and US railroad bonds were riskier than Russian ones (see Figure 3). The less correlated of the bonds was the German (0.04), but the political context after the defeat of 1870 probably made French investments in Germany problematic. Italian, Spanish, US and UK bonds provided a correlation coefficient superior to 0.15, thus a relatively "bad" diversification. Therefore, Russian bonds were one of the best investment opportunities to diversify a French bond portfolios. (See chapter 7 for a deeper look into why Russia was such a good prospect).

Table 2, Cross correlations of various French and foreign assets, 1870-1913. The table shows cross-correlations for total returns of various international assets. For data, see appendix A

	French Bonds	*French stocks*	*French Corp. Bonds*	*US Bonds*	*UK Bonds*	*Spanish Bonds*	*German Bonds*
French Bonds	1						
French stocks	0.27	1					
French Corp. Bonds	0.76	0.21	1				
US Bonds	0.33	0.30	0.42	1			
UK Bonds	0.18	0.26	0.33	0.28	1		
Spanish Bonds	-0.15	0.04	0.01	0.09	-0.12	1	
German Bonds	0.04	-0.11	-0.05	0.01	-0.48	0.14	1
Italian Bonds	0.17	0.05	0.24	0.21	-0.02	0.21	0.44
Argentine Bonds	-0.09	-0.06	-0.14	0.06	0.03	0.34	0.15
Russian Bonds	0.11	0.01	0.10	0.08	-0.08	-0.16	0.29
US railroad Bonds	0.12	0.16	0.07	0.31	0.20	-0.14	0.00
US railroad HG Bonds	0.34	0.26	0.44	0.75	0.39	0.09	0.11
US municipal Bonds	0.14	0.24	0.01	-0.07	0.11	-0.09	-0.08

	Italian Bonds	*Argentine Bonds*	*Russian Bonds*	*US railroad bonds*	*US railroad HG bonds*	*US municipal Bonds*
Italian Bonds	1					
Argentine Bonds	0.04	1				
Russian Bonds	0.23	0.04	1			
US railroad Bonds	-0.01	-0.14	0.02	1		
US railroad HG Bonds	0.28	0.16	0.10	0.26	1	
US municipal Bonds	-0.04	0.01	0.02	0.18	0.03	1

The next figure shows the risk-return relationship of pure French and Russian bonds, in the same way as the Figure 2. Nine possible portfolios combining Russian and French bonds are also calculated following Equations (8) and (9). The first one is constituted by 10 % of Russian bonds and 90 % of French; the second portfolio 20 % of Russian bonds and 80 % of French and so on… All possible combinations between French and Russian bonds are on the curve. Four portfolios of between 25 % and 100 % of leveraged strategy are illustrated according to Equations (10) and (11). Characteristics of these leveraged strategies are on the inferior grey line.

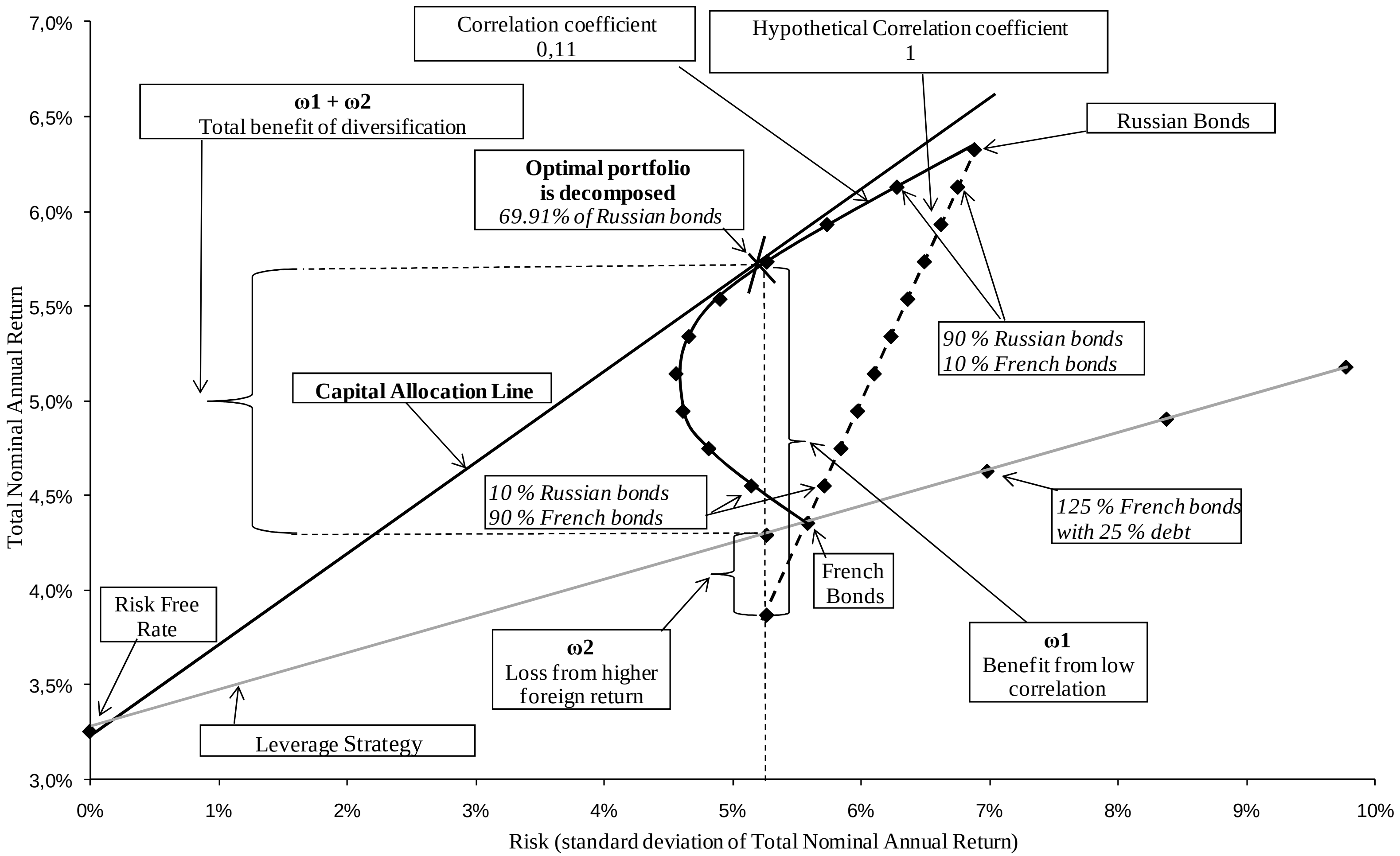

Figure 8, Decomposition of the diversification benefit between French and Russian bonds. 1870-1913. The plot displays all possible combinations between French and Russian bonds constructed with short-sale restrictions (black curve); the line tangent to these combinations, with origin at the risk-free rate (black line), indicating the optimal portfolio. The extra return obtained thanks to international diversification is measured as the difference between the return of the optimal portfolio and the return of a leveraged French-only strategy (grey line) with a similar level of risk. This extra return is decomposed between one part from higher foreign return and another one form low correlation thanks to a second combination of French and Russian bonds with a hypothetical perfect correlation (dashed line). For data, see Appendix A and Appendix E for values

As for French-US stock portfolio analysis, to determine which portfolio (combination) on the curve is decomposed, it is assumed that the optimal portfolio is the best choice. This optimal portfolio indicates an optimal, in a mean-variance model, portion of Russian bonds for a French investor of about 70 %, with a risk σ_O of 5.19 %. This optimal percentage of Russian bonds (combined with French bonds) is far from what was really held by French investors. A non-optimal (in mean-variance analysis) limit of foreign bonds holding probably exists. And calculations of one more complex optimal portfolio with several assets certainly modify this optimal part of about 70 % of Russian bonds (see chapter 7).

2.3.2 Decomposition of the benefit from diversification

The decomposition of the diversification benefit is realized by calculating the return of a leveraged strategy and the return of one portfolio with a hypothetically perfect correlation. These returns are those obtained for the same level of risk as the optimal portfolio ($\sigma_{LS} = \sigma_{hyp} = \sigma_O = 0.0526$)

1. Return of the leveraged strategy: Using formula (11) with a risk level for French bonds equal to 5.58 %:

$$X_a = \frac{0.0526}{0.0558} = 94.29\ \%, \text{ thus, } X_{rf} = +5.71\%$$

The weight of French bonds (X_a) necessary to achieve a risk level of 5.26 % is 94.29 %, thus, the weight of the risk free asset is + 5.71 %. This result means that to support the same level of risk on the domestic market that is offered by the optimal, internationally diversified portfolio, an investor needs to buy only 94.29 % of French bonds and put 5.71 % into the risk free asset providing the short-term rate *rf*.

According to formula (10), the return of the leveraged strategy on the domestic market is:

$$r_{LS} = (94.29\% * 0.0435) + (5.71\% * 0.0325) = 4.29\%$$

2. Return of the hypothetical perfect correlation: To achieve a level of risk equal to that of the optimal portfolio, 5.26 %, the weight of French bonds is obtained using formula (7):

$\sigma_{hyp} = X_a\sigma_a + X_b\sigma_b$ with $1 = X_a + X_b$

$\sigma_{hyp} = X_a\sigma_a + (1 - X_a)\sigma_b$

Therefore, $X_a = \dfrac{\sigma_{hyp} - \sigma_b}{\sigma_a - \sigma_b} = \dfrac{0.0526 - 0.0688}{0.0558 - 0.0688}$ = 124.57 %, thus -24.57 % of Russian bonds

As Figure 8 shows, this choice is clearly non-efficient. Since the risk level indicating by the optimal portfolio is situated below the risk of the French bonds, this portfolio needs to be short on Russian bonds and purchase more than 100 % of the initial wealth of French bonds. The higher Russian return leads in this case to a loss. This special situation is the result of the very low correlation level between French and Russian bonds.

3. Result of the decomposition: Since the return obtained by a hypothetically perfect correlation leads to a loss, all the benefit comes from low correlation (see Table 2):

$\omega_1 = 0.0573 - 0.0387 = 1{,}87\%$

$\omega_2 = 0.0387 - 0.0429 = -0.42\%$

2.3.3 Decomposition on two sub-periods

The result of this decomposition is different when it is performed on two sub-periods. Large French investment in Russia started only at the end of the 19th century. The first significant loan in France was issued in November-December 1888 (Ukhov, 2003). Monthly data availability allows for two sub-periods. The diplomatic alliance between France and Russia is chosen as the break. The first military convention was signed on August 17th 1892. Therefore, the first period starts in January 1870 and ends in July 1892 and the second period starts in August 1892 and ends in December 1913.

In each case, Russian diversification appears to be very rational because it provided a huge increase in Sharpe ratio thanks to a constant low correlation. But the decomposition of these important benefits shows a large change in components.

The first sub-period looks like the entire period: all the benefit of diversification comes from the low correlation (see Figure 9). During the second period, the story is quite different (see Figure 10). At that time, rates on French bonds experienced a historically weak level; thus, the French government bonds provided an exceptional low total returns[149]. With an optimal part of 88 % of Russian bonds, the total benefit from diversification over 1892-1913 provides 269 basis points extra return each year, with 242 points from higher foreign return and only 27 due to the low level of correlation. Using a more realistic proportion of Russian bonds (30 %) in the portfolio, the decomposition of the diversification benefit appears to be mainly (93.27 %) due to low correlation (see Table 2).

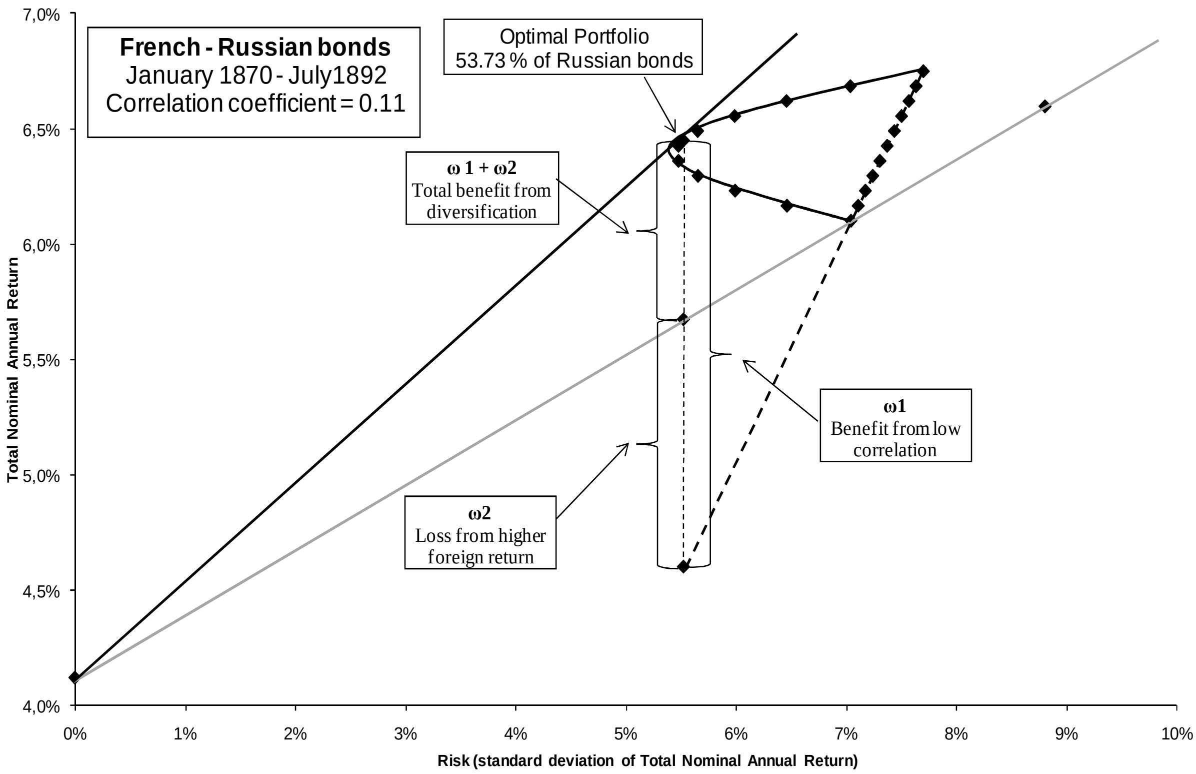

Figure 9, Decomposition of the diversification benefit between French and Russian bonds. 1870-1892.

149 The rate of long French government bonds is below 3 %. This level had been touched again only at the end of the Second World War and since the summer 2010, see Appendix A in Chapter III.

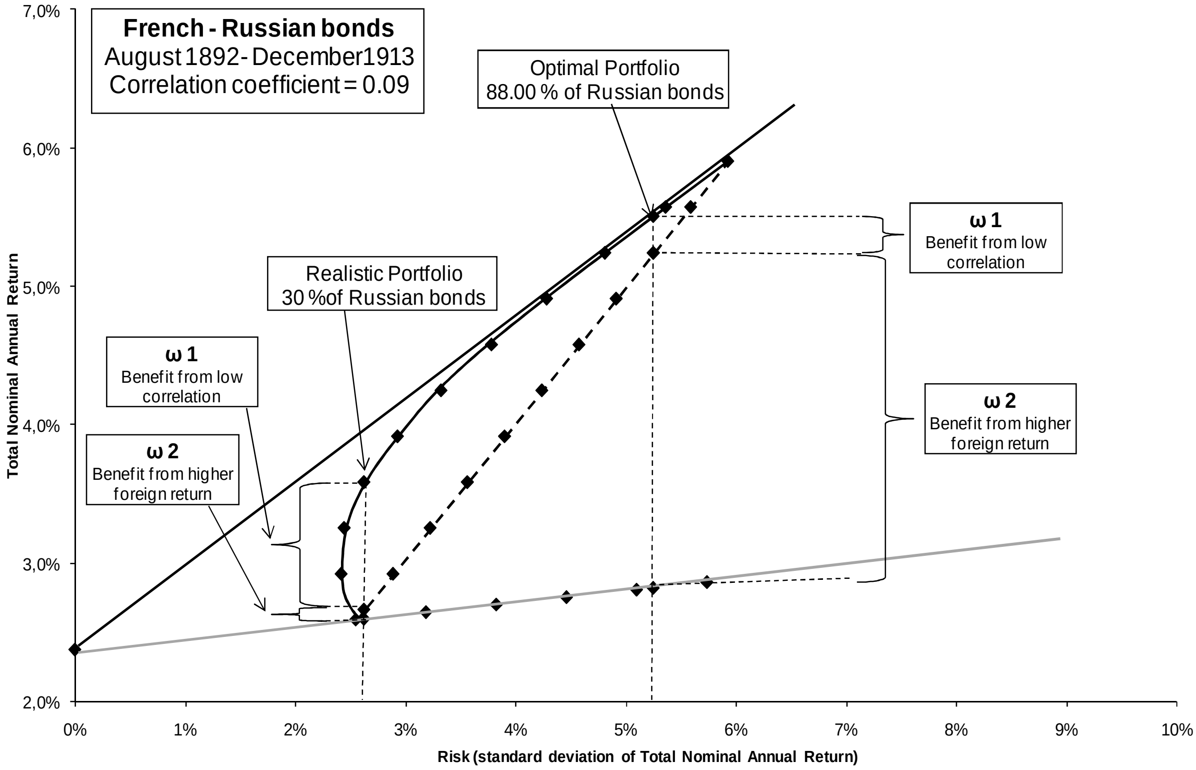

Figure 10, Decomposition of the diversification benefit between French and Russian bonds. 1892-1913.

Table 3, Risk, returns and decomposition of French-Russian bond diversification.

	1870-1913	1870-1891	1892-1913	1892-1913
	Optimal Portfolios			Realistic Port
Weight of Russian bonds	69.91%	53.73%	88.00%	30.00%
Risk	5.26%	5.52%	5.25%	2.62%
Return (I)	5.73%	6.45%	5.51%	3.58%
	Hypothetical perfect correlation Porfolios			
Weight of Russian bonds	-24.57%	-231.62%	79.96%	2.19%
Risk	5.26%	5.52%	5.25%	2.62%
Return (II)	3.87%	4.60%	5.24%	2.66%
	Leveraged Strategies			
Weight of French bonds	108,01%	78.41%	205.91%	102.90%
Risk	5.26%	5.52%	5.25%	2.62%
Return (III)	4.29%	5.67%	2.82%	2.60%
	Results of the Decomposition			
Total benefit (I-III)	1.44%	0.77%	2.69%	0.99%
Low correlation ω1 (I-II)	1.87%	1.85%	0.27%	0.92%
Higher foreign return ω2 (II-III)	-0.42%	-1.07%	2.42%	0.07%
% from low correlation	129.26%	238.29%	9.91%	93.28%

The low correlation observed between French and Russian bonds explains why so many French investors bought Russian bonds before the First World War. The choice of Russian bonds was not only the result of the political situation, but a really efficient investment strategy, since the Russian bond correlation with the French state bond was one of the lowest. With a portion of Russian bonds to complete a portfolio of French bonds, *French investors dramatically increased the strength of their returns and reduced their risk level*. It was a very efficient asset management strategy up until the Red Revolution. Of course, the result of the decomposition would be slightly different if another level of risk other than that of the optimal portfolio was chosen (as we do with the "Realistic Portfolio" during the second period), but the conclusions remain similar.

Therefore, old explanations (political links or bank fees on Russian issues) are not necessary to explain (and to defend) French investment in Russia since, at least, this choice provided a huge increase in return for a constant level of risk, and were thus very rational. This strategy was very efficient thanks to the low level of correlation between French and Russian bonds compared to what is observed today. The suggestion of a moral hazard (London-Lane and Oosterlinck, 2006) effect on incentive for buying Russian bonds is not necessary to explain the behavior of the French savers. This low level of correlation explains a large part of the benefit of diversification for most of the possible portfolios during most of the period. But, at the end of the century, the low rate of French government bonds leads to the observation that higher Russian return alone caused the main part of the diversification benefit for the portfolios composed of more than 50 % of Russian bonds.

III Gradual increase in stock correlations

3.1 Changes in correlation through history

We have demonstrated that the first incentive for buying foreign assets was the low correlation between domestic and foreign assets. What is the variation of that correlation through time? Longin and Solnik (1995) show changes in correlation over the 1960-1990 period and reject the hypothesis of a stable correlation. Dimson and Marsh (2001) compare US and UK assets returns between 1955 and 2000. Statman and Scheid (2005) find a strong increase in correlation between US and international stocks from 0.54 during 1969-1973 to 0.86 during the 1999-2003 period.

Goetzmann *et al.* (2005) construct stocks correlations for international markets since the 19th century on a 5-year rolling window. They found four peaks in correlation of prices variations: around 1860, just before 1914, during the 1930s and since 1970s; the level reached during the 1930s was higher than the current one. Obstfeld and Taylor (2002) on a 10-years rolling window show a weak correlation before the beginning of the 20th century, a quick increase just before 1914, a low correlation during the First World War, an other time of high correlation during the 1930s, and a gradual increase since the low level observed at the end of the Second World War.

A low correlation before 1914 is more consistent with the period of important exports of capital. If the price of risk is equal between several countries (as indicated by Figure 1 and Figure 2), the only motivation to export money is to choose markets with a low correlation. After 1880, French and English savers probably found incentives to export further overseas, rather than to other European countries. Perhaps, the first capital export countries (for example, Spain, Austria-Hungary or Italia) were more correlated after this date; thus investors searched for more exotic countries. High quality data is not available in order to make a meaningful comparison between several stock markets, but the correlations between France and the US have strong explanatory powers. Using the HCAC 40 and the Old-Nyse-Cowles-S&P index, a long-term measure of US-French stock market correlation is realized.

The correlation coefficient of monthly price variations is preferred to the correlation of annual total return used in one of the prior analyses. This choice enables the possibility of comparisons with prior measures of long-term correlation (Goeztmann *et al.* 2005 and Obstfeld and Taylor, 2002). But, these monthly variations are more sensitive to erroneous monthly prices dates (French data are collected the first Friday when US are the last day of the month). As a consequence, the correlation coefficient is underestimated since a lag exists between French and US data. This lag is constant over time; thus, it can be considered not to impact the variations of observations. Despite the fact that, during several periods, capital exchange was difficult, or totally forbidden, such as during WWII, Figure 11 shows all the periods. The correlation coefficient is measured by a 10-year rolling window. A date on Figure 7 corresponds, specifically, to the ten years prior.

Monthly exchange rates between US dollar and French franc are not available. Using annual data of currency rates, three correlation coefficients are provided using three assumptions: one currency change at every January inducing one annual jump in price, a gradual change thanks to a linear interpolation for monthly exchange rate and the last one without adjustment for currency rate. Taking account for exchange rate does not modify major movements in long-term correlations.

This weakest correlation before 1914 is a consistent explanation for massive investments in foreign assets. This observation is consistent with foreign issues in Paris: between 1892 and 1913, foreign assets made up about 53 % of the total stock issues in Paris and 96 % for state bonds (Crédit Lyonnais, 1963). The correlation increases since the 1920s and during the Great Depression. In the same time, foreign asset issues fell during the interwar period: they always remain below the 15 % reached in 1930 and 1931 (Crédit Lyonnais, 1963).

