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Contagion et intégration financière pendant l'entre-deux guerres

L'exemple de la Bourse de Paris

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*The Great Depression is to economics
what the Big Bang is to physics.*

Robert A. Margo

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Contagion et intégration financière pendant l'entre-deux guerres: l'exemple de la Bourse de Paris

Résumé

Cette thèse a pour objet de revisiter, à la lumière de données financières historiques inédites, certains résultats de la littérature en histoire économique concernant la propagation de la Grande Dépression vers l'Europe, et plus particulièrement vers la France. Nous cherchons notamment à étudier les différents canaux de transmission à l'échelle internationale -boursiers, bancaires et monétaires- de cette crise et évaluons le rôle respectif qu'ils ont pu exercer dans la propagation de cette crise aux marchés financiers français. Les différentes contributions, que nous proposons dans cette thèse, sont avant tout empiriques et s'appuient sur un travail important effectué en amont de collecte et de traitement de données financières originales, provenant principalement des archives de la Bourse de Paris.

Plusieurs résultats importants émergent de notre travail. Notre analyse sur les marchés boursiers montre, tout d'abord, que le krach boursier américain de 1929 a eu un faible impact sur la bourse de Paris. De même, le système bancaire français a, dans son ensemble, plutôt bien résisté à la crise bancaire du début des années 1930, en raison notamment de la forte spécialisation qui le caractérisait à cette époque. Enfin, nous montrons que le niveau d'intégration financière entre les Etats-Unis, la France et la Belgique, à travers l'étude des relations bilatérales entre les marchés actions de ces trois pays, a eu tendance à se renforcer avec l'adoption par ces pays du système de l'étalon "de change" or. Cette forte intégration financière, couplée aux contraintes en matière de politique économique liées à ce système monétaire, pourraient ainsi expliquer comment la Grande Dépression s'est propagée en Europe et pourquoi la crise économique s'est prolongée dans des pays comme la France ou la Belgique, comparativement à d'autres grandes économies.

Contagion and financial integration during the interwar: the example of the Paris stock exchange

Abstract

The aim of this thesis is to shed new light on how the Great Depression spread to Europe, and more particularly to France by relying on new historical financial data compiled from original source documents. In particular, we analyze the different transmission channels - stock markets, banking sector and international monetary system - of this crisis, in order to assess the respective role they have played in the impact of this crisis on French financial markets. We contribute empirically to this larger literature by providing evidence based on original historical data hand-collected from the archives of the Paris Stock Exchange.

Several important results emerge from our work. Our analysis based on the stock markets shows, first, that the American stock market crash of 1929 had a low impact on the Paris stock exchange. Similarly, the French banking system, as a whole, remained quite resilient to the banking crisis of the beginning of the 1930s, mainly due to its strong specialization at that time. Finally, we show that the level of financial integration between the United States, France and Belgium - proxied by bilateral relationships between their equity markets - has tended to increase with the adoption by these countries of the Gold Exchange Standard. This high financial integration, coupled with economic policies constrained by the exchange rate regime, could explain how the Great Depression spread to Europe and why the economic crisis lasted longer in countries such as France or Belgium, compared to other major economies.

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Introduction Générale

Eléments de contexte

À la suite de la crise financière internationale dite "*des subprimes*" de 2007-2008, la Grande Dépression des années 1930, et plus généralement la période de l'entre-deux guerres, ont fait l'objet d'un regain d'intérêt dans la littérature économique de ces dernières années. En effet, le caractère global de la crise des *subprimes* et sa mutation en crise économique mondiale nous rappellent, à bien des égards, la forte instabilité qui a caractérisé la période de l'entre deux guerres. Les déséquilibres provoqués par la crise des subprimes restent d'ailleurs aujourd'hui toujours palpables, donnant d'autant plus d'acuité à l'intérêt de coupler une analyse économique et financière à une analyse historique.

Certains faits plaident, en effet, en faveur d'établir un parallèle entre la période de l'entre-deux guerres et celle d'aujourd'hui.

Concernant les Bourses, tout d'abord, alors que les indices américains ont rapidement retrouvé leurs niveaux d'avant crise avant de dépasser leurs records historiques, les indices européens restent distancés. À cet égard, l'indice CAC 40 — qui regroupe les 40 plus importantes capitalisations boursières de la Place parisienne — n'est toujours pas revenu à son niveau de 2007¹. Le régulateur relève toutefois, dans le Rapport annuel 2015 de l'Autorité des Marchés Financiers, la grande réactivité des marchés en ce début d'année 2016². La crise de 1929 a également eu un impact à long terme sur les prix des actifs français. En effet, après une hausse continue du prix des actions pendant les années 1920, la Grande Dépression brisa la dynamique haussière et le niveau atteint en 1929 ne fût dépassé qu'après la seconde guerre mondiale.