This increase in correlation over the period of the Great Depression is partially due to the increase in standard deviation of assets, since the correlation coefficient levels depend on the standard deviation. However, from an investor's point of view, the origin of the rise in correlation is not important: he has to support this high correlation. World War II causes a negative correlation for several years. Correlation has increased again since the 1950s, but decreases during the 1980s. The rise of the correlation has been very strong since 1990; the current level of correlation is exceptional. One major result is that the correlation is obviously stronger today than before 1914. The "first" and the "second" globalizations are totally different in this aspect. Thus, the question asked by Bordo and Eichengreen (1999) - "Is globalization today really different than globalization a hundred years ago?" - can be answered, yes.

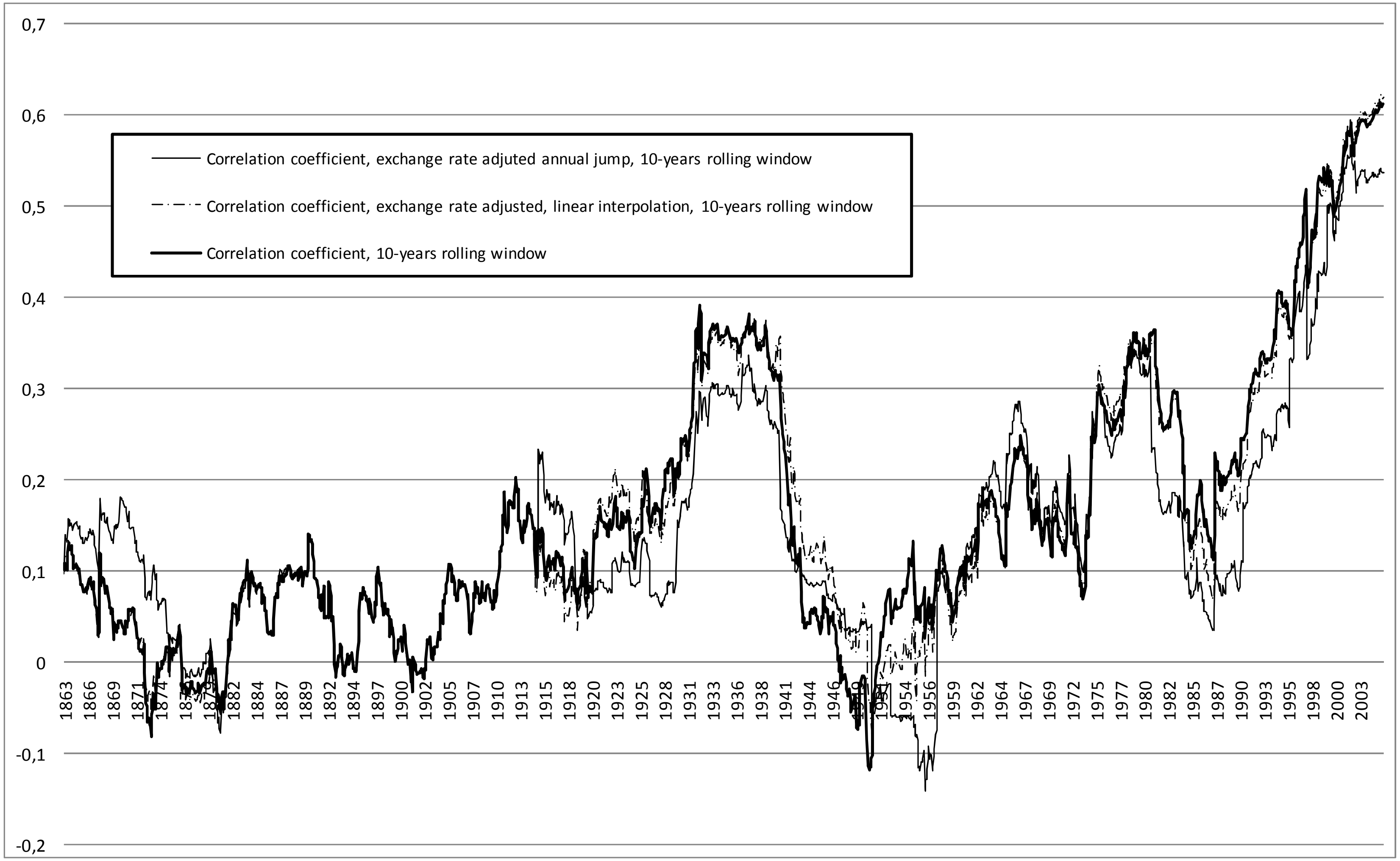

Figure 11, Correlation between US and French stock markets. 1854-2007. The correlation coefficient between monthly price variations of French and US stocks is measured using a 10-years rolling window and presented without adjustment for exchange rate since monthly exchange rate are not available (black curve). Using annual data for exchange rates, a second correlation coefficient is computed with one annual jump (dashed curve). A third correlation coefficient is measured using monthly exchange rates approximated by a linear interpolation of annual data (grey curve). For stocks data, see Appendix A; Exchange rates are from INSEE (1854-1989), Banque de France (1990-1999) and European Central Bank (1999-2007).

3.2 Does the Stock correlation reflect GDP correlation?

Quinn and Voth (2008) have shown the relationship between long-term stock market correlation and levels of financial liberalization: open countries have maintained higher correlation levels in comparison to closed ones. They question the low correlation observed during the 19th century, despite the large capital freedom, and suggest that it comes from the low correlation between economic fundamentals.

A higher correlation means that traded assets (French and US stocks) are more similar. A stock similar to another can be view as two assets with same risk, or, more exactly, an identical time distribution of risks. A large share of the risk for futures payments depends on GDP variation. Thus, one major reason for the increase in French and US stock correlation is probably the rise in GDP correlation.

Figure 12 shows the relationship between correlation of stock prices and correlation of GDP. The correlation coefficient between annual changes to GDP, in the US and France, is calculated over a ten-year rolling window. The correlation level of GDP appears to be slightly correlated with the correlation level of stocks (R^2=0.16). High GDP correlation implies high stock market correlation. The higher stock correlation, of the present day, is probably, at least partially, due to a stronger economic integration. Therefore, the incentive to export money decreases, as economic integration increases. This leads to a paradoxical result: *with the economic integration observed today, the incentive to export capital decreases*.

One can argue that today, firms are themselves internationally diversified, therefore, the diversification is only gone from portfolio to firms. The result would be: with the economic integration observed today, the incentive *to buy foreign securities* decreases. But, it is difficult to find a criterion to measure the long-term diversification inside main French firms (for example, current main market capitalizations as Total, EDF,GDF-Suez, France Telecom or banks do not realized a large part of their activity in the US). Moreover, this potential international diversification inside firms themselves is accompanied by a huge rise of the specific risk of firms which is explored in chapter 9.

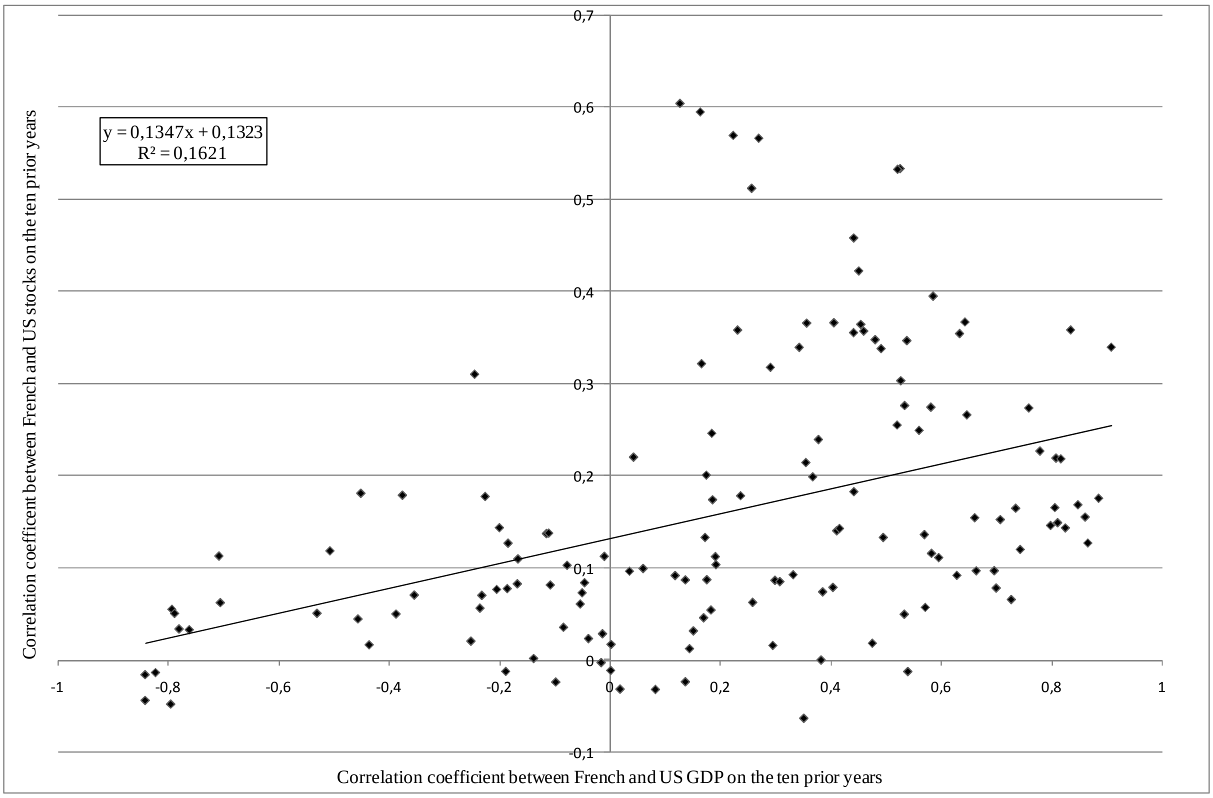

Figure 12, Relationship between US and French stock markets correlation and US and French GDP correlation. 1854-2007. The plot displays the correlation coefficient between French and US stocks (without adjustment for exchange rate) measured each year on the ten prior years (X) and the correlation coefficient between French and US GDP measured each year on the ten prior years on GDP annual change. GDP are from Lévy-Leboyer and Bourguignon (1985) and INSEE, for French GDP and from Bureau of Census (1975) and US-Stats for US one. For stock data, see Appendix A.

IV Conclusion

This paper presents a new method for decomposing the benefit of portfolio diversification between low correlation and higher return. Before 1914, according to results on French-US stocks and French-Russian bonds, an investor could achieve an important portfolio diversification via foreign securities, since international markets were integrated but had a low correlation. Higher foreign return was not the main attraction for investors, since they could achieve the same risk-return level on domestic markets. In most cases, the profit accrued from higher foreign return is clearly weak compared to the profit from the low foreign correlation. Investors were looking for the low correlation abroad. The choice of Russian bonds for a French saver appears efficient thanks to the very low correlation between those two bond markets. Focusing on the period at the end of the 19th century, US stocks appear less attractive to French stockholders, which is consistent with historical behavior. In contrast, during the same period, Russian bonds provided, both, higher foreign return, and lower risk, due to a low correlation. Since 1914, the US-French stocks market correlation levels tend to increase, following, in all probability, an increase in GDP correlation. The result being a gradual decrease in the incentives to invest in foreign stocks. Today, the historically high level of stock correlation provides only a weak incentive to buy foreign stocks compared to the period prior to 1914.

REFERENCES

Annaert J., Buelens F., De Ceuster M., De Schepper A. and W. Van Hyfte (2010) "Does the dividend yield really predict stock returns? Evidence from the Brussels Stock Exchange (1832-2008)*", Working Paper*, University of Antwerp.

Black F., Jensen M.C. and M. Scholes (1972), *The Capital Asset Pricing Model: Some Empirical Tests* in M.C. Jensen (ed.), *Studies in the Theory of Capital Markets,* Praeger.

Bordo M.D., Eichengreen D.A. and D.A. Irwin (1999), "Is Globalization Today really Different than Globalization a Hundred Years Ago?", *Working Paper*, NBER, n. 7195.

Bouvier J. (1961), *Le Crédit Lyonnais de 1863 à 1882, les années de formation d'une banque de dépôt*, Paris, SEVPEN.

Bureau of Census (1975), *Historical Statistics of the United States*, Bicentennial Edition.

Cameron R., (1961), *France and the Economic Development of Europe-1800-1914*", Princeton, Princeton University Press.

Chabot B. and C. Kurz (2009), "That's Were the Money Was: Foreign Bias and English Investment Abroad, 1866 1907", *Working Paper*, Yale University, n. 972, forthcoming in *Economic Journal*.

Cowles A. and Associates (1939), *Common-stocks Indexes*, Bloomington, Principia Press.

Crédit Lyonnais (1963), *Un siècle d'économie française (1863-1963)*, Paris, Draeger.

Daudin G., Morys M. and K.H. O'Rourke (2008), "Globalization 1870-1914", *Discussion Paper*, Institute for International Integration Studies, n. 256.

Dimson E. and P. Marsh (2001), "U.K. Financial Market Returns, 1955-2000", *Journal of Business*, 74, p. 1-31.

Edelstein M. (2004), "Foreign Investment, Accumulation and Empire, 1860-1914", in Floud R. and P. Johnson (eds.), *The Cambridge Economic History of Modern Britain*, Cambridge, Cambridge University Press.

Edelstein M. (1982), *Overseas Investment in the Age of High Imperialism: the United Kingdom,* New York, Columbia University Press.

Feis H. (1964), *Europe the World's Banker 1870-1914*, New-York, Kelley for the Council on Foreign Relations.

Feldstein M.S. and C. Horioka (1980), "Domestic Saving and International Capital Flows", *Economic Journal* 90**,** p. 314–329.

Ferguson N. and R. Batley (1999), "Event Risk and the International Bond Market in the Era of the Classical Gold Standard"*, WorkingPaper*, Oxford University.

Ferguson N. and M. Schularick (2006), "The Empire Effect: The Determinants of Country Risk in the First Age of Globalization, 1880-1913", *Journal of Economic History,* 66, p. 283-312.

Ferguson N. (2006), “Political Risk and the International Bond Market between the 1848 Revolution and the Outbreak of the First World War”, *Economic History Review*, 59, p. 70-112.

Findlay R. and K.H. O'Rourke (2001), “Commodity Market Integration, 1500-2000”, *Working Papers*, NBER, n. 8579.

Flandreau M. and F. Zumer (2004), *The Making of Global Finance. 1880 - 1913*. Paris, OECD.

Forbes K.J. and R. Rigobon (2002), “No Contagion, only Interdependence: Measuring Stock Market Comovements”, *Journal of Finance*, 57, p. 2223-2261.

Garbade K.D. and L. Silber (1978), “Technology, Communication and the Performance of Financial Markets: 1840-1975”, *Journal of Finance*, 33, p. 819-832.

Goetzmann W.N. and A.D. Ukhov (2006), “British Overseas Investment 1870-1913: A Modern Portfolio Theory Approach”, *Review of Finance,* 10, p. 261-300.

Goetzmann W.N., Ibbotson R. and L. Peng (2000), “A New Historical Database for the NYSE 1815 to 1925: Performance and Predictability”, *The Journal of Financial Markets,* 4, p. 1-32.

Goetzmann W.N., Lingfeld L. and G. Rouwenhorst (2005), “Long-Term Global Market Correlations”, *Journal of Busines*, 78, p. 1-38.

Hoag C. (2006), “The Atlantic Telegraph Cable and Capital Market Information Flows”, *Journal of Economic History,* 66, p. 342-353.

Homer S. and R. Sylla (1998), *A History of Interest Rates*, 3d ed., New-York, Wiley & Sons.

INSEE (1990), *Annuaire rétrospectif de la France*, Paris, INSEE.

Klovland J.T.(1994), “Pitfalls in the Estimation of the Yield on British Consol, 1850-1914”, *Journal of Economic History*, 54, p. 164-187.

Klovland J.T. (2005), “Commodity Market Integration 1850–1913: Evidence from Britain and Germany”, *European Review of Economic History*, 9, p. 163-197.

Le Bris D. and P-C Hautcoeur (2010), “A Challenge to the Triumphant Optimists: a Blue Chips Index for the Paris Stock Exchange (1854-2007)”, *Financial History Review*, 17, p. 141-183.

Lévy-Leboyer M. (1977), “La balance des paiements et l’exportation des capitaux français”, in Lévy-Leboyer, M. (ed.), *La position internationale de la France*, Paris, EHESS.

Lévy-Leboyer M. and F. Bourguignon (1985), *L’Économie Française au XIX^{ème} siècle, analyse macroéconomique*, Paris, Économica.

London-Lane J. and K. Oosterlinck (2006), “Hope Spring Eternal – French Bondholders and the Soviet Repudiation (1915-1919)”, *Review of Finance,* 10, p. 507-535.

Longin F. and B. Solnik (1995), “Is the Correlation in International Equity Returns Constant: 1960-1990?”, *Journal of International Money and Finance,* 14, p. 3-26.

Lowenfeld H. (1907), *Investment an Exact Science*, The Financial Review of Reviews, London.

Macauley F.R. (1938), *The Movement of Interest Rate, Bond Yield and Stock Prices in the United States since 1856*, NBER, New-York.

Markowitz H. (1959), *Portfolio Selection: Efficient Diversification of Investments*, New-York, John Wiley.

Mauro P., Sussman N. and Y. Yafeh, Y. (2002), “Emerging Market Spreads: Then versus Now”, *Quarterly Journal of Economics*, 117, p. 695-733.

Michalet C-A (1968), *Les placements des épargnants français de 1815 à nos jours*, Paris, PUF.

O’Rourke K.H. and J.G. Williamson (1999), *Globalization and History. The Evolution of a Nineteenth Century Atlantic Economy*, Cambridge, Massachusetts, MIT Press.

Obstfeld M. and A. Taylor (1999), “The Great Depression as a Watershed: International Capital Mobility over the Long-Run”, *working paper*, NBER, n. 5960.

Obstfeld M. and A. Taylor (2002), “Globalization and Capital Markets”, *Working Paper*, NBER, n.8846.

O'Rourke K. and J.G. Williamson (1994), “Late Nineteenth-Century Anglo-American Factor-Price Convergence: Were Heckscher and Ohlin Right? », *Journal of Economic History*, 54, p. 892-916.

Parent A. and C. Rault (2004), “The Influences affecting French Assets Abroad Prior to 1914”, *The Journal of Economic history,* 64, p. 328-362.

Quinn D.P and H-J. Voth (2008), “A Century of Global Equity Market Correlations”, *American Economic Review* 98, p. 535-540.

Rajan R. and L. Zingales (2003), “The Great Reversals: the Politics of Financial Development in the 20th Century”, *Journal of Financial Economics,* 69, p. 5-50.

Rezaee A. (2008), “The Performance and the Efficiency of the Corporate Bonds Market in Paris 19th Century Bourse”, *Working Paper*, Université d’Orléans.

Sharpe W. (1994), “The Sharpe Ratio”, *The Journal of Portfolio Management,* 21, p. 49-58.

Statman M. and J. Scheid (2005), “Global Diversification”, *Journal of Investment Management,* 3, p. 53-63.

Ukhov A. (2003), “Financial Innovation and Russian Government Debt Before 1918”, *Working Paper*, Yale ICF, n. 03-20.

Viaene A. (2005), *L’efficience de la bourse de Paris au XIX^{ème} siècle*, Paris, Connaissance et Savoirs.

White H. D. (1933), *The French International Accounts*, Cambridge, Mass.

Appendix A, Data Sources

US Stocks : 1854-1870 : monthly data, “Old NYSE” Goetzmann *et al.* (2000)

1871-2008: monthly data, Cowles-S&P according to Shiller version, available online: http:-/www.econ.yale.edu/~shiller/data.htm

US long-term rates:

1854-1871: New England selected interest rates, annual data interpolated, Homer and Sylla (1998)

1871-1913: monthly data, Schiller online

US Bills: 1854-1913: open market rate of discount, annual average interpolated, Homer and Sylla (1998)

US Railroad bonds:

US Railroad bonds high grade:

US Municipal bonds:

1870-1913: monthly data, Macaulay (1938) available online: http://www.nber.org/databases/macrohistory/contents/chapter13.html

French Stocks: 1854-1988: historical CAC 40, monthly data, Le Bris and Hautcoeur, 2010.

1988-2008: CAC 40, monthly data, NYSE-Euronext

French state bonds:

1854-1913: Rente 3 %, monthly data, author.

French Corporate bonds:

1870-1913: Rezaee (2008)

French Bills: 1854-1864: Banque de France's taux d'escompte, annual data (interpolated for monthly values), INSEE's Statistical Yearbooks

1864-1913: taux du marché interbancaire, monthly data, Bulletin de statistique et de législation comparée, 91, 1921, p.524-525 available online : http://www.nber.org/databases/macrohistory/contents/chapter13.html

Belgian Stocks: 1850-1913: New index, monthly data, Annaert *et al.* (2010)

UK Consol: 1854-1913: monthly data, Klovland (1994)

UK Bills: 1854-1913: open market rate of discount, annual average interpolated, Homer and Sylla (1998)

Spread with UK Consol for government bonds for France, Germany, Argentine, Russia, Spain, Italy:

1870-1913: Investor's Monthly Manual, monthly data, in Ferguson and Batley (1999)

Appendix B, Foreign Assets in French portfolios

Table 1, Distribution of 1,032 French portfolios observed in 1897. Table exhibits in Michalet (1968).

Distribution of 1 032 French portfolios in 1897					
	Portfolio value between (in French franc)				
	0	15,000	60,000	100,000	150,000
	2,000	2,000	75,000	150,000	100,000
Russian State Bonds	12.60%	28.30%	20.00%	38.20%	17.00%
Other Foreign State Bonds	0.20%		10.00%		23.00%
Foreign securities		4.90%	5.00%	7.60%	2.00%
French Securities	87.20%	66.80%	65.00%	54.20%	58.00%

Table 2, Geographical distribution of French foreign assets. Table exhibits in Feis (1964).

Geographical repartition of the French portfolio of foreign securities		
	1900	**1914**
Russia	25%	25%
Turkey	7%	8%
Spain-Portugal	16%	9%
Austria-Hungary	9%	5%
Balkans	3%	6%
Italy	5%	3%
Switzerland, Benelux	3%	3%
Other Europe	3%	3%
French colonies	5%	9%
Other Africa	11%	7%
USA-Canada	3%	4%
South America	7%	13%
Asia	3%	5%

Appendix C, Risk and Returns of assets and portfolios of French and US stocks. 1854-1913.