¹Cf. Graphique 1.

²Cf. Graphique 1.

Sur le plan bancaire, les grandes banques, notamment européennes, suscitent régulièrement la crainte des investisseurs. En effet, leurs cours ont significativement chuté durant l'année 2016, confirmant les appréhensions du monde financier quant à leur capacité à croître dans un environnement de défiance généralisée. À titre d'exemple, citons en 2016 les difficultés de la banque italienne *Monte Paschi*, qui a sollicité l'aide conjointe de la Banque Centrale Européenne et de l'Etat Italien afin d'être recapitalisée, ou encore la *Deutsche Bank*, dont la crainte des investisseurs est largement justifiée par la taille de son bilan. Selon un certain nombre d'observateurs, ces deux banques feraient porter un risque systémique sur la zone euro en cas d'aggravation de leurs difficultés. Notons également que malgré des taux d'intérêt historiquement bas (voire négatifs dans certains cas), les banques, en particulier en Europe, ne financent plus que très peu l'investissement productif dans la période post-crise. En outre, l'encadrement accru imposé par le régulateur (européen et national) a engendré pour les banques des coûts de conformité, qui se répercutent sous forme de baisse du financement de l'investissement.³ Sur le plan historique, la littérature identifie souvent la crise bancaire d'Europe centrale, qui démarra en Autriche avant de se propager à l'Allemagne, comme facteur aggravant des difficultés financières en Europe dans les années 1930. Cette crise serait à l'origine de la sortie du Royaume-Uni de l'étalon or, marquant ainsi le début de la désintégration du système financier international.

Du point de vue monétaire enfin, la situation mondiale s'est également complexifiée. Les grandes banques centrales ont toutes assoupli leur politique monétaire afin de faire face à l'assèchement du crédit. Cependant, malgré l'assouplissement de la politique monétaire et l'abaissement des taux d'intérêt à des niveaux faibles, et ce sur une période historiquement longue, les banques ne consentent que très peu à prêter. Dans ce contexte, le concept de "*stagnation séculaire*" développé par l'économiste keynésien Alvin Hansen en 1938 a ressurgi depuis le début des années 2010, qualifiant ainsi la faible croissance économique de la période actuelle.

Autre point de comparaison, la politique d'assouplissement quantitatif, terme attribué aux outils non-conventionnels utilisés par les banques centrales pour mener leurs politiques monétaires expansionnistes, nous renvoie à la "guerre des monnaies", qui a caractérisé le début du 20ème siècle. Il s'agit pour chaque banque centrale, d'émettre une importante quantité de monnaie afin de déprécier sa monnaie par rapport aux autres et ainsi gagner

³Voir pour BNP, Crédit Suisse, Deutsche Bank et Barclays. (Financial Times, 24 Janvier 2016 et 5 Février 2016).

en compétitivité-prix⁴. La plupart des grandes économies mondiales ont pratiqué cette stratégie de dévaluation compétitive dans l'entre-deux guerres, soit en stabilisant leur monnaie à un niveau avantageux — comme la France en 1928—, soit en quittant le système de l'étalon-or comme l'ont fait successivement le Royaume-Uni (1931) et les États-Unis (1933). Cette situation déstabilisante pour le système monétaire et financier international devient alors particulièrement pertinente lorsqu'il s'agit d'analyser la situation actuelle, qui pourrait être aggravée par l'éventualité d'une sortie de la Grèce et/ou de l'Italie de la zone euro. On pourrait ajouter ici une autre similarité : l'indépendance des banques centrales par rapport au pouvoir politique dans la conduite de la politique monétaire, que Blancheton (2015) explique par la prise en compte par les banques centrales du niveau de dette publique pour mener leur politique monétaire. Or, dans les années 1920 comme dans la situation actuelle, les pays sont fortement endettés: à l'époque à cause de la Grande Guerre, aujourd'hui suite aux interventions des États pour soutenir la demande intérieure pendant la récession. Lorsque les banques centrales s'intéressent au niveau de dette publique, elle abandonnent *de facto* une partie de leur indépendance. La différence principale soulignée par Blancheton (2015) entre les deux périodes est que dorénavant, les banques centrales anticipent les besoins des gouvernements et participent de plus en plus directement dans la monétisation de la dette.