Assets and portfolio returns, 1854-1913			
	Risk	***Mean***	***Geo mean***
Pure asset			
French Stocks (Cac 40)	7.37%	5.75%	5.50%
French State Bonds (Rente 3 %)	5.61%	4.31%	4.15%
French Corporate Bonds (Rezzae)			
French Bills	1.24%	3.04%	3.04%
US Stocks (Old NYSE-Cowles)	16.95%	8.99%	7.75%
US Bonds	4.19%	4.65%	4.56%
US Bills	1.70%	4.37%	4.36%
Consols UK	3.42%	2.96%	2.91%
UK Bills	1.22%	3.14%	3.14%
French-US stock portfolio			
10 % US stocks_90 % French stocks	7.22%	6.08%	
20 % US stocks_80 % French stocks	7.46%	6.40%	
30 % US stocks_70 % French stocks	8.05%	6.72%	
40 % US stocks_60 % French stocks	8.93%	7.05%	
50 % US stocks_50 % French stocks	10.01%	7.37%	
60 % US stocks_40 % French stocks	11.24%	7.69%	
70 % US stocks_30 % French stocks	12.57%	8.02%	
80 % US stocks_20 % French stocks	13.98%	8.34%	
90 % US stocks_10 % French stocks	15.45%	8.66%	
Optimal portfolio			
28.74 % US stocks_71.25 % French stocks	***7.96%***	***6.68%***	
French-US stock portfolio with hypothetical perfect correlation			
10 % US stocks_90 % French stocks	8.33%	6.08%	
20 % US stocks_80 % French stocks	9.29%	6.40%	
30 % US stocks_70 % French stocks	10.25%	6.72%	
40 % US stocks_60 % French stocks	11.20%	7.05%	
50 % US stocks_50 % French stocks	12.16%	7.37%	
60 % US stocks_40 % French stocks	13.12%	7.69%	
70 % US stocks_30 % French stocks	14.08%	8.02%	
80 % US stocks_20 % French stocks	15.04%	8.34%	
90 % US stocks_10 % French stocks	15.99%	8.66%	
Risk similar to optimal internationl portfolio			
6.17 % US stocks_93.83 % French stocks	**7.96%**	**5.95%**	
Leveraged strategy on domestic market			
- 25 % Debt_125 % French Stocks	9.22%	6.43%	
- 50 % Debt_150 % French Stocks	11.06%	7.11%	
- 75 % Debt_175 % French Stocks	12.90%	7.78%	
- 100 % Debt_200 % French Stocks	14.74%	8.46%	
- 125 % Debt_225 % French Stocks	16.59%	9.14%	
Risk similar to optimal internationl portfolio			
-8.01 % Debt_108,01 % French stocks	***7.96%***	***5.97%***	

Appendix D. Risk and Returns of assets and portfolios of French and US stocks. 1854-1889 and 1890-1913.

Assets and portfolio returns, 1854-1889		
	Risk	***Mean***
Pure asset		
French Stocks (Cac 40)	8.87%	6.68%
French Bills	1.33%	3.54%
US Stocks (Old NYSE-Cowles)	17.36%	9.86%
French-US stock portfolio		
10 % US stocks_90 % French stocks	8.63%	7.00%
20 % US stocks_80 % French stocks	8.73%	7.32%
30 % US stocks_70 % French stocks	9.16%	7.63%
40 % US stocks_60 % French stocks	9.87%	7.95%
50 % US stocks_50 % French stocks	10.81%	8.27%
60 % US stocks_40 % French stocks	11.92%	8.59%
70 % US stocks_30 % French stocks	13.16%	8.90%
80 % US stocks_20 % French stocks	14.49%	9.22%
90 % US stocks_10 % French stocks	15.90%	9.54%
Optimal portfolio		
34.82 % US stocks_65.18 % French stocks	***9.47%***	***7.79%***
French-US stock portfolio with hypothetical perfect correlation		
10 % US stocks_90 % French stocks	9.72%	7.00%
20 % US stocks_80 % French stocks	10.57%	7.32%
30 % US stocks_70 % French stocks	11.42%	7.63%
40 % US stocks_60 % French stocks	12.27%	7.95%
50 % US stocks_50 % French stocks	13.12%	8.27%
60 % US stocks_40 % French stocks	13.96%	8.59%
70 % US stocks_30 % French stocks	14.81%	8.90%
80 % US stocks_20 % French stocks	15.66%	9.22%
90 % US stocks_10 % French stocks	16.51%	9.54%
Risk similar to optimal internationl portfolio		
7.10 % US stocks_92.90 % French stocks	**9.47%**	**6.91%**
Leveraged strategy on domestic market		
- 25 % Debt_125 % French Stocks	11.08%	7.47%
- 50 % Debt_150 % French Stocks	13.30%	8.26%
- 75 % Debt_175 % French Stocks	15.52%	9.04%
- 100 % Debt_200 % French Stocks	17.73%	9.83%
- 125 % Debt_225 % French Stocks	19.95%	10.62%
Risk similar to optimal internationl portfolio		
-6,80 % Debt_106,80 % French stocks	***9.47%***	***6.90%***

Assets and portfolio returns, 1890-1913		
	Risk	***Mean***
Pure asset		
French Stocks (Cac 40)	4.01%	4.40%
French Bills	0.58%	2.67%
US Stocks (Old NYSE-Cowles)	16.28%	7.72%
French-US stock portfolio		
10 % US stocks_90 % French stocks	4.10%	4.73%
20 % US stocks_80 % French stocks	4.78%	5.06%
30 % US stocks_70 % French stocks	5.86%	5.39%
40 % US stocks_60 % French stocks	7.16%	5.73%
50 % US stocks_50 % French stocks	8.57%	6.06%
60 % US stocks_40 % French stocks	10.05%	6.39%
70 % US stocks_30 % French stocks	11.58%	6.72%
80 % US stocks_20 % French stocks	13.13%	7.06%
90 % US stocks_10 % French stocks	14.70%	7.39%
Optimal portfolio		
14.18 % US stocks_85.82 % French stocks	***4.32%***	***4.87%***
French-US stock portfolio with hypothetical perfect correlation		
10 % US stocks_90 % French stocks	5.24%	4.73%
20 % US stocks_80 % French stocks	6.46%	5.06%
30 % US stocks_70 % French stocks	7.69%	5.39%
40 % US stocks_60 % French stocks	8.92%	5.73%
50 % US stocks_50 % French stocks	10.15%	6.06%
60 % US stocks_40 % French stocks	11.37%	6.39%
70 % US stocks_30 % French stocks	12.60%	6.72%
80 % US stocks_20 % French stocks	13.83%	7.06%
90 % US stocks_10 % French stocks	15.06%	7.39%
Risk similar to optimal internationl portfolio		
2.55 % US stocks_97.45 % French stocks	**4.32%**	**4.48%**
Leveraged strategy on domestic market		
- 25 % Debt_125 % French Stocks	5.01%	4.83%
- 50 % Debt_150 % French Stocks	6.01%	5.26%
- 75 % Debt_175 % French Stocks	7.02%	5.69%
- 100 % Debt_200 % French Stocks	8.02%	6.12%
- 125 % Debt_225 % French Stocks	9.02%	6.56%
Risk similar to optimal internationl portfolio		
-7.81 % Debt_107.81 % French stocks	***4.32%***	***4.53%***

Appendix E, Risk and Returns of assets and portfolios of French and Russian bonds. 1870-1913.

Assets and portfolio returns, 1870-1913			
	Risk	***Mean***	***Geo Mean***
Pure asset			
French Stocks (Cac 40)	6.92%	5.40%	5.10%
French State Bonds (Rente 3 %)	5.58%	4.35%	4.19%
French Corporate Bonds (Rezzae)	3.42%	4.20%	4.14%
French Bills	1.34%	3.25%	3.24%
US Stocks (Old NYSE-Cowles)	15.43%	7.65%	6.55%
US Bonds	4.00%	4.35%	4.19%
US Bills	1.92%	4.15%	4.13%
Consols UK	3.41%	2.81%	2.75%
UK Bills	0.77%	2.75%	2.75%
Spanish Bonds	17.04%	9.40%	8.17%
German Bonds	2.38%	4.62%	4.59%
Italian Bonds	6.32%	7.31%	7.13%
Argentine bonds	12.23%	7.95%	7.25%
Russian Bonds	6.88%	6.33%	6.10%
French-Russian bonds portfolio			
10 % Russian Bonds_90 % French bonds	5.14%	4.55%	
20 % Russian Bonds_80 % French bonds	4.81%	4.75%	
30 % Russian Bonds_70 % French bonds	4.61%	4.94%	
40 % Russian Bonds_60 % French bonds	4.56%	5.14%	
50 % Russian Bonds_50 % French bonds	4.66%	5.34%	
60 % Russian Bonds_40 % French bonds	4.90%	5.54%	
70 % Russian Bonds_30 % French bonds	5.27%	5.73%	
80 % Russian Bonds_20 % French bonds	5.73%	5.93%	
90 % Russian Bonds_10 % French bonds	6.28%	6.13%	
Optimal portfolio			
69.91 % Russian Bonds_30.09 % French bonds	***5.26%***	***5.73%***	
French-Russian bonds portfolio with hypothetical perfect correlation			
10 % Russian Bonds_90 % French bonds	5.71%	4.55%	
20 % Russian Bonds_80 % French bonds	5.84%	4.75%	
30 % Russian Bonds_70 % French bonds	5.97%	4.94%	
40 % Russian Bonds_60 % French bonds	6.10%	5.14%	
50 % Russian Bonds_50 % French bonds	6.23%	5.34%	
60 % Russian Bonds_40 % French bonds	6.36%	5.54%	
70 % Russian Bonds_30 % French bonds	6.49%	5.73%	
80 % Russian Bonds_20 % French bonds	6.62%	5.93%	
90 % Russian Bonds_10 % French bonds	6.75%	6.13%	
Risk similar to optimal internationl portfolio			
-24.57 % Russian bonds_ 124.57 % French bonds	**5.26%**	**3.87%**	
Leveraged strategy on domestic market			
- 25 % Debt_125 % French Stocks	6.98%	4.63%	
- 50 % Debt_150 % French Stocks	8.37%	4.90%	
- 75 % Debt_175 % French Stocks	9.77%	5.18%	
- 100 % Debt_200 % French Stocks	11.17%	5.45%	
- 125 % Debt_225 % French Stocks	12.56%	5.73%	
Risk similar to optimal internationl portfolio			
5,71 % Debt_94.29 % French bonds	***5.26%***	***4.29%***	

Appendix F, Risk and Returns of assets and portfolios of French and Russian bonds. 1870-1892 and 1892-1913.

Assets and portfolio returns, 1870-1913		
	Risk	***Mean***
Pure asset		
French State Bonds (Rente 3 %)	7.04%	6.10%
French Bills	1.29%	4.12%
Russian Bonds	7.70%	6.75%
French-Russian bonds portfolio		
10 % Russian Bonds_90 % French bonds	6.46%	6.16%
20 % Russian Bonds_80 % French bonds	5.99%	6.23%
30 % Russian Bonds_70 % French bonds	5.65%	6.29%
40 % Russian Bonds_60 % French bonds	5.48%	6.36%
50 % Russian Bonds_50 % French bonds	5.48%	6.42%
60 % Russian Bonds_40 % French bonds	5.65%	6.49%
70 % Russian Bonds_30 % French bonds	5.99%	6.55%
80 % Russian Bonds_20 % French bonds	6.46%	6.62%
90 % Russian Bonds_10 % French bonds	7.04%	6.68%
Optimal portfolio		
53.73 % Russian Bonds_46.27 % French bonds	***5.52%***	***6.45%***
French-Russian bonds portfolio with hypothetical perfect correlation		
10 % Russian Bonds_90 % French bonds	7.11%	6.16%
20 % Russian Bonds_80 % French bonds	7.17%	6.23%
30 % Russian Bonds_70 % French bonds	7.24%	6.29%
40 % Russian Bonds_60 % French bonds	7.31%	6.36%
50 % Russian Bonds_50 % French bonds	7.37%	6.42%
60 % Russian Bonds_40 % French bonds	7.44%	6.49%
70 % Russian Bonds_30 % French bonds	7.50%	6.55%
80 % Russian Bonds_20 % French bonds	7.57%	6.62%
90 % Russian Bonds_10 % French bonds	7.63%	6.68%
Risk similar to realistic portfolio		
-231.61 % Russian bonds_ 331.61 % French bonds	**5.52%**	**4.60%**
Leveraged strategy on domestic market		
- 25 % Debt_125 % French Stocks	8.80%	6.59%
- 50 % Debt_150 % French Stocks	10.56%	7.09%
- 75 % Debt_175 % French Stocks	12.32%	7.58%
- 100 % Debt_200 % French Stocks	14.09%	8.08%
- 125 % Debt_225 % French Stocks	15.85%	8.57%
Risk similar to optimal internationl portfolio		
+21.58 % Debt_78.42 % French bonds	***5.52%***	***5.67%***

Assets and portfolio returns, 1892-1913		
	Risk	***Mean***
Pure asset		
French State Bonds (Rente 3 %)	2.55%	2.59%
French Bills	0.65%	2.37%
Russian Bonds	5.93%	5.90%
French-Russian bonds portfolio		
10 % Russian Bonds_90 % French bonds	2.42%	2.92%
20 % Russian Bonds_80 % French bonds	2.44%	3.25%
30 % Russian Bonds_70 % French bonds	2.62%	3.58%
40 % Russian Bonds_60 % French bonds	2.93%	3.92%
50 % Russian Bonds_50 % French bonds	3.32%	4.25%
60 % Russian Bonds_40 % French bonds	3.78%	4.58%
70 % Russian Bonds_30 % French bonds	4.28%	4.91%
80 % Russian Bonds_20 % French bonds	4.81%	5.24%
90 % Russian Bonds_10 % French bonds	5.36%	5.57%
Optimal portfolio		
88.00 % Russian Bonds_22.00 % French bonds	***5.25%***	***5.51%***
Realistic portfolio		
30.00 % Russian Bonds_70.00 % French bonds	***2.62%***	***3.58%***
French-Russian bonds portfolio with hypothetical perfect correlation		
10 % Russian Bonds_90 % French bonds	2.89%	2.92%
20 % Russian Bonds_80 % French bonds	3.22%	3.25%
30 % Russian Bonds_70 % French bonds	3.56%	3.58%
40 % Russian Bonds_60 % French bonds	3.90%	3.92%
50 % Russian Bonds_50 % French bonds	4.24%	4.25%
60 % Russian Bonds_40 % French bonds	4.58%	4.58%
70 % Russian Bonds_30 % French bonds	4.91%	4.91%
80 % Russian Bonds_20 % French bonds	5.25%	5.24%
90 % Russian Bonds_10 % French bonds	5.59%	5.57%
Risk similar to optimal internationl portfolio		
79.96 % Russian bonds_ 20.04 % French bonds	**5.25%**	**5.24%**
Risk similar to realistic portfolio		
2.19 % Russian bonds_ 97.81 % French bonds	**2.62%**	**2.66%**
Leveraged strategy on domestic market		
- 25 % Debt_125 % French Stocks	3.19%	2.64%
- 50 % Debt_150 % French Stocks	3.82%	2.70%
- 75 % Debt_175 % French Stocks	4.46%	2.75%
- 100 % Debt_200 % French Stocks	5.10%	2.81%
- 125 % Debt_225 % French Stocks	5.74%	2.86%
Risk similar to optimal internationl portfolio		
105.91 % Debt_205.91 % French bonds	**5.25%**	**2.82%**
Risk similar to optimal internationl portfolio		
2.90 % Debt_102.90 % French bonds	***2.62%***	***2.60%***

Chapitre 9, L'irrésistible hausse du risque du marché français « Is the Portfolio Effect Ending? Idiosyncratic and Market Risk over the Long Run. »[150]

Abstract: Contrasting the US case, French stock market risk observed over the last 150 years, presents a long-term rise. Despite peace and economic stability, market risk has never, since, converged to levels seen pre-1914. Reversely, the idiosyncratic risk remains quite stable. Combining these two paths, market risk becomes the major source of risk reducing the effect of diversification. Today, market risk explains about two thirds of the total risk whereas, before 1914, it only accounted for one half. As the relative weight of the market risk increases, the correlation coefficient among stocks also rises. A theoretical relation is proposed and tested between these two terms. The empirical and theoretical effects of the sequential adding of stocks in one portfolio are measured attesting that, today, it is impossible to reach the level of diversification that a portfolio composed of few stocks had before 1914. At this time, a "super portfolio effect" is identified. The rise of the correlation among stocks seems to be linked with the end of the monetary stability and the rise of public deficits over time.

Keywords: volatility, diversification, idiosyncratic risk, correlation, 19th century, 20th century.

JEL classification: G1, G12, N23, N24.

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In the CAPM framework (Sharpe, 1964 and Lintner, 1965), idiosyncratic risk (hereafter, *specific risk*) has no bearing because it is not paid since it can be suppressed by diversification. As a consequence, most empirical studies have focused on the *market risk* and, thus, neglected both *specific risk* and *total risk* (the risk observed before any diversification). During the last years, research has focused again on *specific risk* thanks to a number of different findings. Benartzi and Thaler (2001) or Falkenstein (1996), argue that investors do not, in actual fact, hold diversified portfolios. In this vein, Barber and Odean (2000) found that among 60,000 US accounts, the average portfolio was composed of only four stocks: thus, *specific risk* does exist in many investor portfolios. This observation is referred to as the "non-diversification puzzle" (see Goetzmann and Kumar, 2008 for a recent survey). These observations are also consistent with approaches developed by behavioral finance (Statman, 2004 or Broihanne *et al.*, 2008).

Therefore, as suggested by Malkiel and Xu (2002), the relevant risk measure for individual investors may well be *total risk* (that comprises both *market* and *specific risk*). But even for those holding diversified portfolios (say, an institutional investor), the measure of *specific risk* is important because its level determines the interest of the diversification strategy. In addition, s*pecific risk* remains important in three other cases listed by Campbell *et al.* (2001): arbitrageurs who trade individual stocks to exploit mispricing, event studies and option pricing.

A stream of research has been initiated by the work of Campbell *et al.* (2001). In their study of the US stock market from 1962 to 1997 (between 2,047 and 8,927 firms), measuring both *market* and *specific risk* (at the industry and firm level), they found an upward trend for *specific risk* but not for *market risk*. Thus the correlations among individual stocks and the explanatory power of the market model for a typical stock have declined.

However, several authors produced findings contrary to an increasing trend of the US *specific risk*, further extending the sample into the 2000s (Brandt *et al.* 2005), and, for the 1926-1962 period (Brockman and Yan, 2008). Bekaert *et al.* (2005) did not find a trend in *specific risk* either in the US and in 22 international markets considering data on a weekly basis from 1980 to 2003. They also confirm Brandt *et al*, finding a trend in US *specific risk* but only for the period studied by Campbell *et al.* (2001). But, Bali *et al.* (2008) confirm for the US market between 1962 and 2005 the existence of an upward trend for *specific risk*; it just appeared more pronounced on the NASDAQ stocks, than on the NYSE, or on the NYSE-

AMEX stocks. Kearney and Poti (2009) also extended studies into the European markets put forward by Campbell *et al.* (2001). Using 3,515 European stocks listed between 1974 and 2004, they contrast US observations: both, *specific* and *market risk* stocks have increased over time. The number of stocks needed to eliminate the *specific risk* has increased but the benefit of diversification remains substantial.

Market risk has received greater focus in studies, as it is central to the theory and practices of asset pricing, asset allocation, and risk management. The study and forecast of stock return volatility at the aggregate level (*market risk*), is one of the main streams of research in finance. It is widely held, that the assumption of constant *market risk* is often violated in financial markets. However, the question remains: what is the instability of this *market risk* outside the US over the long run? Anderson and Breedon (2000) provides one of the few long-term historical analyses of *market risk* behavior outside of US market, consisting of a study covering fifty years of UK stock market volatility.

The present paper uses a new highly valuable database of the French stock market, consisting of monthly data from 1854 to 2008 for the 40 biggest French stocks (in terms of market capitalization) identified at the beginning of each year. It first, confirms the finding by Schwert (1989), and Campbell *et al.* (2001), that *market* volatility is unstable over time. Contrasting with the US case, French *market risk* reveals several phases of increase (peaking in 1949) and decrease consistent with French economic history. However, in the US a long-term stability is observed with the exception the peak of the Great Depression (Schwert, 1989). In France, the weak level observed before 1914 has never recurred. Trends on sub-periods are, at this stage, not clear, but *market risk* appears to follow a deterministic trend over several sub-periods consistent with French economic history.

This paper then studies the behavior of *specific risk*. Compared with *market risk, specific risk* remains relatively stable over time; and according to French economic history, appears to be only slightly affected by shocks. Combining a volatile, but gradually increasing *market risk* with a more stable *specific risk*, *market risk* represents an increasing part of *total risk* in the French stock market. As a result, portfolio diversification can eliminate a decreasing share of the *total risk*. In other words, the effect of the portfolio diversification decreases over time. This rise of the relative weight of *market risk* is consistent with an increase of the average correlation coefficient among stocks.

The average correlation coefficient among the 40 French stocks cited in this paper, is measured between 1854 and 1997 by virtue of 780 pairwise coefficients. Assuming some simplifications, a theoretical link is provided and tested, between the weight of the *market risk* in the *total risk* and the correlation coefficient among stocks. Clearly, an increase of the *market risk* in the *total risk* leads to a rise of the correlation coefficient; thus, reducing what can be obtained from the diversification. As in the long run, the *market risk* component in the *total risk* has increased, the correlation coefficient among stocks has also progressed.

However, as pointed out by Forbes and Rigobon (2002), the standard correlation coefficient is vulnerable to heteroskedasticity bias. Thus, this paper tests for bias in the correlation coefficient resulting from changes to *specific risk* since the variations of individual volatilities leads to an automatic variation of the correlation coefficient without any change of common factors (*market risk*). The standard correlation coefficient is adjusted for the self-acting effect from changes in the *specific risk*.

Practical consequence of these observations, the famous diagram depicting the decrease of risk with sequential adding of stocks in a portfolio is built from, both, empirical observations and theoretical simplifications. They summarize major findings. Since 1914, the *total risk* has increased combined with a decreased of the diversification benefit. Despite using several hundred stocks, today, it is impossible to achieve a level of risk comparable with observations of a poorly diversified portfolio before the First World War. Today a well-diversified portfolio reduces the *total risk* by about 30 %; a level that was achieved with only two or three stocks before 1914.

We conclude by a research of some explanatory factors in rise of the French *market risk* observed over history. Theoretically, several historical changes could impact *market risk*. These changes are measured and a regression is performed to test their explanatory power with several variables used for controlling theses observations. A correct approximation of the *market risk* is provided by a combination of a dummy for after 1914 (mainly the end of the Gold Standard), the inflation rate and the ratio public deficits on GDP.

This paper is organized as follows: Section I presents the data, for, and the main observations, of, the French *market risk* compared to the US case. Section II compares *market* and *specific risk*. Section III attempts to identify trends in both *market* and *specific risk*. Section IV questions whether it is the end of the diversification effect? Section V exposes the average correlation coefficient observed among stocks. Section VI proposes and tests a theoretical link between the relative weight of *market risk* and the correlation between stocks returns. Section VII measures the number of stocks which is required to decrease the risk over time. Section VIII investigates explanations for *market risk* increase over time. Section IX concludes.

I The instability of market risk over time

Data for the French market has come from a new database constructed in order to rebuild an index of performance based on the design of the current CAC 40 (for a complete presentation of this index, see Le Bris and Hautcoeur, 2010 or chapter 1). The components of this historical CAC 40 (HCAC 40) are selected at the beginning of each year as the first 40 market capitalizations among all firms listed in Paris, and, therefore, avoid survival bias. Prices of these 40 firms are collected the first Wednesday of each month leading to a dataset of about 80,000 monthly stock prices. Monthly price variation of the index is the average of the price variations of these firms weighted by market capitalization. In January of the following year, components of the index change. When this method is applied to the decade between 1988 and 1997, and results compared with those of official NYSE-Euronext CAC 40, it can be seen that they are statistically similar. In addition, the use of 40 firms allows an accurate image of the market given the high concentration of capitalizations. In recent years, the CAC 40 represents about 70 % of all French market capitalization and, in the middle of the 19th century, was about 90 %.

Schiller (1981) shows that in the US, the unpredictability of stock prices is higher than what was implied by the instability of the dividends. Schwert (1989) details the US instability of the *market risk* since 1857. He shows that leverage is not enough to explain the changes observed, particularly the high levels reached during the Great Depression of the 1930s. Voth (2003) tests and confirms the hypotheses of Schwert-Merton, stating that political uncertainty during the interwar period explains the exceptional market instability. Others, such as Cutler, Poterba and Summers (1989), and Odean (1999), agree that economic factors cannot exclusively explain market volatility; even despite, the fact that it clearly rises during economic recession (Schwert, 1989). In Europe, the volatility of UK stocks is on a declining trend after peaking in the late 1970s following inflation changes (Anderson and Breedon, 2000).

The volatility of the HCAC 40 is not stable over time. Figure 1 presents the average (annualized) and the standard deviation (annualized) of monthly changes measured each month *on a ten year rolling window* for the HCAC 40 index. Since this index is well-diversified, all the *specific risk* has been eliminated. Thus, the standard deviation of the HCAC 40 index measures the *market risk* alone. This *market risk* starts to rise after 1914 and culminates in 1949. It decreases between 1949 and 1971 but then rises again after 1973. The 1980s appear volatile. Given the sensitivity of the standard deviation to one observation far from the average, extreme events have a clear impact. For January 1882 and May 1981, Figure 1 displays the ten years impact on standard deviation attributable to the ten years rolling window used.[151]

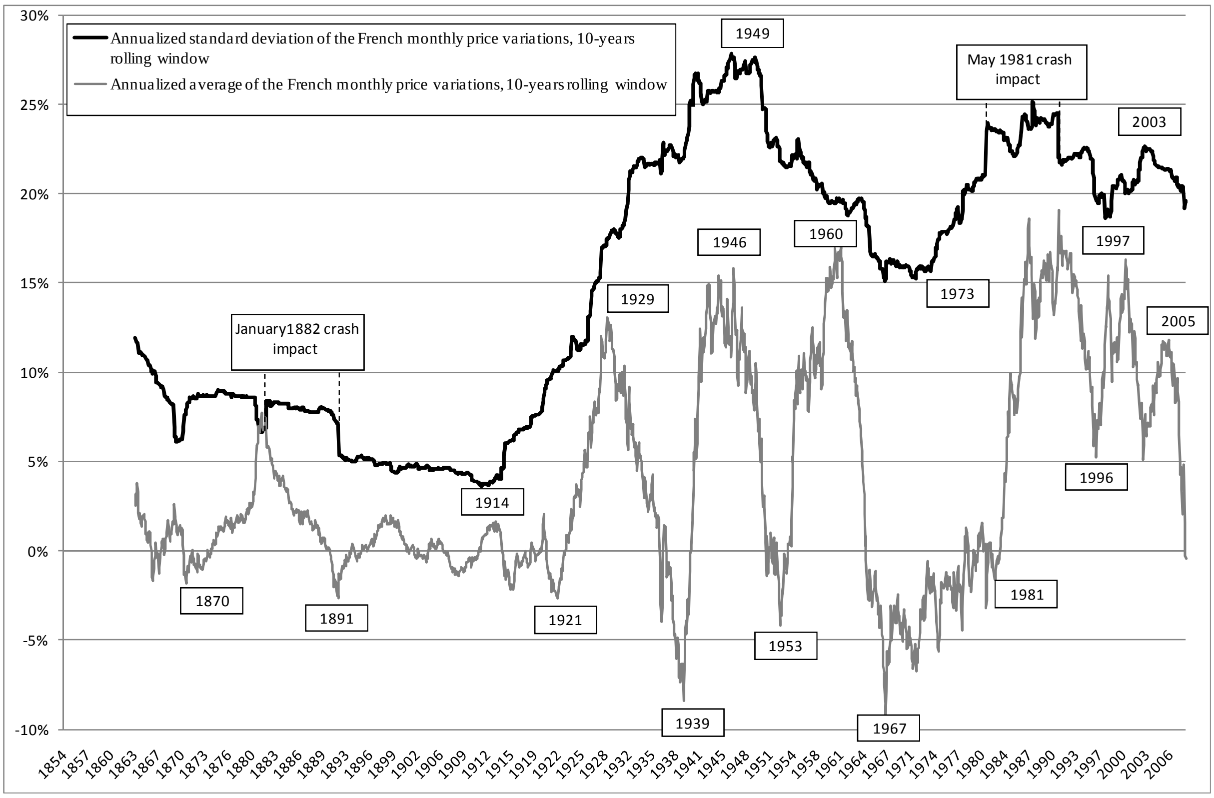

Figure 1, Average and standard deviation of monthly price variations of the HCAC 40. January 1854-December 2008. Theses statistics are measured over a ten year rolling window and annualized. The standard deviation of the HCAC 40 measures the market risk.

[151] One observation far from the mean causes a strong rise of the standard deviation. Thus, these two extremes price variations (Crash of January 1882 and election of François Mitterrand in May 1981) causes a rise of the standard deviation for ten years during which they are taking into account.

This graphical analysis shows that the *market risk* is free of any clear long-term trend. Opposed to a popular opinion, the volatility of the market does not present a continuous tendency to increase due to the consequences of modern financial tools or the economic system (first fallacies according to Jorion, 2002). The current level of *market risk* is not at a historical maximum. In fact, the highest historical level was reached sixty years ago, just after World War II over the period 1939-1949. This may be explained by factors associated with the war and policy, such as the process of nationalization implemented in 1944-1946, revolutionary riots of 1947 and the ascent of the *Parti Communiste Français* as the first party (one third of votes at the election of November 1946).

For consistency with Schwert (1989) and Campbell *et al.* (2001), *market risk* as the annualized standard deviation based on monthly data measured each month *on the prior 12 months* is also computed. Figure 2 exhibits the standard deviation, measured each month over a prior 10-years and 12-months rolling windows. The *market risk* appears more volatile over the short-run. According to this one year rolling window, the maximum level of *market risk* is reached during the year 1941, and, crucially, not in 1949 as indicated by the 10-years rolling window (but of course, this ten year period includes the year 1941).

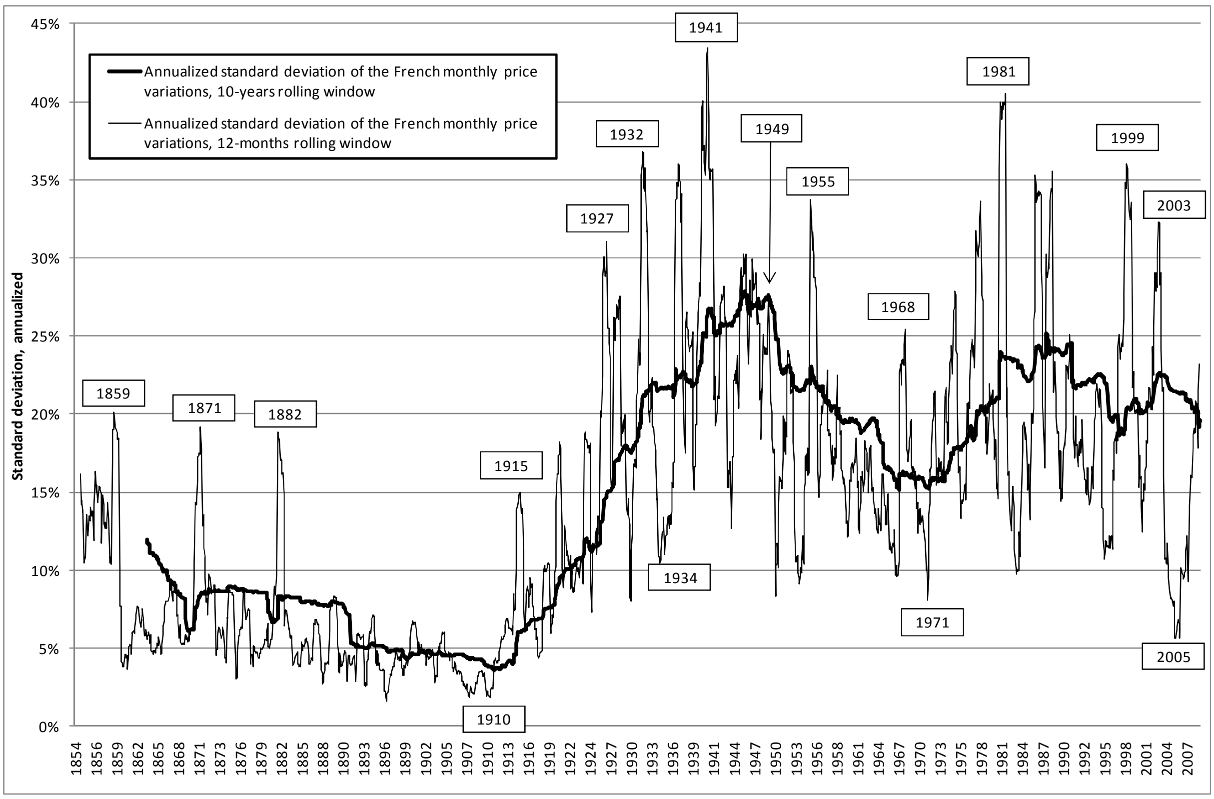

Figure 2, Market risk for the HCAC 40 measured on a 10-years and 12-months rolling window. January 1854-December 2008. These statistics are measured as the standard deviation of the monthly prices variations on a 12-months and 10-years rolling windows and annualized.

To form a comparison with the well-known behavior of US long-term stocks volatility, the 12-months of French *market risk* is presented along side the US equivalent; see Figure 3. The US data originated from the Old NYSE (Goetzmann *et al.*, 2001) before 1925 and S&P (according to the Shiller online version) after this date. The level of the French *market risk* was lower than that for the US before the interwar period and has been higher since the Second World War. The huge spike in US *market risk* occurring during the Great Depression (more than 60 %), is without equivalence in the France. In France, the maximum observed level of *market risk* was reached in 1940 (with 43 %) and not during the interwar period.

Contrary to the US, a period of high *market risk* begun in France with the onset First World War. A rapid climb in instability was experienced by a number of comparative companies listed both before and after the First World War (see chapter 3). The level of *market risk* is three times higher after the war. This structural break, clearly displayed on Figure 1, is perhaps a consequence of the end of monetary stability (this hypothesis is not rejected in the test presented in section VIII of this paper).

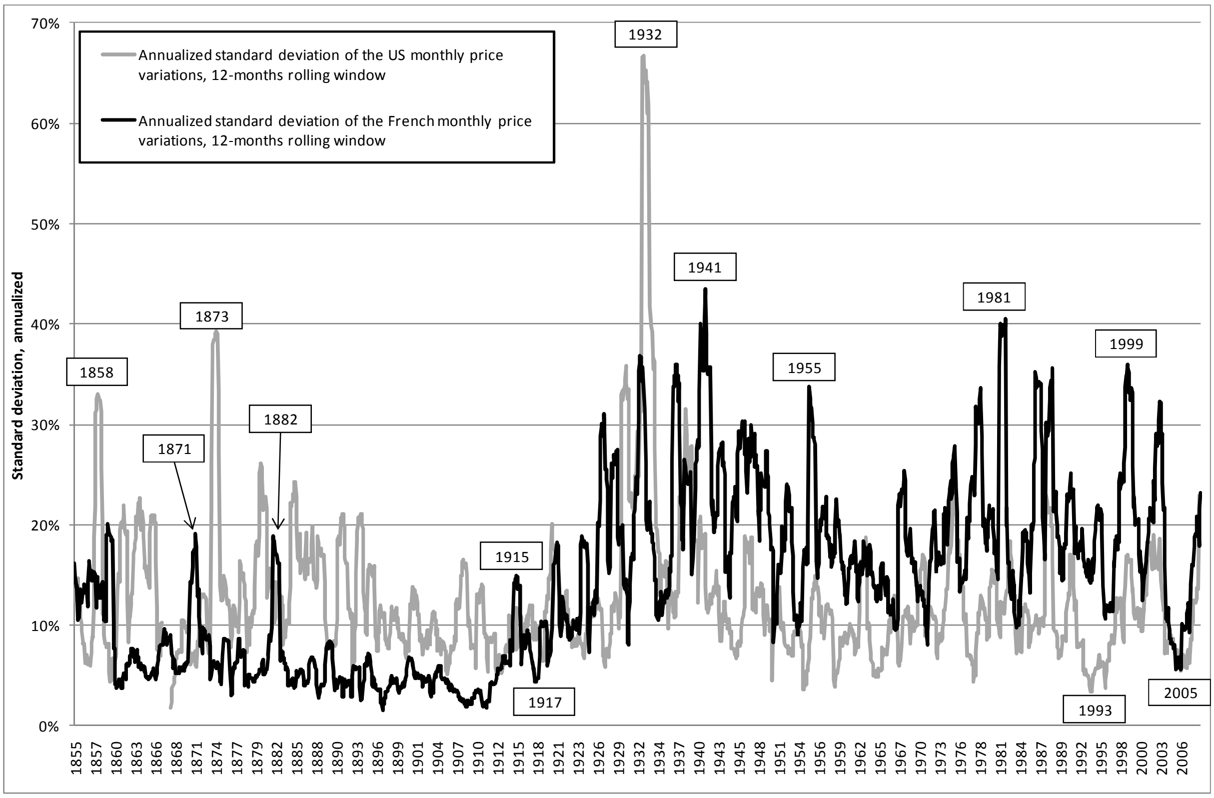

Figure 3, Market risk of the HCAC 40 and Old NYSE-S&P. January 1854-December 2008. These statistics are measured over a one year rolling window as the standard deviation of the monthly price variations and annualized. Data are from Goetzmann *et al.* (2001), S&P and Le Bris and Hautcoeur (2010).

II Market risk versus specific risk

All risk associated with the prior figures stated, was measured at the aggregate level thanks to the HCAC 40 index and US stock indices. In fact, it is *market risk*, since taking into account the diversification of these indices, the *specific risk* is eliminated. Using the database of monthly prices for the first 40 market capitalizations at the beginning of each year, the standard deviation of price variations at the individual level is also measured; we then calculate an average of these individual volatilities. This average of individual volatility is named the *total risk* because it is the risk measured before any effect of diversification. To compare the *market risk* with the volatility at individual stock level (*total risk*), HCAC 40 which was a value-weight index is replaced by an equal-weight index. It is more relevant to measure the *market risk* through an equal weight index, since it will next be compared with an equal-weight average of individual risks as a measure of the *total risk*. The equal-weight index is the average of monthly returns.

The *market risk* is the volatility of the average while the *total risk* is the average of individual volatilities.

$$\textit{Total risk} = \frac{\sum_{i=1}^{40} \sigma\left(\frac{P_t^i}{P_{t-1}^i} - 1, \ldots, \frac{P_{t-n}^i}{P_{t-1-n}^i} - 1\right)}{40} \tag{1}$$

$$\textit{Market risk} = \sigma\left(\frac{\sum_{i=1}^{40} \frac{P_t^i}{P_{t-1}^i} - 1}{40}, \ldots, \frac{\sum_{i=1}^{40} \frac{P_{t-n}^i}{P_{t-1-n}^i} - 1}{40}\right) \tag{2}$$

where P_t^i, is the price of the stock *i* at the date *t*, σ *is* the standard deviation and *n* is the rolling window.

After calculating these two measures over a ten years rolling window, the average of volatilities (the *total risk*) can be compared with the volatility of the average (the *market risk*). The difference between the *total risk* and the *market risk* constitutes the *specific risk* which is eliminated due to diversifications at the aggregate level. Of course this *specific risk* is an average. This simple method, based on the concept of gain from diversification does not require an estimate of betas.

$$Total\ Risk = Market\ Risk + Specific\ Risk \tag{3}$$

In other words, on one hand, the standard deviation of every 40 French stocks is calculated over the ten prior years; then, the average of these 40 individual volatilities is calculated which is named the *total risk*. On the other hand, the standard deviation of the equal weight index is calculated over the ten prior years. This volatility is named the *market risk* since it is the risk support remaining after diversification. The difference between these two risks is the *specific risk*.

In Figure 4, the decomposition of the *total risk* shows that the *market risk* is the main source of long-term changes in *total risk*. While this *total risk* was always below 25 % before WWI with a minimum of 11 % in 1914, its historical maximum of about 50 % is recorded just after the Libération. Then, it falls until the first oil shock but never converges again to pre-WWI levels. Since the 1970s, it stays at a high stable rate. This historical rise of the *total risk* is clearly a result of the increase of *market risk*.[152] Today, the *market risk* explains about two thirds of total volatility whereas it was only one half before the First World War.

[152] The maximum for the *market risk* measured with an equal-weight was about 33 % versus less than 27 % for the market capitalization weighted HCAC 40. This difference can be explained by the higher volatility of small capitalizations which have more impact in an equal-weight index than in a value-weight one.

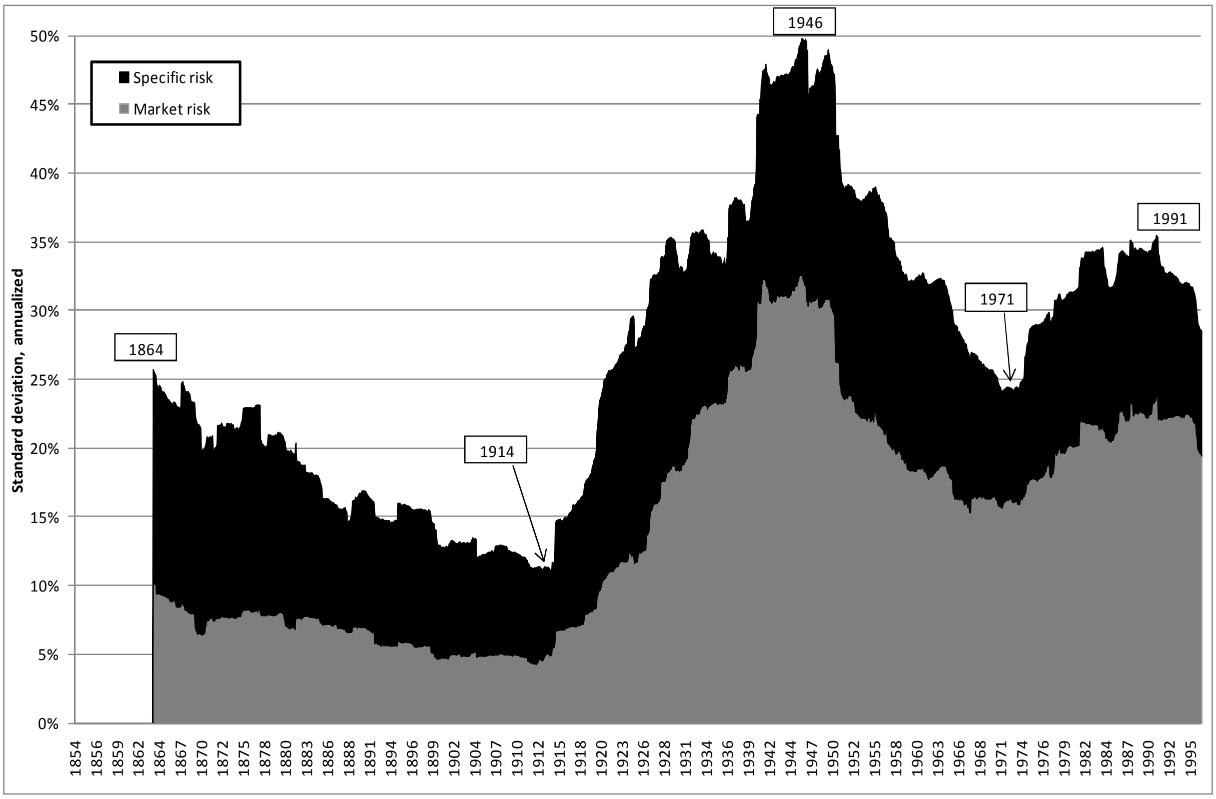

Figure 4, Total risk decomposed into specific and market risk. January 1854-December 1997. The total risk is the average of individual standard deviations. The market risk is the standard deviation of the average of monthly returns. The difference constitutes the specific risk. These statistics are measured on a *10-years rolling window* and annualized.

The *specific risk* offers a more stable narrative than the *market risk* (Figure 5). The 19th century shows a gradual decrease of *specific risk* to its historical minimum of about 6 % between 1911 and 1914. The inter-war period does not present a continuous increase of the *specific risk* whereas it indeed does for *market risk*. Since 1930, *specific risk* has decreased quickly to fall below 10 % in 1936 and again in 1939. With the Second World War, the risk experiences a second period of rise peaking at 18 % in 1947; and then decreasing until 1972. Since 1984, a new phase of decrease can be observed. Today, in contrary to *market risk*, *specific risk* is again at his 19th century level. Since 1927, *market risk* is higher than the *specific risk* and, thus has become the main source of risk. In summation, the *specific risk* remains quite stable over time when compared to *market risk*.