La période de l'entre-deux guerres représente donc un intérêt certain pour les économistes. Elle soulève en effet des questions diverses, à partir desquelles il est possible d'établir des parallèles avec des problématiques plus récentes. Du point de vue de la recherche en finance d'abord, la Grande Dépression représente un cas de crise économique-financière d'ampleur internationale. Au cours du 19^{ème} siècle, les crises financières ne dépassaient pas l'échelle nationale, comme le montre la mise en péril de la place de Paris après la faillite de l'*Union Générale* en France en 1882⁵. Citons également l'exemple de la *Barings* à Londres en 1890, où l'intervention de la Banque d'Angleterre avait permis de contenir le risque de contagion.

Du point de vue macroéconomique ensuite, la période de l'entre-deux guerres se caractérise également par des faits saillants qui ne sont pas éloignés de ceux que l'on peut observer aujourd'hui. Il s'agit, en effet, de la première crise qui a plongé les économies dans des situations de sous-emploi, ce qui permettra d'ailleurs l'émergence du keynésianisme. Au sein de cette période, il est possible de distinguer deux régimes, d'une durée relativement similaire,

⁴Le problème devient évident : les monnaies ne peuvent pas toutes se déprécier les unes par rapport aux autres.

⁵Voir White (2007).

la croissance des années 1920 puis la dépression des années 1930, durant lesquels certaines variables macroéconomiques clefs — production industrielle, inflation, emploi, monnaie — ont évolué de manière très différente, comme le montre l'exemple français (Tableau 1). Enfin, cette période est également marquée par plusieurs changements de régimes de change dans de nombreux pays, ainsi que la formation et la dislocation d'unions monétaires telles que le bloc-or ou le bloc-sterling.

Table 1: Evolution de certaines variables macroéconomiques françaises durant l'entre-deux guerres

	PIB ^(a) (base 100 1913)	Indice des prix ^(b) (base 100 1913)	Chômage ^(c)	CAC 40 historique ^(d) (base 100 1913)
1920	81	392,5	293,9	90,93
1921	80,5	336,5	484,4	81,44
1922	93,6	312,5	281,8	73,93
1923	98,3	360,5	259,9	87,52
1924	109,1	400,2	249,3	106,60
1925	110	443,5	268,2	106,13
1926	111,2	567	248,8	117,21
1927	109,8	575	437,6	140,12
1928	116,2	575	273,5	169,42
1929	126	601	242,5	244,93
1930	97	599	260,3	238,33
1931	92,9	577	486,6	168,14
1932	88,6	537	745,7	108,19
1933	92,6	510	739,8	128,15
1934	92,1	491	823,3	124,61
1935	88,8	454	922,3	110,35
1936	89,6	477	934,7	106,35
1937	93,2	606	820,3	121,04
1938	93	678	854,9	110,68

Notes. ^(a), ^(b), Sauvy (1984). ^(c), nombre de demandes d'emploi non satisfaites (en milliers), source : Villa (1997). ^(d), Indice de prix des 40 plus grandes capitalisations boursières sur la place de Paris, source : Hautcoeur et Lebris (2010).

Problématique de la thèse et choix méthodologiques

L'objet de cette thèse est de revisiter les résultats de la littérature sur la crise de 1929, en nous appuyant sur des données de haute qualité et sous l'angle des marchés financiers. Les facteurs financiers ont certes joué un rôle prépondérant dans la propagation de la Grande Dépression ; cependant, ces différents facteurs ont fait l'objet de nombreux débats dans la littérature. Comme le montrait déjà le travail de Calomiris (1993), les chocs financiers tels que les krachs boursiers, les faillites bancaires ou la contraction de la masse monétaire entraînent fréquemment une dépression; mais, la contribution de ces différents facteurs financiers est souvent difficile à évaluer. Dans cette thèse, nous nous intéressons également au rôle des chocs financiers, mais nous cherchons à évaluer leurs contributions respectives au processus de propagation de la Grande Dépression en France. Plus particulièrement, nous cherchons à identifier les canaux de contagion potentiels de la crise de 1929. S'est-elle transmise via les marchés boursiers, les marchés des changes, et/ou par les banques ? Quel rôle a joué le système monétaire international ?

Nous répondons à ces questions en nous appuyant sur des données de marchés afin de rendre compte de l'évolution de la perception des investisseurs sur la situation financière de la France au cours de l'entre-deux guerres. Nous confrontons alors nos résultats avec ceux de la littérature existante dans le domaine, l'objectif étant de contribuer aux analyses effectuées sur cette période particulièrement complexe.