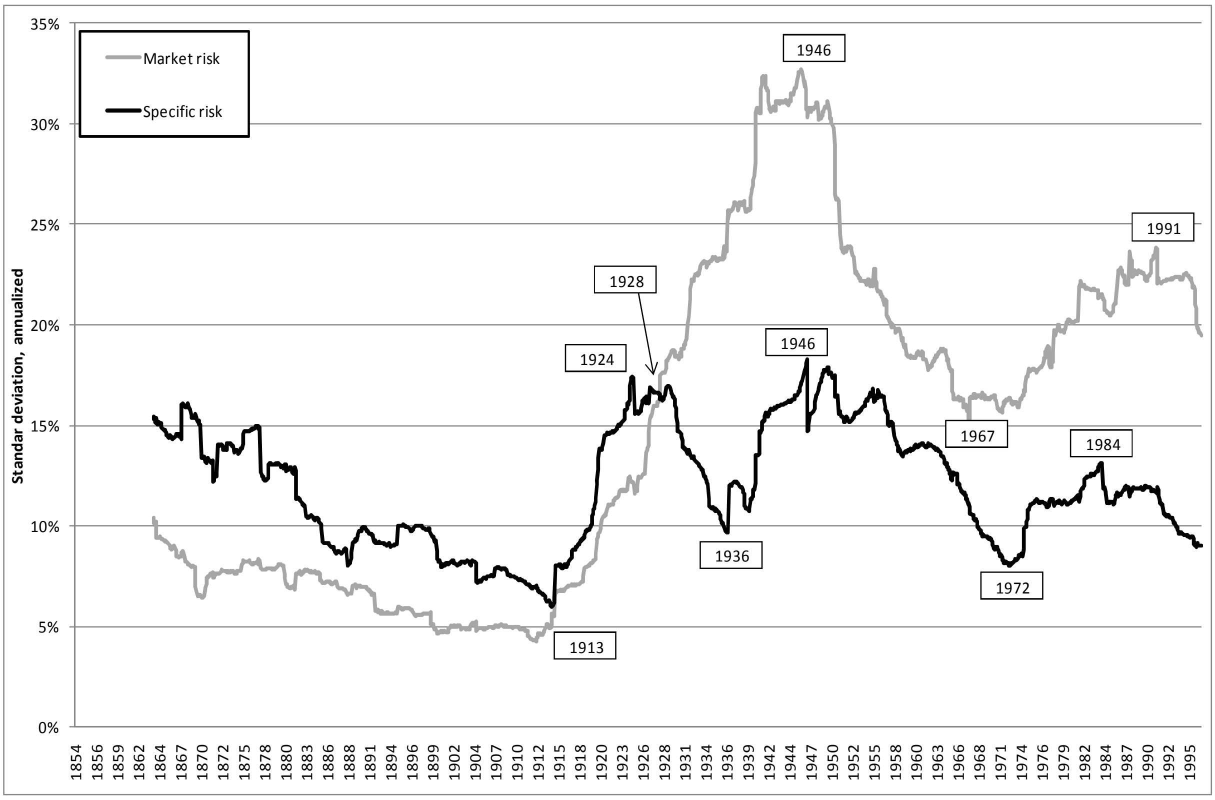

Figure 5, Specific risk and market risk. January 1854-December 1997. The total risk is the average of individual standard deviations. The market risk is the standard deviation of the average of monthly returns. The difference constitutes the specific risk. These statistics are measured on a 10-years rolling window and annualized.

These observed changes of the French *specific risk* are unable to be used to confirm the findings of Campbell *et al.* (2001) that US *specific risk* has experienced an upward trend. Between 1962 and 1997 (according to Campbell *et al,* 2001), the level of US *specific risk* has doubled, whereas the *market risk* has remained relatively stable. *Specific* risk exhibits large changes with a magnitude of three (between 5.97 and 18.26 %) but, contrary to the US case, display a high stability compared to *market risk.* In France, the main source of change of the *total risk* is clearly attributable to *market risk.* Of course, these results do not also confirm Kearney and Poti (2008) who found that European stocks have become more volatile both at the individual and at the aggregate level. However, here, in this study, not only, is the main source of risk constituted by *market risk*, but some trends, do, in fact, seem to appear.

III Measures of trends in risks

The *market risk* in Figure 1 is indicative of several extreme points consistent with economic history. The first point until 1914 shows a slow decrease. The second point, between 1915 and 1949 covers the two World Wars with major monetary disorders and the Great Depression. This period, characterized by a huge rise in *market risk* can be described as the first part of the famous "Great Reversal" of the role of the market in the economy (Rajan and Zingales, 2003) or the "Second Thirty Years War" (Temin, 1993). Up until the first oil shock in 1973 a new phase of decreasing *market risk* is observed. A last rise of this risk is recorded between 1974 and 1983. 1984 is the last point of inflexion with the end of high inflation and the deregulation of financial markets.

Using this periodization, a search has been conducted, applying numerical tests to identify trends for, both, *market* and *specific risk*. In order to avoid autocorrelations, a *switch is made, for risks measured each month, over the ten prior years rolling window, to risks measure each year over the twelve months of the year* without any rolling window[153] and from the level observed to the first difference. Table 1, presents autocorrelations measures for, both, *market* and *specific risk*. *Market risk* exhibits a strong negative autocorrelation for one and two year lags. The result of an Augmented Dickey Fuller test, based on regressions of the time series on their lagged values cannot rejected the existence of a unit root for both *specific* and *market risk* for 1950-1972 period; nor for 1984-1996 period, concerning *specific risk* only.

Given these results and following the graphical analysis, an analysis is made of the volatility series in levels rather than in first differences to look for a deterministic trend.[154] Some descriptive statistics, and linear trend regressions are reported in Table II. For the long run, *market risk* represents about 50 % more than the *specific risk* and in addition, a higher volatility of his average. For the whole period, one OLS regression on time does not identify any trend for the *specific risk*, but does a weak trend for the *market risk*. The sub-periods detailed above provide strong OLS regression (with a high R^2) for the *market risk* during 1854-1914, 1915-1949 and 1984-1996 periods; whereas *specific risk* appears to follow a trend (although a decreasing one) only during 1854-1914 and 1950-1973 periods.

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[153] As explained for the Figure 3, the volatility measured on the 10-years window smooths our observations. For example, the maximum of the *market risk* is 47.32 % on *12-months* against only 32.73 % on *10-years*.
[154] The homogeneous increase of the *market risk* during the interwar period suggests a trend in level.

Table 1, Descriptive statistics of risks in first difference, autocorrelations and unit root test. Market and specific risks are measured according to Equation (3). They are measured each year using twelve monthly observations.

First differences of the risks	Specific Risk		Market Risk	
Descriptive statistics				
Average	6.66%		8.48%	
Standard deviation	41.96%		46.66%	
Minimum	-69.47%		-64.81%	
Maximum	244.22%		181.01%	
Number of observations	1595		1595	
Autorcorrelations				
ρ1	-0.0134		-0.1824	
ρ2	0.0105		-0.1926	
ρ3	-0.0412		0.0614	
ρ4	-0.0185		-0.0921	
ρ6	-0.0593		0.0299	
ρ12	-0.0651		-0.0475	
ADF Test				
	p-value	Lag	p-value	Lag
1854-1996	0.0000	5	0.0000	5
1854-1914	0.0272	3	0.0151	3
1915-1949	0.0683	3	0.0133	3
1950-1972	0.5921	2	0.2205	2
1973-1983	0.0000	2	0.0644	2
1984-1996	0.2525	2	0.0930	2

Table 2, Descriptive statistics of risks in level and linear trend test. Market and specific risks are measured according to Equation (3). They are measured each year using twelve monthly observations. Risks are regressed against time to find a deterministic trend

Risks in level (standard deviations)	Specific Risk		Market Risk	
Descriptive statistics				
Average	9.42%		14.08%	
Standard deviation	3.86%		8.97%	
Minimum	3.16%		2.56%	
Maximum	22.15%		47.32%	
Number of observations	1596		1596	
OLS Regression				
	R^2	slope	R^2	slope
1854-1996	0.0545	0.0002	0.3354	0.0013
1854-1914	0.3899	-0.0009	0.2037	-0.0008
1915-1949	0.0424	0.0010	0.4450	0.0063
1950-1972	0.4437	-0.0031	0.0063	-0.0005
1973-1983	0.0357	0.0024	0.0374	-0.0041
1984-1996	0.0884	-0.0014	0.4060	-0.0106

IV Is the portfolio effect ending?

For an investor seeking diversification benefit, the *market risk* indicates the level of *total risk* that cannot be eliminated. The *specific risk* remains quite stable for the long run, whereas the *market risk* has increased since the First World War. As a result, the weight of *market risk* as a component of *total risk* would be expected to have risen. This weight is displayed on Figure 6; it is the part of the *total risk* that an investor cannot reduce despite the diversification among French stocks. This weight appears to trend upward with a maximum reached between 1936 and 1940 with about 70 % of the *total risk* composed by the *market risk*. This level is, again, observed during recent years. For portfolio management, Figure 6 subtly demonstrates how important the effect of the diversification can be. The the weight of *market risk* as a part of *total risk* is indicative of the portion of risk, which is impossible to eliminate. In contrast, the weight of *specific risk* as a part of *total risk* represents the part that a portfolio diversification can eliminate.

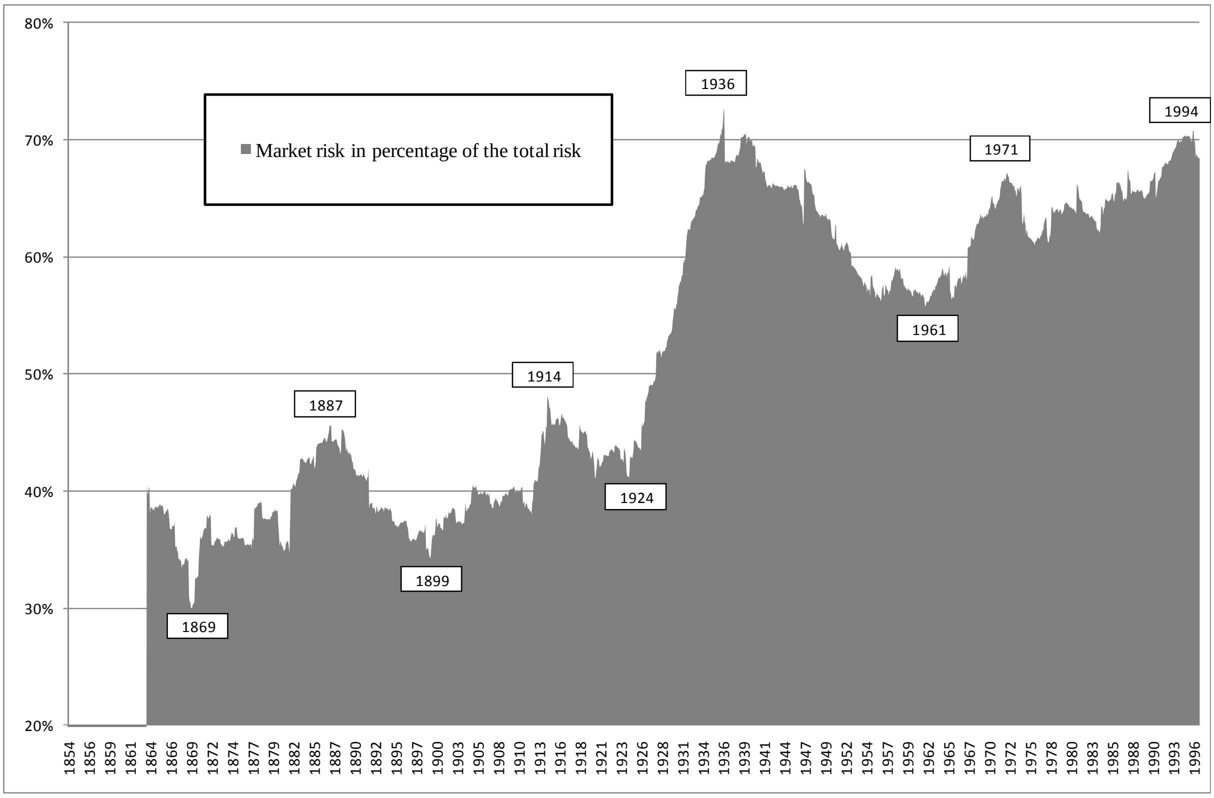

Figure 6, Market risk in percentage of the total risk. January 1854-December 1997. The statistics presented are measured over a ten-year rolling window according to Equation (1) and (2).

To provide a direct view of the benefit of the diversification among different stocks, a “portfolio effect”measure is introduced. This portfolio effect is the decrease in risk that is due to the diversification compared with the *total risk*. The portion of *specific risk* contained within *total risk* can always be eliminated on account of diversification converging towards the level of the *market risk*. Thus the risk supported by a diversified investor decreases from the *total risk* to the *market risk*. This decrease is expressed as a percentage of the *total risk* according to Equation (4). It indicates the percentage of *total risk*, which is eliminated by means of the portfolio diversification.

As can be seen in Figure 7, portfolio diversification has considerable effect before the 1920s, but only a small one today. This is due to the historical rise of *market risk* whereas *specific risk* has remained relatively stable. As a consequence, the current diversifiable portion of *total risk* is smaller. Before 1914, the decrease in the *total risk* that was due to the portfolio effect was always about -60 %; but since the 1920s, this effect has supported a gradual decrease. Currently, this effect is only about -30 % of the level of the *total risk*.

$$Portfolio\ Effect = \frac{Market\ risk - Total\ risk}{Total\ risk} \tag{4}$$

$$= \frac{\sigma\left(\frac{\sum_{i=1}^{40}\frac{P_t^i}{P_{t-1}^i}-1}{40},\ldots,\frac{\sum_{i=1}^{40}\frac{P_{t-n}^i}{P_{t-1-n}^i}-1}{40}\right) - \frac{\sum_{i=1}^{40}\sigma\left(\frac{P_t^i}{P_{t-1}^i}-1,\ldots,\frac{P_{t-n}^i}{P_{t-1-n}^i}-1\right)}{40}}{\frac{\sum_{i=1}^{40}\sigma\left(\frac{P_t^i}{P_{t-1}^i}-1,\ldots,\frac{P_{t-n}^i}{P_{t-1-n}^i}-1\right)}{40}} \tag{5}$$

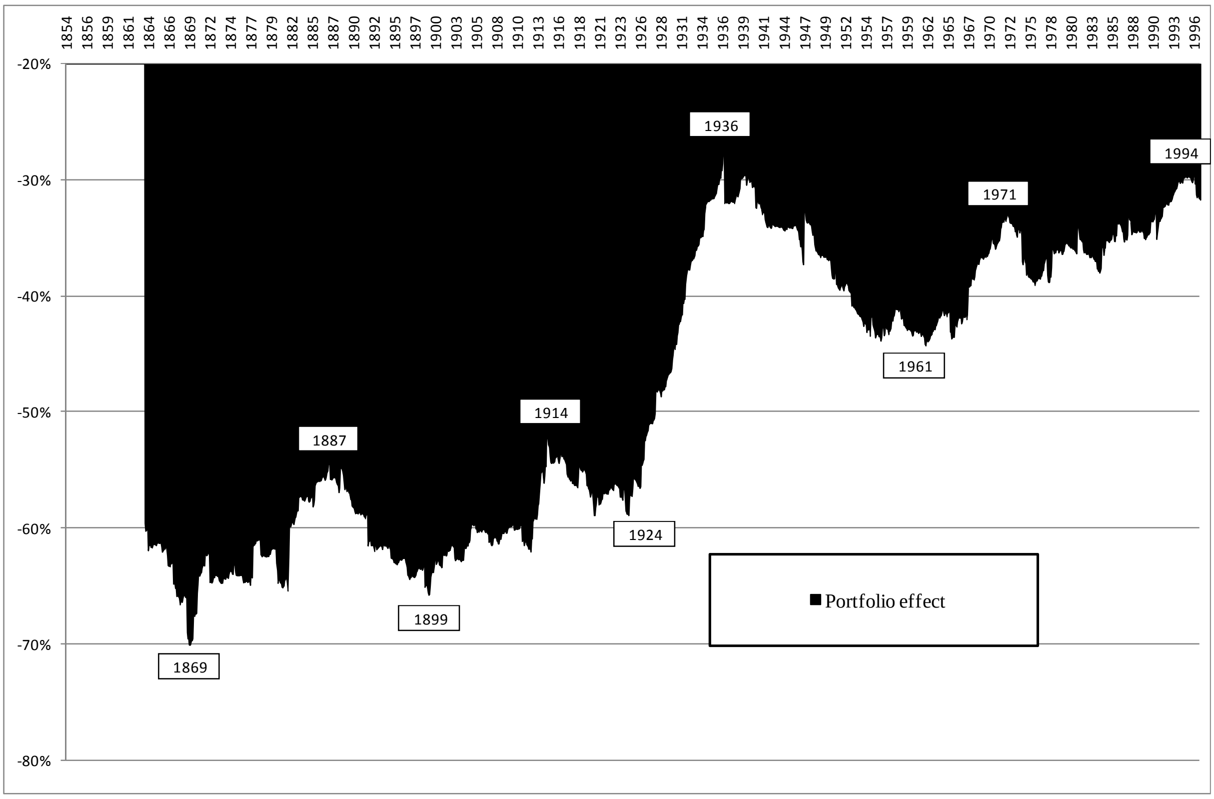

Figure 7, Domestic portfolio effect (decrease in risk due to portfolio) on the French stock market. January 1854-December 1997. This portfolio effect respects Equation (5). Market and total risk are measured over a 10-years rolling window.

V Long-term correlation between stocks

As the relative weight of the *market risk* as a part of *total risk* changes over time, consistent should be observed in the changes to correlation level. The higher the level of *market risk* is, compared to the *specific risk* (in other words the *market risk* in percentage of the *total risk*), the higher the correlation among individual stocks will be; since a larger part of their price variations will result from common market changes.

The correlation in price variations for every single stock and the 39 remaining stocks, is measured over a 10-years rolling window. For 40 stocks, 780 pairwise correlation coefficients are calculated each month for the ten prior years or 120 months (Campbell *et al.* use 60 prior months). Thus, an average of the 780 coefficients is shown by month in Figure 8. Since the database studied had, for the beginning of each year compiled the monthly stock price for the first 40 market capitalization, pairwise correlations have not been calculated between the same firms within any single ten-year window. However, monthly measurements are taken of the average of all possible correlations; thus, each change in pair balance the other. The only noisy effect comes from the entrance (and exit) of one stock in the top 40 stock market capitalization. This effect should be limited since the market capitalizations are quite stable over time. A positive consequence is to measure correlations only among stocks interesting for portfolio management since they are the most important in terms of market capitalization.

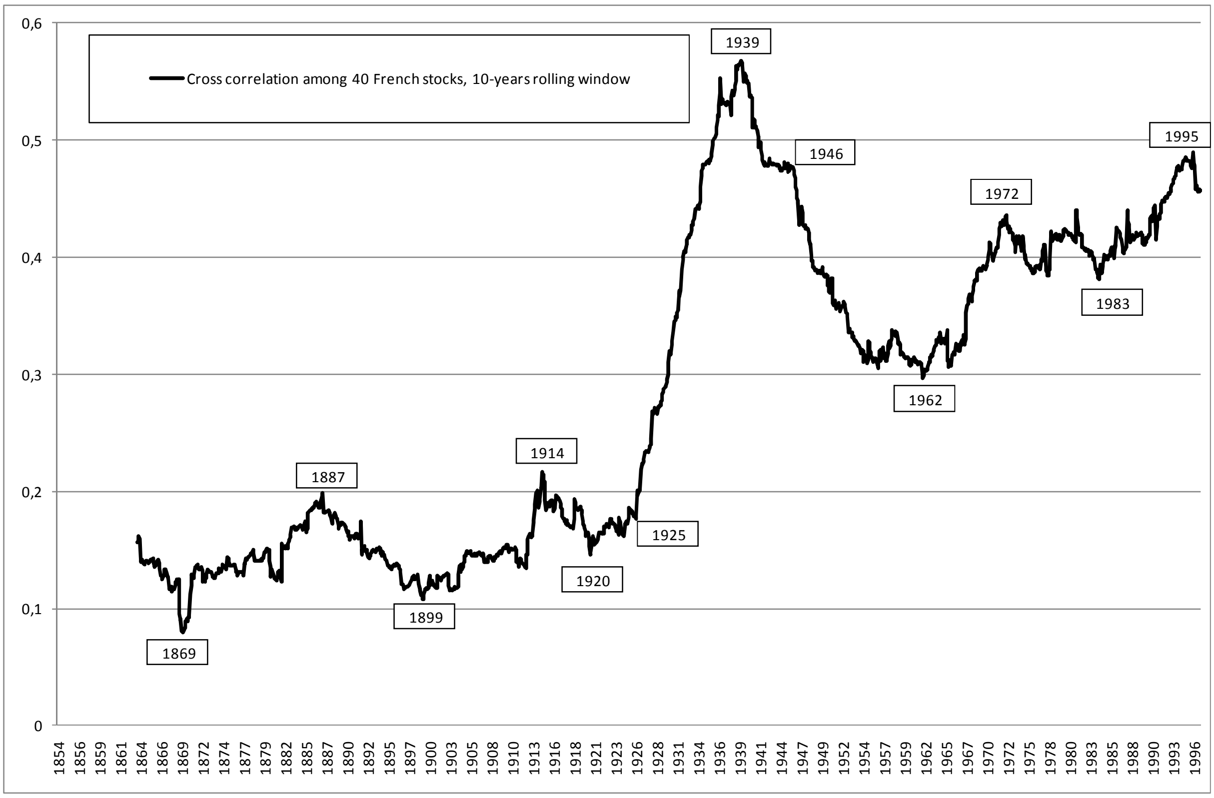

Figure 8, Average correlation between French stocks. January 1854-December 1996. This graph dispays the average correlation measured over a ten-year rolling window of 780 pairwise correlation coefficients.

As anticipated, the correlation among stocks is not stable throughout history. The average correlation is always below 0.2 before the 1920s (more exactly before 1925).[155] Since the second part of the 1920s, the correlation has increased rapidly to a maximum of 0.56 in 1939 (on the 1929-1939 period). This rise can be explained by the disorders affecting the country, thus common to all the firms. The end of the increase in correlation with the Second World War is not inconsistent. Indeed, the events of the war make firms affected more (North coal mines) or less (firms with foreign assets like Port de Rosario or Banque d'Indochine).

[155] Note that, this low level of correlation removes a large part of the explanative power of the "market model". The weakness of common factors leads to explain a small part of individual return by market return. As a result, it is not consistent to use the "market model" before the 1920s.

Between 1939 and 1962, the correlation sees a fall despite the nationalization of the Libération where several specific industries disappear (banks, gas, electricity, coal)[156]. In the last set of years the correlation is close to 0.5, therefore, very high compared to levels prior 1914.[157]

These results strongly contrast from those of Campbell *et al.* (2001) from the US. They measure the average correlation to be between 1,500 and 8,000 US stocks but limited to post-1962. They found a fall in correlation from 0.28 in the early 1960s to 0.08 in 1997. The increase in the number of stocks over time can impact their results; for instance, if the database includes more and more small market capitalizations with a weak liquidity and thusly affected by very specific information. In this vein, Bennett and Sias (2006) posit that changes in the correlation coefficient are reflective of changes to the composition of the panel of stocks used. Extending the sample into the 2000s, Brandt *et al.* (2005) or Bekaert *et al.* (2005) do not confirm the increasing trend of *specific risk*. The current level of correlation among French stocks (about 40 %) is more consistent with the findings of Kearney and Poti (2008), who report that for European stocks there is an average stock correlation of about 0.2.

One can argue the correlation coefficient among stocks presented in Figure 8 to be misleading since the rise of individual volatilities leads to an automatic increase in the correlation coefficient - without any change in common factors. As pointed out by Forbes and Rigobon (2002), the standard correlation coefficient is vulnerable to heteroskedasticity bias. They demonstrate that an adjustment to the correlation coefficient is needed between two markets in case of a financial crisis; this is because the rise of correlation may only result from a rise of volatility, exclusive of change to common factors. Non-adjusted correlation coefficients mislead, both, the results and their interpretation. In the study conducted here, a similar effect can lead to a false comparison of the correlation coefficients among stocks over time. This bias can be important because it has been seen in Figure 5 that the *specific risk* is affected by large changes over time. In this way, observed changes in correlation can only be an indirect result of changes to *specific risk* since the correlation coefficient is directly affected by changes in standard deviation.

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[156] The nationalization of specific industries can theoretically lead to a higher correlation among stocks still listed.
[157] One important consequence of this law correlation before the interwar period is the weakness of the use of the market model at this time.

In order to eradicate this heteroskedasticity bias, the correlation coefficients should be adjusted to account for the changes in *specific risks*. The adjuster proposed by Forbes and Rigobon (2002) is utilized here. However, as a base of comparison, it is calculated against only one common month.[158] In such a way, a correlation coefficient adjusted for the increase in *specific risk* is obtained from a single month, forming a base and, thus, comparable through time.

The last month, number 1,716 (standard deviation measured in December 1996 on the ten prior years), is chosen for adjustment, according to Equation (6). Hence, historical observations can be compared against current knowledge on stocks correlations.

$$\delta_n = \frac{\sigma_n^{specific}}{\sigma_{1,716}^{specific}} - 1 \tag{6}$$

This heteroskedasticity adjuster for France, δ_n, is used to adjust the standard correlation coefficient using Equation (7), following Forbes and Rigobon (2002).

$$\rho_n^* = \frac{\rho_n^u}{\sqrt{1 + \delta_n \left(1 - (\rho_n^u)^2\right)}} \tag{7}$$

where ρ^* is the adjusted correlation coefficient, and ρ^u is the observed correlation coefficient.

[158] Forbes and Rigobon (2002) adjust one month compared to another because they look for contagion on the short-term during financial crises.

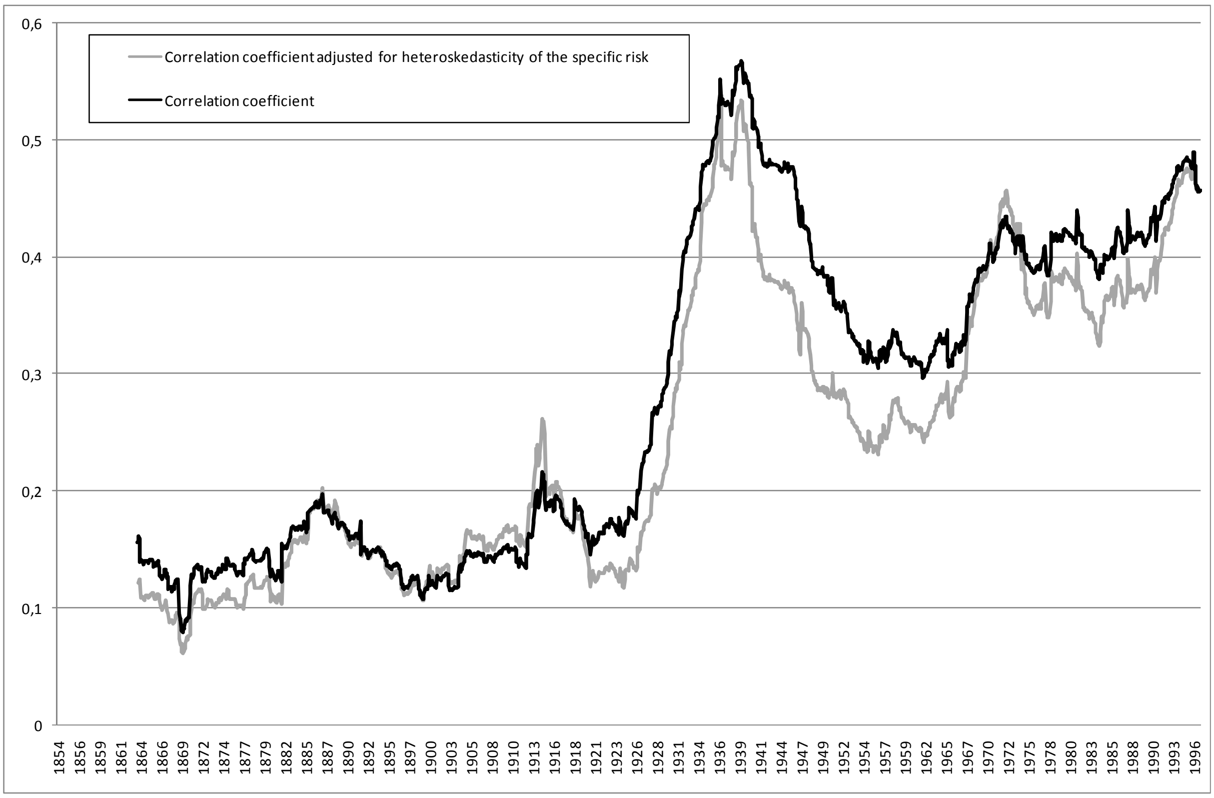

Figure 9, Average correlation and average correlation adjusted for heteroskedasticity between French stocks. January 1854-December 1997. This graph illustrates the average correlation measured over a ten-year rolling window of 780 pairwise correlation coefficients and the effect of the adjustment for specific risk heteroskedasticity, according to Equation (7).

Comparing the two series, they appear very close except during some periods. For example, the adjusted correlation decreases at the beginning of the 1970s until 1983 (similar to the US case according to Campbell *et al.* (2001). But it is still possible observe the large rise in correlation, during the interwar period, and the huge difference between the levels observed before 1914 and after 1945. Since the investor supports such changes in correlation coefficient, whatever the cause may be, the non-adjusted correlation coefficient in the following of this study is maintained.

VI A theoretical link between the correlation coefficient and the weight of the market risk as a component of the total risk

The main changes to the correlation coefficient are consistent with what was indicated by the decomposition of *total risk* into the *specific* and *market risk*. Thus, the relationship between those two observed variables is investigated. One theoretical link between the relative weight of *market risk* and the correlation coefficient is demonstrated in Kearney and Poti (2008): “particularly useful for portfolio managers because it simplifies the construction of the average correlation time series amongst a large number of assets”. It is very similar to an estimator of average correlation used by RiskMetrics™ and, as such, is further discussed by Finger (2000). But Kearney and Poti (2008) assume that this link is only “valid for large, well-diversified portfolios”.

In this study a different theoretical relationship between the relative weight of *market risk* and the correlation coefficient is proposed, which is dependant upon on the number of stocks within a portfolio. Therefore, this relation is, thus, valid for small portfolios and more adaptable to what is observed of real portfolio (4 stocks in average according to Barber and Odean, 2000). This is applied to the 40 stocks portfolio considered in this study.

In a mean-variance framework, the standard deviation, σ_n, of a portfolio of n stocks is:

$$\sigma_n = \sqrt{\sum_{j=1}^{n} \sum_{i=1}^{n} w_i . w_j . cov(r_i, r_j)} \tag{8}$$

where *wi* and *wj* are the weights of stocks *i* and *j* in the portfolio and *cov(ri, rj)* is the covariance between the returns of stocks *i* and *j*.

Accepting the hypothesis of an equal standard deviation, σ, for each of the n stocks in the portfolio and equal correlation, ρ, between each pair of stock returns, Statman (2004) demonstrates this equality:

$$\sigma_n = \sqrt{n(\frac{1}{n})^2\sigma^2 + (n^2 - n)(\frac{1}{n})^2\sigma^2\rho} \tag{9}$$

$$\sigma_n = \sigma * \sqrt{\left(\frac{1}{n}\right) + (\frac{n-1}{n})\rho} \tag{10}$$

Using this last form, each term is divided by σ and thus obtained

$$\frac{\sigma_n}{\sigma} = \frac{\sigma * \sqrt{\left(\frac{1}{n}\right) + (\frac{n-1}{n})\rho}}{\sigma} \tag{11}$$

where, $\frac{\sigma_n}{\sigma}$ is the weight of *market risk* into *total risk*, because with the assumption of an equal standard deviation for n stocks, the average risk of individual stocks is σ. By assumption, σ_n is the standard deviation of a portfolio of n stocks. The risk for this portfolio is only similar to the *market risk* if n is great enough to eliminate all *specific risk*[159]; thus for a small value of n, σ_n is only the risk for this portfolio and cannot be considered as *market risk*.

We can simplify Equation (9) as follows:

$$\frac{\sigma_n}{\sigma} = \sqrt{\left(\frac{1}{n}\right) + (\frac{n-1}{n})\rho} \tag{12}$$

$$\frac{\sigma_n}{\sigma} = \sqrt{\left(\frac{1}{n}\right)(1 + n\rho - \rho)} \tag{13}$$

$$\frac{\sigma_n}{\sigma} = \sqrt{\left(\frac{1}{n}\right)} * \sqrt{1 + \rho(n-1)} \tag{14}$$

This relationship can be graphically illustrated see, Figure 10 for a differing number of stocks (n). A high level of correlation among stocks leads to a high weight of the risk of the portfolio (the risk of the portfolio becomes the *market risk* if the number n of stocks is great enough to eliminate all *specific risk*) compared to the *total risk* (the risk of holding one stock). This theoretical link between the weight of the *market risk* into the *total risk* and the correlation coefficient makes sense, since our previous observations made, point to similarly large changes over time for these two variables.

[159] The number of stocks leading to the elimination of all the specific risk varies over time (see section VII).

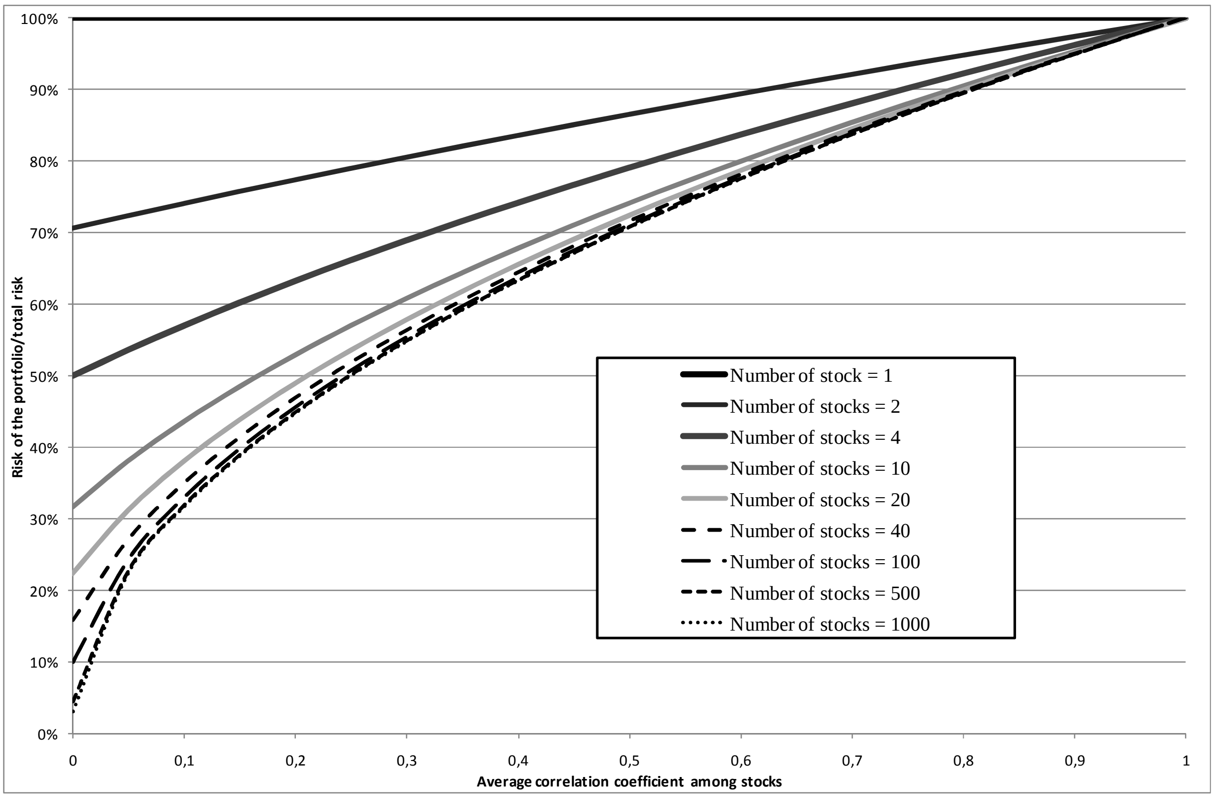

Figure 10, Theoretical relation between the correlation coefficient among stocks and the weight for the risk of the portfolio as part of the total risk for various portfolios. Theoretical relation respects Equation (14) with the number of stocks into the portfolio (*n)* between 1 and 1000. With *n* great enough to eliminate all the *specific risk*, the risk of the portfolio becomes the *market risk*. Thus the ratio becomes *market risk* to *total risk*.

This theoretical relation (Equation (14)) is, then, compared with empirical observations. Figure 11, displays in grey the curve according to Equation (14) for *n*=40 and a scatter plot of the average correlation coefficient presented in Figure 8, as well as, the ratio *market risk* to *total risk* presented in Figure 6. Clearly an increase of the relative weight of the *market risk* leads to a rise in the correlation coefficient; thus, reducing what can be obtained from the diversification. The strong empirical relationship observed in graph 9 also confirms the quality of the average correlation calculated, as expressed above.

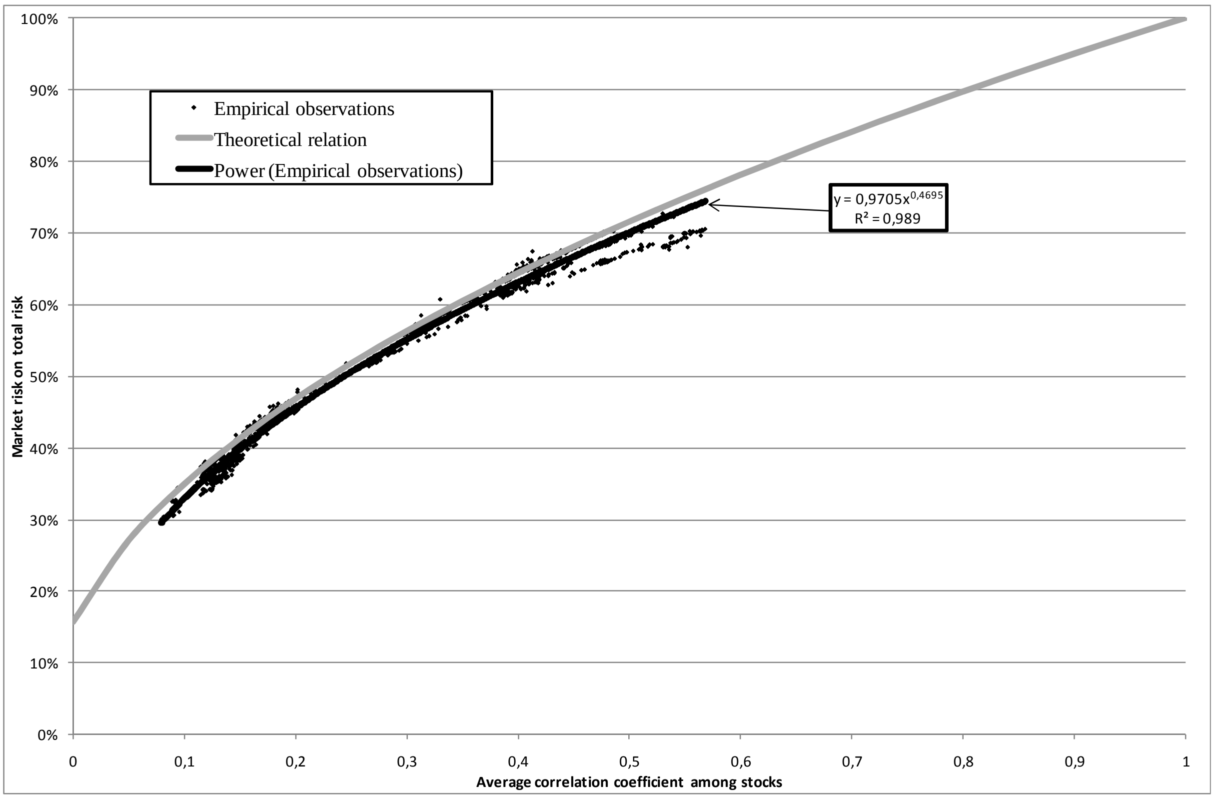

Figure 11, Theoretical and empirical relation between the correlation coefficient among French stocks and the weight of the market risk in the total risk. January 1854-December 1997. Empirical statistics are measured over a ten-year rolling window. Theoretical relation (in grey) respects Equation (14) with n=40.

VII The decrease of the risk with sequential adding of stocks through time

It is a common knowledge that a quick decrease in the portfolio risk occurs with the sequential addition of stocks. The well-known diagram depicting the effect of diversification upon *total risk* is exposed in a number of different studies (Wagner and Lau, 1971 or Pogue and Solnik, 1974, for example). The decrease in risk obtained with adjunction of stocks into the portfolio is very high for the first component but very low after 10 or 15 securities; the decrease in risk for a portfolio containing more than twenty stocks is very small.

Another piece of common knowledge, supported, for example, by the results of Bloomfield *et al.* (1977) is that a portfolio of 20 stocks provides a large fraction of the total potential benefit of diversification. Statman (1987) shows that a portfolio of 20 stocks was optimal since the cost of holding more lines was higher than the benefit obtained due to higher diversification.

These diagrams representing the decrease in risk when one adds new stock to a portfolio, are computed amongst 40 stocks on the French stock market over a twenty-year period (Figure 12). The risk is measured by the standard deviation of price variations over seven periods of twenty years. Each portfolio is equally weighted. The risk of holding only one stock is the average standard deviation of 40 stocks (40 “portfolios” are possible, it is the *total risk*). The risk of holding 40 stocks is the standard deviation of a portfolio composed with all the stocks (only one combination possible, it is the *market risk*). These two extreme results are very clear. In contrast, potential combinations for a portfolio consisting of two stocks are too complex for it to be practical to make all of the necessary calculations. Thus, only one portfolio of two stocks is used: the portfolio of two stocks is composed by the first and the second market capitalization. The portfolio of three securities is built with addition of the third market capitalization and so on… Therefore, intermediary results are not perfect but extreme values are.

According to previous results discussed in this paper, in the case that there are large changes to *total risk*, curves for risk decrease differ widely depending on the period. To provide a better basis of comparison, Figure 13 shows the same decrease in risk but with a common basis of 100 % as the risk level support when holding a single stock (or *total risk*). Since 1914, the diversification benefit appears to be weak when compared to the situation prior to the First World War. Holding a portfolio of 40 stocks causes approximately a 60 % fall for the risk for the three twenty years periods prior to 1914; since 1914, it has only been about 35 %, with the latest period (1974-1993) displaying the weakest effect.

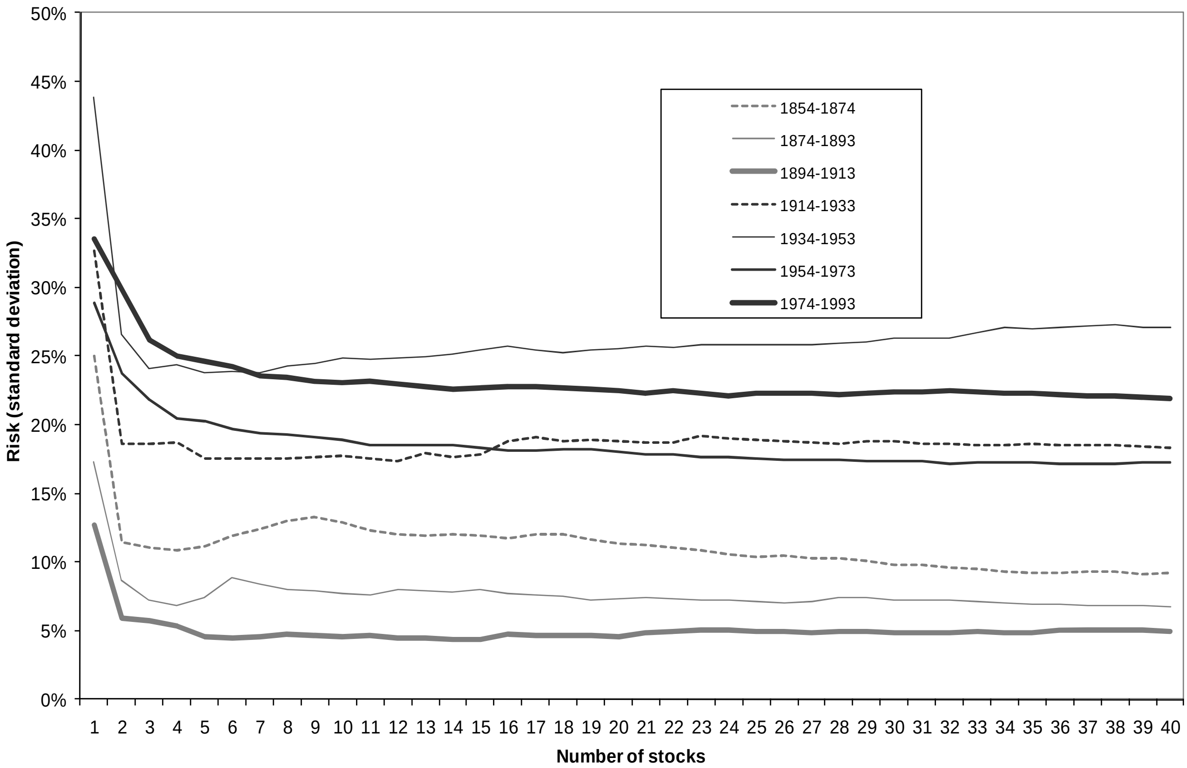

Figure 12, Empirical decrease in risk with sequential adjunction of stocks in a French portfolio. Standard deviations are measured on seven periods of twenty years. This graph shows the risk for one portfolio that is composed by successively adding stocks.

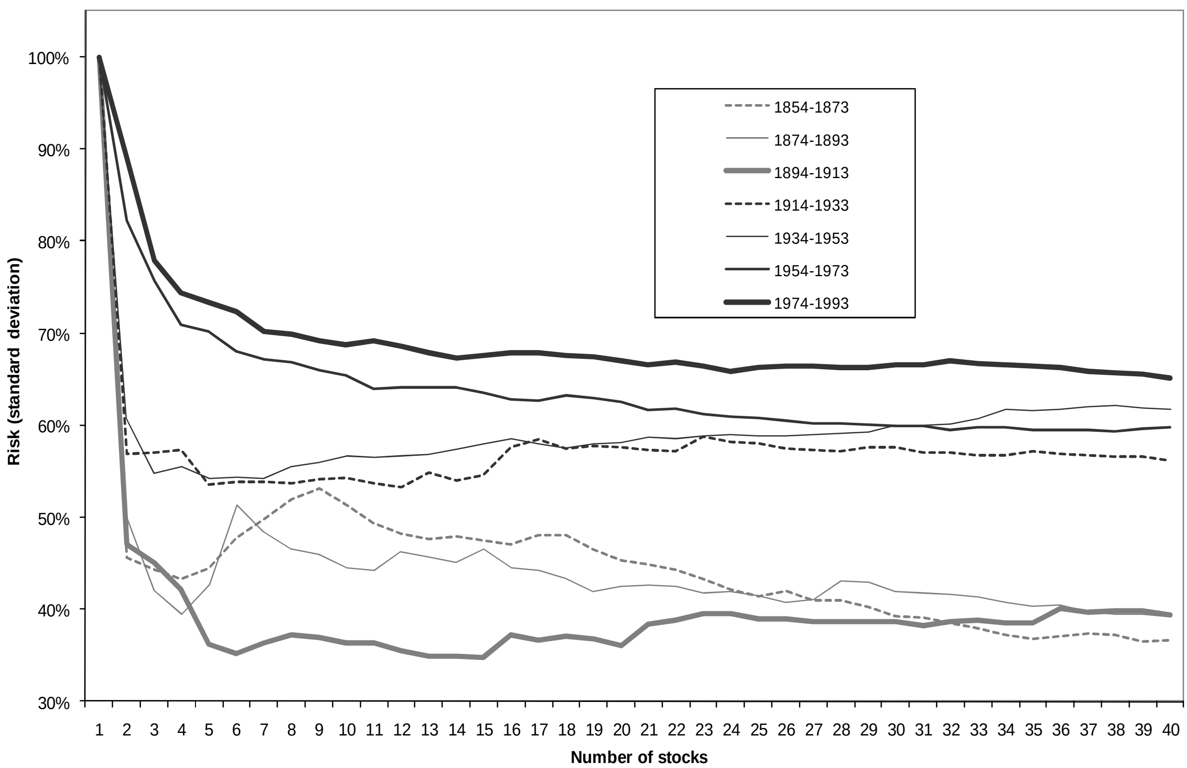

Figure 13, Empirical decrease in risk (maximum = 100 %) with sequential adjunction of stocks in a French portfolio. Standard deviations are measured on seven periods of twenty years. The risk of the portfolio when composed by only one stock is equal to 100 %. This graph shows the risk of one portfolio composed by successive addition of stock.

To provide clearer results, same kind of figure can be constructed using a few theoretical simplifications. According to the average individual risk (the *total risk*) and the average correlation coefficient, Statman (2004) proposes in Equation (9) the theoretical risk of a portfolio of n stocks. The determination of equal risk, σ, uses the average of individual risks (*total risk*) measured over 7 periods of 20 years (similar to periods observed previously) and for equal correlation, ρ, use is made of the average correlation between the 780 pairwise on the same 7 periods of 20 years. Then, for each period, the theoretical level of risk is measured depending on the number of stocks (between 1 to *100 stocks*). Figure 14 shows this decrease of risk with sequential adding of stocks whereas Figure 15 shows the same decrease accepting the 100 %level for the standard deviation of portfolios composed by only one stock.

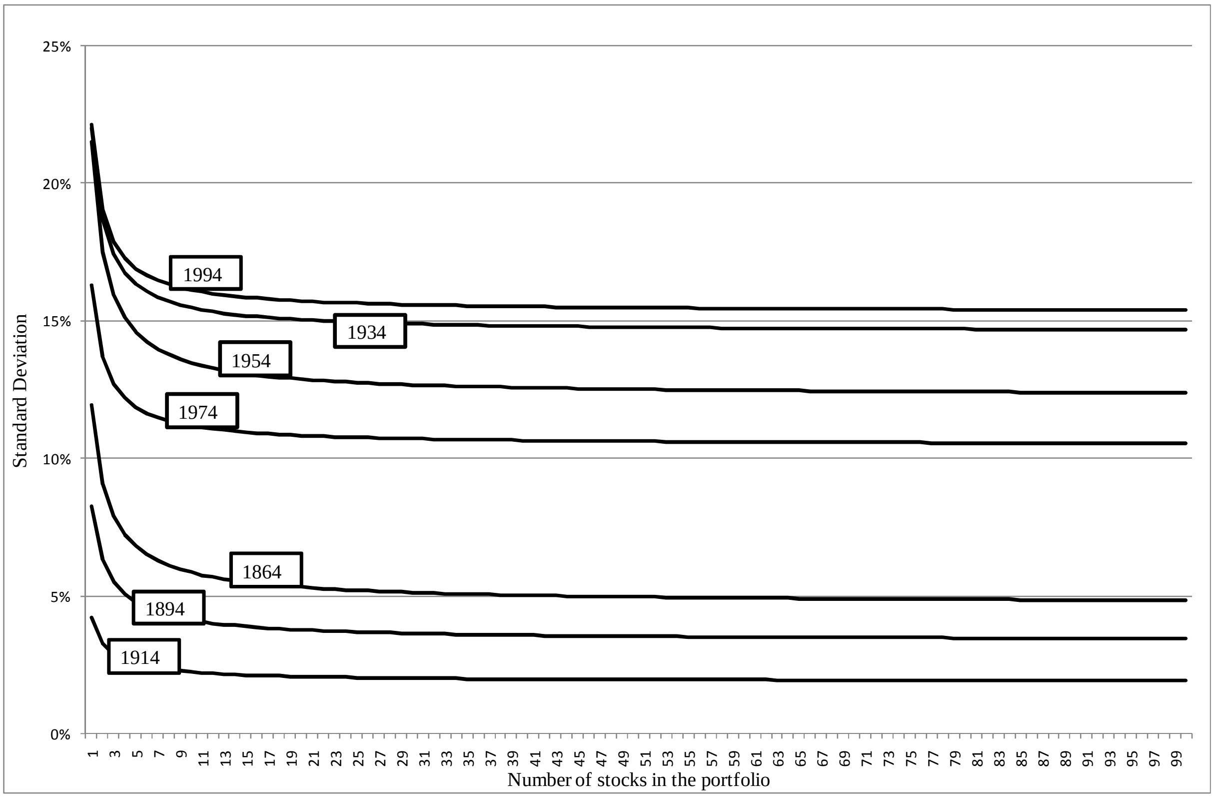

Figure 14, Theoretical decrease in risk with sequential adjunction of stocks in a French portfolio. This graph shows the risk of portfolios composed by successive adding of 100 stocks. Standard deviations are measured at seven different dates using Equation (8).

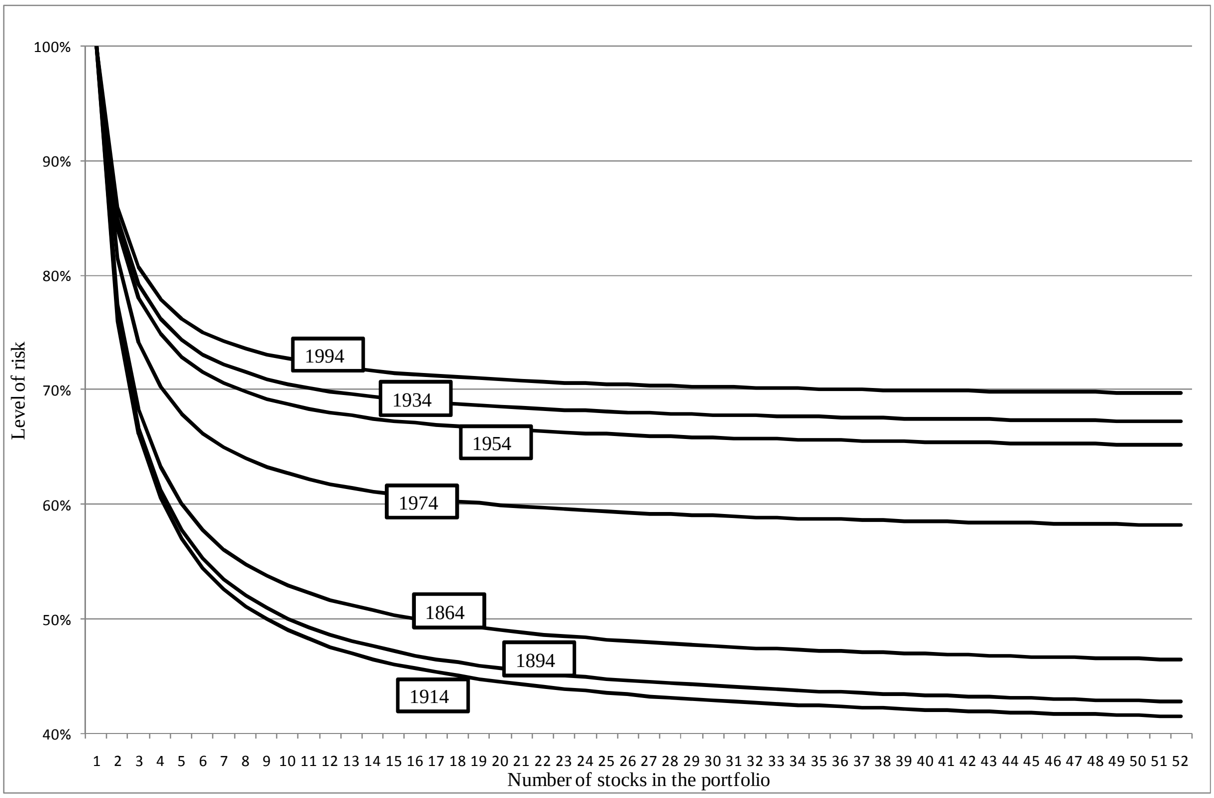

Figure 15, Theoretical decrease in risk (maximum = 100 %) with sequential adjunction of stocks in a French portfolio. This graph shows the risk of portfolios composed by successive adding of 100 stocks. Standard deviations are measured at seven different dates using Equation (8). The risk of the portfolio composed by only one stock is equal to 100 %.

Consistent with empirical measurements since the inter-war period, the decrease of risk resulting from portfolio diversification has diminished. Before the 20th century, *specific risk* represented a major part of the *total risk* and thus could be eliminated. Figure 16 displays this time variation: for each month the theoretical risk of portfolios being composed by one to *250 stocks* is estimated. As can be seen in Figure 16, it is totally impossible today to constitute a French portfolio with a level of risk similar to that was achieved with only few stocks before 1914. Despite a maximum, on this graph, of 250 stocks, the diversification effect is not enough to balance the historical increase in *total risk*. But it is also impossible to benefit from a similar risk decrease, in percentage, of the *total risk*. Both observations are the results of the historical rise of *market risk*. As indicated in Figure 15, compared to a base 100 % for the risk of holding only one stock, the risk can today be downturned by about 33 % thanks to more than 100 stocks. Before 1914, this same decrease was reached with only two or three stocks. This *"old super portfolio effect" is consistent with the large diffusion of few securities holdings among French savers at that time*.[160] Whereas, today, professional asset

[160] Unfortunately, there is a lack of data to confirm this idea.

management is needed to reach a pale diversification compared to what was observed before 1914.

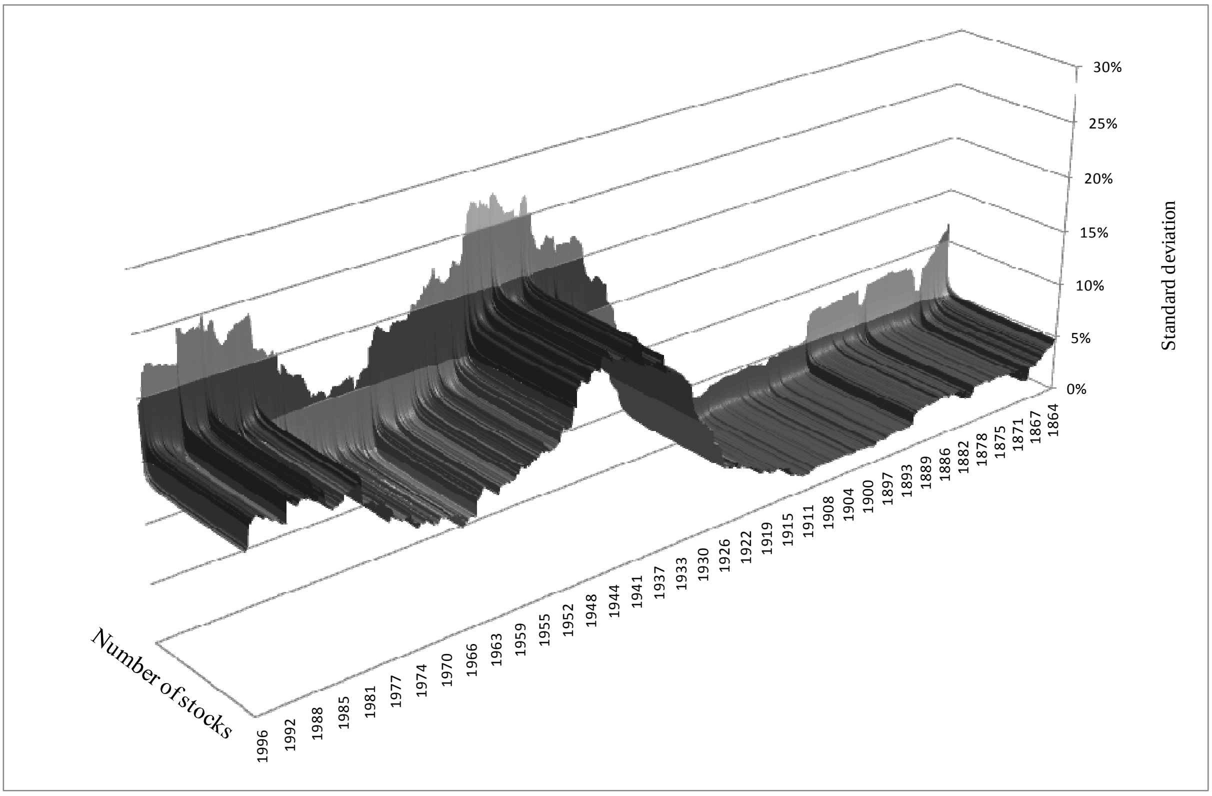

Figure 16, Theoretical decrease in risk with sequential adjunction of stocks within a French portfolio. January 1854-December 1997. This graph displays the risk of portfolios composed by the successive addition of 250 stocks. Standard deviations are measured each month between 1864 and 1996 using Equation (8).

VIII Explaining this historical rise of the market risk

The final aim of this study is to look for explanations of the long-term increase of the *market risk*. Several variables are investigated to explain the *market risk* (*MKR*) observed *each year over 12 monthly returns*.

Several factors[161] can be theoretically linked with changes in the *market risk*.

- The end of the period of monetary stability after 1914. Between 1802 and 1914, the value of the French franc in gold is stable. After 1914, monetary issues affect all firms; hence, it

[161] See data in Appendix A.

is a new common factor. However, the monetary situation is not only the only change in 1914.

- *1914* is a dummy with a 0 value before1914 and 1 after this date.
- *INFL* is the inflation rate measured each year.

- The historical rise of public spending measured in percentage of GDP. Public spending leads to a smoothness of firms revenues, since the most profitable revenues are taxed to a greater extent, moreover politicians can choose to give preferential treatment to some firms and with the rise of the amount of GDP collectivized, the revenues of the firms become increasingly common.
    - *STATE* is the amount of public spending on the GDP
- The amount of public deficit measured in percentage of GDP. A large deficit is financed through the financial market by issuing new debt which affect all firms.
    - *DEFICIT* is the annual public deficit on GDP.
- The change of the price of money (*i.e.* the rate of interest), on both short- and long-term since all firm’s profits depend on the interest rate they paid to finance their investments and all stock prices depend on the return offered by the alternative investment constituted by fixed-income assets.
    - *LTR* is the annual average long-term rate.
    - *ΔLTR* is the annual change of the long-term rate.
    - *σLTR* is the standard deviation of the long-term rate measured yearly over 12 calendar months.
    - *STR* is the annual average of the short-term rate.
    - *ΔSTR* is the annual change of the short-term rate. The standard deviation of the short-term rate cannot be used since monthly data for the whole period is unavailable.

Additional factors could potentially bias the measure of factors theoretically affecting the *market risk*. These are measured and added to the regression for the purpose of controlling potential bias.

- The number of zero returns. Some of monthly returns for individual stocks are zero due to two alternative explanations: no exchange, and no data available. These zero returns are more frequent at the beginning of the period (Le Bris and Hautcoeur, 2010 or chapter 1). These zero returns can bias the standard deviation measurement.

- *ZRET* is the number of zero returns observed each year among the monthly returns of the 40 stocks.

- The nature of firms listed. The listed firms change through time. Before 1920s, utilities (railways, gas, water, infrastructure...) dominate the market (Le Bris, 2009 or chapter 6). These firms experience a decline through the 20^{th} century due to inflation, war and nationalizations. These firms present special characteristics as long horizon, no cyclical business or political contracts. The number of utilities stocks is used as the control in this aspect.
  - *UTILIT* is the number of utilities firms measured each year among the forty stocks.
- The role of the stock market in the economy. As exposed by Rajan and Zingales (2003) the role of the stock market in the economy follows a “Great reversal”. The market capitalization of the HCAC 40 on GDP is about 30 % before WWI, and less than 2 % after WWII and again more than 30 % during the 1990s.
  - *MV/PIB* is the ratio market capitalization of the HCAC 40 to French GDP.
- The statistical nature of the distribution. Stocks returns do not follow a normal law since they present more extreme events as expected. The 20^{th} century probably provides more of these extreme events.
  - *KURT* is the kurtosis of monthly returns measured each year on the monthly returns of the HCAC 40.
- The dividend yield. The dividend yield changes over time (Shiller, 1981) and seems able to predict future stock returns since a mean reversion is sometimes observed (Campbell and Viceira, 2002). Returns and risk are closely linked. Thus the effect of the dividend yield can be controlled.
  - *DIV* is the log dividend yield observed at the beginning of the year.

$$\begin{aligned} MKR = {} & a_1 1914_i + a_2 INF_i + a_3 STATE_i + a_4 DEFICIT_i + a_5 LTR_i + a_6 \Delta LTR_i + a_7 \sigma LTR_i \\ & + a_8\, STR_i + a_9 \Delta STR_i + a_{10} ZRET_i + a_{11} UTILIT_i + \ a_{12} MV/PIB_i \\ & + a_{13} KURT_i + \ a_{14} DIV_i + \ \varepsilon_i \end{aligned}$$

In order to identify potential bias from collinearity and non-stationarity two tests are applied. For collinearity, first a regression (1) is run, with all variables explaining *market risk* (*MKR*). The R^2 of this regression is 0.60. We apply a “Klein test” to identify potential problems. If the square of one cross-correlation of independent variables is above the R^2 of the complete regression (0.60), a problem probably exists. Table 3 shows some problematic square correlation. Then, an Augmented Dickey Fuller test is realized to test for stationarity. Table 3 also shows several potential biases from non-stationary variables. However, as can be seen below, these variables associated with potential bias have not to been selected to form the best model.

Table 3, Cross-correlation, ADF and square of cross-correlation of dependant variables. Correlations coefficient across dependent variables are measured on each annual series. ADF tests are running on series to identify unit root (in bold). Square of cross-correlations are compared (“Klein test”) with the R^2 of the complete regression to identify problematic series (in bold). See sources in Appendix A.

	Cross correlation coefficient of variables													
	1914	*INFL*	*STATE*	*DEFICIT*	*LTR*	*ΔLTR*	*sLTR*	*STR*	*ΔSTR*	*ZRET*	*UTILIT*	*MV/PIB*	*KURT*	*DIV*
Independent variables														
1914	1													
INFL	0.41	1												
STATE	0.69	0.45	1											
DEFICIT	-0.36	-0.38	-0.85	1										
LTR	0.52	0.04	0.29	0.05	1									
ΔLTR	0.08	0.27	0.02	-0.04	-0.09	1								
sLTR	0.15	-0.15	-0.06	0.22	0.38	0.00	1							
STR	0.36	-0.02	0.21	0.02	0.92	-0.13	0.31	1						
ΔSTR	0.01	0.12	-0.01	0.04	-0.05	0.60	0.01	-0.18	1					
ZRET	-0.57	-0.18	-0.27	-0.05	-0.25	0.06	-0.11	-0.10	0.06	1				
UTILIT	-0.85	-0.23	-0.41	0.02	-0.64	-0.06	-0.29	-0.46	0.03	0.56	1			
MV/PIB	-0.73	-0.37	-0.36	0.11	-0.63	-0.21	-0.29	-0.47	-0.10	0.31	0.71	1		
KURT	-0.11	-0.07	-0.06	0.01	-0.11	-0.03	-0.03	-0.11	-0.08	0.03	0.12	0.18	1	
DIV	-0.38	-0.51	-0.30	0.14	0.20	-0.03	0.26	0.31	-0.02	0.45	0.29	0.04	-0.02	1
MKR	0.71	0.42	0.48	-0.18	0.40	0.08	0.13	0.23	0.02	-0.37	-0.62	-0.59	0.06	-0.31
	Augmented Dickey-Fuller test													
ADF		-3.20	-3.98	-3.98	-2.16	-4.35	-2.92	-2.18	-6.51	-2.71	-3.17	-2.17	-4.38	-3.64
p-value		0.09	0.01	0.01	**0.51**	0.01	0.19	**0.50**	0.01	**0.28**	0.10	**0.50**	0.01	0.03
	Square of cross-correlation coefficients of independent variables													
1914	1													
INFL	0.17	1												
STATE	0.48	0.20	1											
DEFICIT	0.13	0.14	**0.72**	1										
LTR	0.27	0.00	0.08	0.00	1									
ΔLTR	0.01	0.07	0.00	0.00	0.01	1								
sLTR	0.02	0.02	0.00	0.05	0.14	0.00	1							
STR	0.13	0.00	0.05	0.00	**0.84**	0.02	0.09	1						
ΔSTR	0.00	0.01	0.00	0.00	0.00	0.36	0.00	0.03	1					
ZRET	0.33	0.03	0.07	0.00	0.06	0.00	0.01	0.01	0.00	1				
UTILIT	**0.72**	0.05	0.17	0.00	0.41	0.00	0.08	0.21	0.00	0.32	1			
MV/PIB	0.54	0.14	0.13	0.01	0.39	0.04	0.08	0.22	0.01	0.10	0.51	1		
KURT	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.02	0.03	1	
DIV	0.14	0.26	0.09	0.02	0.04	0.00	0.07	0.09	0.00	0.20	0.08	0.00	0.00	1

To select the best model and avoid multicollinearity, a “forward stagewise regression” is applied. First a regression is made only with the most correlated variable which is the dummy for 1914 (*1914*). Next, a second variable is selected according to its correlation coefficient with the residual of the prior regression. This variable, *x,* is included only if the correlation with residuals is statistically different from zero according to a T-test respecting:

$$T = \frac{\rho_{\epsilon,x}}{\sqrt{\frac{1-\rho_{\epsilon,x}^{2}}{n-3}}} \tag{15}$$

with $\rho_{\epsilon,x}$ is the correlation coefficient between the residual of the first regression and the variable *x,* and *n,* the number of degrees of freedom. The threshold is 10 %. After each adjunction of one variable, a new regression and a new T-test with the more correlated variable (with *n* minus by one more degree of freedom) are run.

Following this “forward procedure”, the fat tails measurement of the distribution of price movements (*KURT*), the inflation rate (*INF*) and the ratio of public deficit on GDP (*DEFICIT*), are successively selected and added to the most correlated variable, the dummy (*1914*). These four variables remain without a fifth one, since the correlation coefficients between the residuals of this last regression and other variables are not significant according to the threshold of Equation (15).

As a result, the best model to explain the *market risk* is composed by the four afore mentioned variables. The adjusted R^2 of this best regression model (3) is 0.5483, close to the adjusted R^2 of the regression including all variables (0.5713). The four variables are free of potential bias as identified in table III and are statistically significant. One variable identified in the best model is a control variable (*KURT*). The remaining three variables of the best model (*1914, INFL, DEF*) are theoretically linked with the dependent variable; thus it is highly consistent that they are found in this best model. All signs are as expected. The final regression (3) is realized using the four variables of the best model combined with the variables of control. In this case, all explanative variables remain significant whereas all variables of control (except *KURT* already included in the best model) remain non-significant.

These regressions show that the best variables to explain the changes to *market risk* through time are: the changes realized after 1914 (mainly the end of the Gold Standard), the inflation rate, the ratio public deficit to GDP and a control variable for the presence of extreme events (thus leading to a fat tail distribution) as measured by the kurtosis.[162] All other variables identified as potential explanations or as containing potential bias effect can be rejected. This model provides a correct estimation of the *market risk*, as graphically indicated on the Figure 17. This graph also shows that an important part of the residuals between observations and predictions is concentrated between 1914 and 1950.

[162] The same method is used to explain the ratio *market risk* to *total risk* (available on request). Variables identified for the best model are inflation rate (*INF*), then the ratio public spending on GDP (*STATE*) and the ratio of public deficit on GDP (*DEFICIT*). The R^2 of this regression is 0.42. All control variables including the kurtosis are rejected.

Table 4, Regressions to explain the market risk. This table displays regression coefficients and robust p-values for OLS regressions. In regressions (1) all variables identified are used. In regression (2), the best model is built thanks to a sequential of adding the most correlated variable with the residuals of the prior regression. Regression (3) adds the variable of control to the best model identified. 1914 is a dummy equal to one after 1914. INFL is the inflation rate. STATE is the ratio public spending on GDP. DEFICIT is the ratio public deficit on GDP. LTR is the long-term rate. ΔLTR is the annual change of the long-term rate. σLTR is the annual standard deviation of the monthly long-term rate. STR is the short-term rate. ΔSTR is the annual change of the short-term rate. ZRET is the number of zero return. UTILIT is the number of firms from railways, utilities and infrastructure. MV/PIB is the ratio of the market capitalization to GDP. KURT is the average kurtosis observed each year over the 12 monthly returns of the index. DIV is the log of average dividend yields at the beginning of the year. See sources in Appendix A.

	Complete	Best Model	Best Model + control
	(1)	(2)	(3)
1914	0.0983	0.1213	0.1241
	(0.0021)***	(0.0000)***	(0.0000)***
INFL	0.1263	0.1436	0.1265
	(0.0412)**	(0.0035)***	(0.0395)**
STATE	0.6406		
	(0.0197)**		
DEFICIT	0.7631	0.2022	0.2225
	(0.0040)***	(0.0219)**	(0.0506)*
LTR	0.8577		
	(0.2443)		
ΔLTR	0.0002		
	(0.9974)		
σLTR	-1.0990		
	(0.8063)		
STR	-1.0990		
	(0.0509)*		
ΔSTR	-0.0298		
	(0.2986)		
ZRET	0.0003		0.0002
	(0.0534)*		(0.2197)
UTILIT	0.0013		0.0003
	(0.4916)		(0.8607)
MV/PIB	-0.1422		-0.0951
	(0.2443)		(0.3883)
KURT	0.0075	0.0074	0.0079
	(0.0087)***	(0.0097)***	(0.0065)***
DIV	0.0158		-0.0094
	(0.6905)		(0.7877)
Constant	-0.0123	0.0381	0.0256
	(0.87)	(0.0035)***	(0.6394)
Number of observations	143	143	143
R^2	0.6135	0.5610	0.5710
Adjusted R^2	0.5713	0.5483	0.5454

* 10%, **, 5%, *** 1%

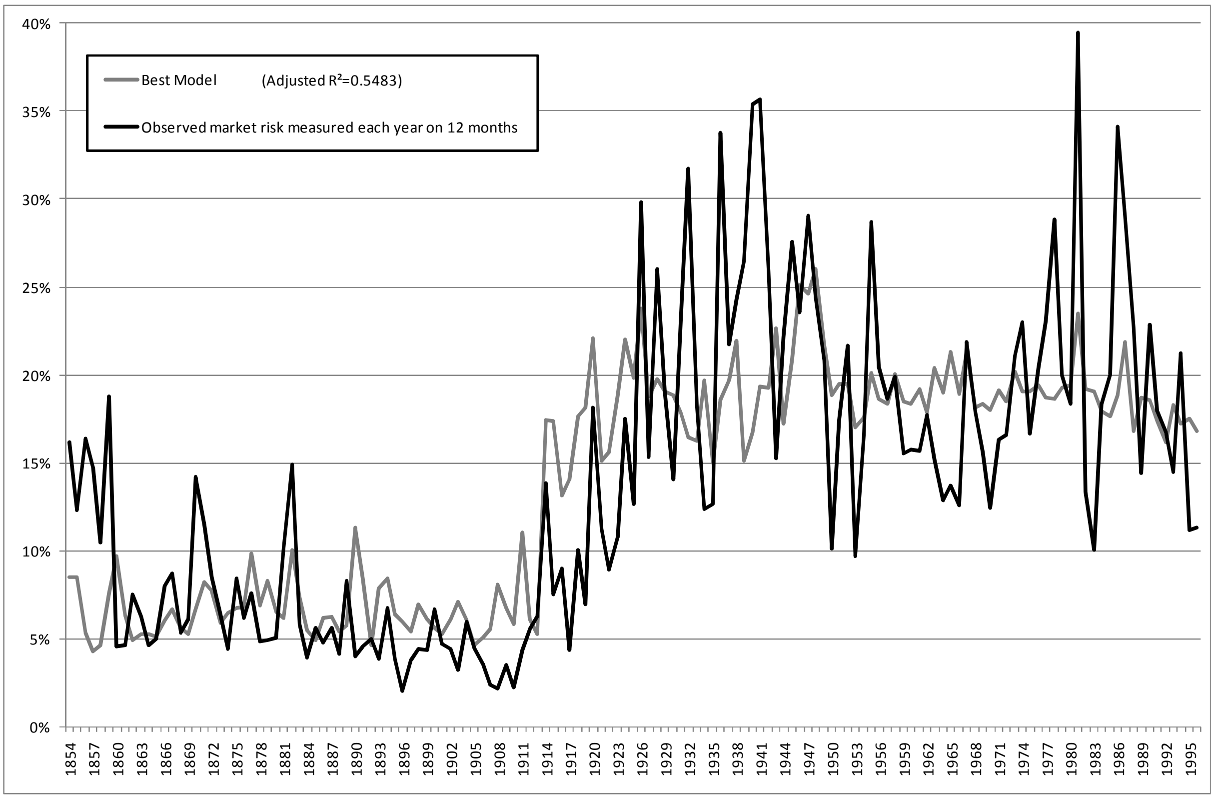

Figure 17, Market risk observed and predicted. January 1854-December 1996. This graph depicts observations of the market risk measured each year as the standard deviation of 12 monthly returns and the model combining: a dummy 1914, the kurtosis measured yearly on 12 monthly returns, the inflation rate and the ratio of the public deficit to GDP. These four variables were defined thanks to a stagewise regression.

IX Conclusion

Before 1914, French stocks present a very low level of volatility (*total risk*) compared to what is observed in current conditions. Moreover, an investor could achieve an important level of diversification through directly holding few securities since domestic stocks offer a very low correlation. A good diversification level did not require a large number of securities. This "old super portfolio effect" is highly consistent with the typical behavior of French savers at this time consisting in holding a portfolio constituted by few stocks.

Since the interwar period, *market risk* demonstrates a historical rise. Despite peace and economic prosperity of the end of the 20th century, it never converged again to levels observed before 1914. During, this long-term rise, *market risk* experiences several phases of increase and decrease quite correctly approximated by a linear function of the time. This French story points out that the US observation of a long-term stable *market risk* is a special one. During the 20th century, the Great Depression is the only shock to US *market risk*. Contrasting strongly with this record of stability, the French case shows that *market risk* is deeply affected by a number of event in history.

As a consequence, again contrasting with the US case, the *specific risk* behavior remains highly stable throughout time when compared with *market risk*. The rise of *market risk* with a combined stable *specific risk*, has one major consequence for investors: a small part of the *total risk* can be eliminated thanks to portfolio diversification since the *market risk* has become the main source of risk.

Today, to look for the same decrease in risk, a direct holding, in all probability, implies a high expense of transaction costs (a more important number of securities, information cost, broker and so on). The consequence of such a higher diversification price may induce a preference for indirect holding rather than direct one and therefore, may offer a partial explanation for the development of the mutual funds industry. But despite the existence of such new tools, it is impossible for a French investor to achieve a similar diversification level to what was achieved before 1914. From this point of view, the present diversification effect is pale compared to what it was.

This rise of *market risk*, seen historically, appears to be linked to factors such as the end of the Gold Standard, the inflation rate and the rise of the public deficits.

REFERENCES

Anderson N. and B. Francis (2000), “Fifty Years of UK Asset Price Volatility”, *Journal of Risk*, 2, p. 63-77.

Bali T. G., Cakici N. and H. Levy (2008), “A Model-Independent Measure of Aggregate Idiosyncratic Risk”, *Journal of Empirical Finance*, 15, p. 878-896.

Barber B.M. and T. Odean (2000), “Trading Is Hazardous To Your Wealth: the Common Stock Investment Performance of Individual Investors”, *Journal of Finance, 5*5, p. 773-806.

Bennett J. A. and R.W. Sias (2006), “Why Company-Specific Risk Changes over Time?”, *Financial Analyst Journal*, 62, p. 89-100.

Bekaert G., Robert J. Hodrick and X. Zhang, (2005). “International Stock Return Comovements”, *Working paper*, NBER, 11906.

Benartzi S. and R.H. Thaler (2001), “Naïve Diversification Strategies in Defined Contribution Saving Plan”, *American Economic Review*, 91, p. 79-98.

Brandt M.W., Brav A. and J.R. Graham (2005), “The Idiosyncratic Volatility Puzzle: Time Trend or Speculative Episodes?”, *Working paper*, Duke University.

Brockman P. and S. Yan (2008), “The Time-Series Behavior and Pricing of Idiosyncratic Volatility: Evidence from 1926 to 1962,” under revision at *Journal of Banking and Finance.*

Broihanne M-H., Merli M. and P. Roger (2008), "Solving Some Financial Puzzles with Prospect Theory and Mental Accounting: a Survey", *Revue d'économie politique,* 118, p. 475-512.

Calvet L., Campbell J. and P. Sodini (2007), "Down or Out: Assessing the Welfare Costs of Household Investment Mistakes." *Journal of Political Economy,* 115, p. 707-747.

Campbell J.Y, Lettau M., Malkiel B.G. and Y. Xu (2001), "Have Individual Stocks Become More Volatile? An Empirical Exploration Of Idiosyncratic Risk", *Journal of Finance,* 51, p. 1-43.

Campbell J.Y. and L.M. Viceira (2002), *Strategic Asset Allocation*, Oxford University Press, New-York.

Cutler D. M., Poterba J. M. and L.H. Summers, (1989) "What Moves Stock Prices", *Journal of Portfolio Management*, 15, p. 4-12.

INSEE (1951), *Annuaire rétrospectif de la France*, Paris, INSEE.

Falkenstein E.G. (1996), "Preferences for Stock Characteristic as Revealed by Mutual Fund Portfolio Holdings", *Journal of Finance,* 51, p. 111-135.

Finger C. (2000), "Why Is the RMCI so Low?", *Working Paper*, The RiskMetrics Group, 99-11.

Forbes K.F. and R. Rigobon (2002), "No Contagion, Only Interdependence: Measuring Stock Market Co-movements", *The Journal of Finance*, 57, p. 2223-2261.

Goetzmann W and A. Kumar (2008), "Equity Portfolio Diversification", *Review of Finance,* 12, p. 433-463.

Goetzmann W., Ibbotson R., and L. Peng, (2001), "A New Historical Database for the NYSE 1815 to 1871: Performance and Predictability", *The Journal of Financial Markets*, 4, p. 1-32.

Jorion P. (2002), "Fallacies about the Effects of Market Risk Management Systems", *Financial Stability Review*, 13, p. 115-127.

Kearney C. and V. Potì. (2008), "Have European Stocks become More Volatile? An Empirical Investigation of Idiosyncratic and Market Risk in the Euro Area", *European Financial Management,* 14, p. 419-444.

Lévy-Leboyer M. and F. Bourguignon (1985). *L'Économie Française au XIX^{ème} siècle, analyse macroéconomique*, Paris, Économica.

Le Bris D. (2009), « La France peut-elle se développer sans industrie ? Une réponse dans l'histoire boursière », *Impertinences*, La Documentation Française, p. 159-182.

Le Bris D. and P-C Hautcoeur, (2010), "Challenge to the Triumphant Optimists. A Blue Chips Index for the Paris Stock Exchange,1854-2006", *Financial History Review,* 17, p. 141-183.

Lintner J. (1965), "The Valuation of Risk Assets and Selection of Risky Investments in Stock Portfolios and Capital Budgets", *Review of Economics and Statistics,* 47, p. 13-37.

Malkiel B.G and Y. Xu (2002), "Idiosyncratic Risk and Security Returns", *Working Paper,,* AFA 2001 New Orleans Meetings.

Odean T. (1999), "Do Investors Trade Too Much?", *American Economic Review*, 89, p. 1279-1298.

Pogue G.A. and B. Solnik, (1974), "The Market Model Applied to European Common Stocks: Some Empirical Results", *Journal of Financial and Quantitative Analysis*, p. 917-944.

Rajan R. and L. Zingales (2003), "The Great Reversal: the Politics of Financial Development in the 20th Century", *Journal of Financial Economics*, 69, p. 5-50.

Sharpe W.F. (1964), "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk", *Journal of Finance*, 19, p. 425-442.

Shiller R. J., (1981), "Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends?," *American Economic Review*, 71, p. 421-36.

Schwert G. (1989), “Why does Stock Market Volatility Change over Time?”, *Journal of Finance,* 44, p. 1115-1153.

Schwert G. (1997), “Stock Market Volatility: Ten Years after the Crash”, *Working Paper* NBER, n. 6381.

Temin P. (1993), “The Transmission of the Great Depression”, *Journal of Economic Perspectives*, 7, p. 87-102.

Voth H-J. (2003), “Stock Price Volatility and Political Uncertainty: Evidence from the Interwar Period”, *Working Paper,* MIT, 02-09.

Wagner W. H. and S. C. Lau (1971), “The Effect of Diversification on Risk, *Financial Analyst Journal*, 27, p. 48-53.

Appendix A, Data

Long-term rate:
1854-1969: monthly data, Rente 3 % then Rente 5 % from author
1970-2008: monthly data, average state bonds from Caisse des Dépôts et Consignations
Short-term rate:
1854-1951: monthly data, Paris Open Market from NBER except 1914-1925 and 1940-1951: annual interpolated of discount rate of the Banque de France from INSEE,
1952-2008: monthly data,money market rate from the Banque de France
Inflation rate:
1854-1913: consumer price index from Lévy-Leboyer and Bourguignon (1985).
1914-2008: consumer price index from INSEE
GDP:
1854-1913: from Lévy-Leboyer and Bourguignon (1985).
1914-2008: from INSEE
State budget:
1854-1950: INSEE (1951)
1951-2008: from INSEE
Public Spending:
1854-1950: INSEE (1951)
1951-2008: from INSEE

CONCLUSION

Au terme de ces différentes études, il est possible de résumer les apports essentiels de cette thèse en suivant le fil de la performance obtenue par l'investisseur. Tout d'abord, une fois correctement mesurées, les actions rapportent moins que ce que l'on pensait. Pour un épargnant français, elles demeurent le placement le plus rentable mais sans « prime de risque excessive » (chapitre 1). Elles rapportent aussi nettement moins que les actions américaines. Différentes pistes ont été explorées pour expliquer la sous-performance des actions françaises par rapport au cas américain. Tout d'abord, cette sous-performance n'existe pas réellement avant 1914 comme l'indique l'égalité des ratios de Sharpe ou de la prime de risque entre actions françaises ou américaine (chapitre 2). D'ailleurs, à cette période, les actions américaines n'offrent pas non plus une « equity premium » mystérieuse. Leurs rentabilités sont en ligne avec leurs risques comme l'indique la cohérence des droites de risques pour différents actifs internationaux avant 1914 (chapitre 8).

En revanche, depuis 1914, la sous-performance française est manifeste. Les deux conflits mondiaux ont un impact certain (chapitre 3). Toutefois, il ne peut expliquer la persistance de faibles rentabilités entre la Libération et le début des années 1980 et d'un risque moins bien rémunéré depuis. La responsabilité du facteur politique est donc explorée (chapitre 4). Si les marchés sont sensibles à la politique, le critère gauche-droite n'est pas suffisant pour comprendre leur influence ; au contraire les actions sont plus rentables sous la gauche. Les krachs ont un impact décisif mais, une fois correctement mesurés, ils correspondent en grande partie aux événements politico-militaires déjà évoqués (chapitre 5). Malgré ces soubresauts, il est à noter que, sur la durée, la cote est dominée par des entreprises de services et très rarement par des firmes industrielles (chapitre 6).

Depuis les années 1980, le niveau de rentabilité des actions françaises semble converger avec celui des actions américaines. Mais cette convergence cache le maintien d'un risque français bien supérieur. Le risque de marché des actions françaises a considérablement augmenté dans l'entre-deux-guerres et malgré une baisse ultérieure, il n'a jamais retrouvé son niveau d'avant 1914. L'instabilité monétaire et les déficits publics semblent être liés à cette évolution du risque (chapitre 9). Ces facteurs ont probablement été plus déstabilisants en France qu'aux Etats-Unis y compris depuis 1945. Ils provoquent en France un risque supplémentaire qui ne semble pas rémunéré. C'est probablement parce que les autres actifs français y sont aussi exposés que ce risque de marché n'est pas rémunéré : c'est un « risque pays » et pas propre aux actions. Ce « risque pays » non rémunéré pourrait expliquer la persistance de la sous-performance française depuis la Libération (voir chapitre2).

Conséquence de cette hausse de risque commun, les actions françaises sont de plus en plus corrélées entre elles, réduisant le bénéfice de la diversification ; à l'inverse, avant 1914, un « super effet de diversification » est identifié (chapitre 9). L'investisseur peut aussi chercher à se diversifier internationalement. L'investissement en emprunts russes avant 1914 apparaît de ce point de vue comme un choix parfaitement rationnel (chapitre 7). Une nouvelle méthode de décomposition du bénéfice de diversification montre que les investisseurs cherchaient à l'étranger une faible corrélation avec les actifs domestiques plutôt qu'une rentabilité plus élevée. A cet égard, l'effet de diversification internationale est lui aussi sur une pente descendante. En effet, la corrélation internationale augmente, suivant probablement la hausse de la corrélation des économies réelles (chapitre 8).

Certains regretteront de ne pas avoir trouvé dans ces études, des thèmes qui leur paraissent fondamentaux. Sans être exhaustif, les phénomènes de « bulles », les tests d'efficience informationnelle, des analyses de la variance ou du type de distribution font partie de ces sujets délaissés. Plusieurs sont d'ailleurs déjà en cours d'investigation… Cette thèse espère au moins avoir apporté une lumière nouvelle sur ce que l'on sait d'un marché d'actions. Peut être même suscité l'envie de chercher dans la longue durée, sur le marché français comme sur d'autres, de nouveaux terrains d'investigation. Et, dans le meilleur des cas, contribué à réconcilier quelques Français avec cette réalité si difficile à appréhender mais tellement humaine que constituent les marchés financiers.

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David LE BRIS

Les actions françaises depuis 1854: analyses et découvertes

Le Bris a collecté environ 200 000 données sur les actions françaises entre 1854 et 1988 pour construire un indice de performances.
Différents biais qui surestimaient la rentabilité dans les indices français existants sont identifiés. D'autres probables cas à l'étranger sont présentés.
Sur le long terme, les actions offrent une meilleure rentabilité que les autres actifs mais sans prime particulière.
Par rapport aux actions américaines, les françaises sous-performent y compris durant les périodes de paix.
Le marché est très sensible aux changements de gouvernements et surperforme sous ceux de gauche.
Une nouvelle méthode de détection des krachs est proposée. Elle identifie des krachs cohérents avec l'histoire.
Les entreprises de services dominent la capitalisation boursière de manière quasi-continue depuis 1854.
La rationalité des investissements en emprunts russes avant 1914 est démontrée grâce à une optimisation de portefeuille parmi les actifs français (action, obligation, rente) et huit emprunts d'Etats étrangers.
Une nouvelle méthode de décomposition du bénéfice de diversification est proposée ; les investisseurs français étaient attirés par la faible corrélation plus que par les rentabilités étrangères supérieures avant 1914.
Les actions françaises et américaines présentent une hausse de corrélation sur le long terme probablement suivant l'intégration des économies. Ainsi, l'incitation à diversifier internationalement a baissé.
Le risque de marché enregistre une forte hausse durant l'entre-deux-guerres et le niveau pré-1914 n'est jamais retrouvé. Il semble lié à la fin du Gold Standard, à l'inflation et aux déficits publics.
Conséquence de la hausse de ce risque commun, la corrélation entre actions françaises augmente, réduisant l'effet de diversification domestique ; a l'opposé un « super effet portefeuille » est identifiée avant 1914.

Mots clés : rentabilité des actions, prime de risque, guerres, long terme, krachs, risque, diversification.

The French stocks since 1854: analysis and findings

Le Bris, collecting about 200,000 data on French stocks from 1854 to 1988, builds a performance index.
Several biases leading to overestimate the returns in prior French indices are demonstrated, as well as other probable examples across the globe.
Over the long run, French stocks provide a better return than other assets, but without any excessive premium.
Compared to US stocks, French stocks have underperformed since 1914, including during the periods of peace.
The French stock market is highly sensitive to governmental changes, and overperforms under the left ones.
A new method to identify market crashes is proposed. This method identifies crashes that are consistent with history.
Firms from service industries have almost always dominated market capitalization since 1854.
The rationality of the French investments in Russian bonds, before 1914, is demonstrated thanks to a portfolio optimization among French assets (stock, bonds and corporate bonds) and eight international state bonds.
A new method to decompose the benefit of diversification is proposed; before 1914, French investors were clearly attracted by low foreign correlation rather than higher foreign returns.
French and US stocks present a long-term rise in correlation, probably following the economic integration. Thus, the incentive to diversify through international markets has decreased.
The market risk exhibits a significant rise during the interwar-period, and the pre-1914 level is never reached again. This risk appears to be linked to the end of the Gold Standard, the inflation rate and the public deficits.
The consequence of the rise of this common risk is that the correlation among French stocks trend upwards, and then, reduce the domestic portfolio effect; reversely, before 1914, a "super portfolio effect" is identified.

Keywords : stock return, equity premium, long term, crashes, market risk, portfolio diversification.

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