Dans cette thèse, nous nous intéressons plus particulièrement à la bourse de Paris. Le choix de limiter l'espace géographique à la bourse de Paris s'explique d'abord par son importance qui en faisait, à l'époque, la principale place financière de l'Europe continentale avec Amsterdam. La bourse de Paris s'est développée tout au long du 19^{ème} siècle, passant d'un nombre limité de titres cotés au début du siècle, à près de deux mille au début du 20^{ème} siècle, et plus de trois mille au cours des années 1930. En outre, la bourse de Paris fonctionnait différemment de ses homologues londonienne ou new-yorkaise. En France, l'État a accordé le monopole des transactions effectuées à un groupe d'agents de change qui, en contrepartie, avaient l'obligation de transparence vis-à-vis des investisseurs. Dans ce contexte, l'historien de la finance a accès à d'importantes sources de qualité provenant d'archives : tous les cours, ainsi qu'un nombre important de données liées aux titres, sont reportés quotidiennement sur un bulletin de cote officiel. Concernant les émetteurs, de nombreuses informations sont également diffusées via la publication d'annuaires officiels. Du point de vue historique également, Paris tient un rôle important en tant que centre

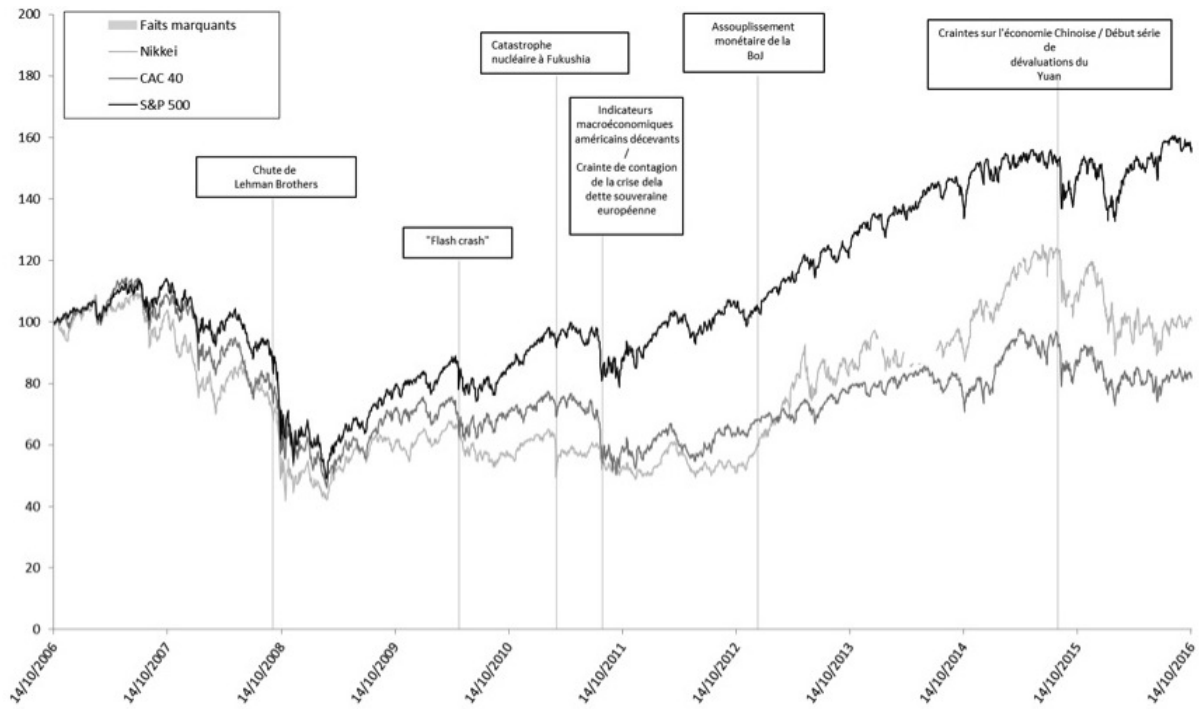
financier international. A partir de 1927, lorsque le Franc se stabilise *de facto* par rapport à la Livre sterling, de grandes quantités d'or affluent vers la France, confortant la position de la Banque de France dans ses négociations avec les autres banques centrales. Enfin, alors que le système monétaire international commence à vaciller au début des années 1930, la France devient le *leader* du bloc-or, dernier groupe de pays à garder une parité fixe entre leur monnaie et l'or, et ce malgré la sortie du Royaume-Uni et des Etats-Unis de ce système.

Le cadre méthodologique de cette thèse se situe au croisement de l'économie appliquée et l'histoire économique, c'est-à-dire dans le champ de la cliométrie. Pour nous aider à interpréter les faits historiques et leur dynamique, nous avons principalement recours à l'économétrie des séries temporelles. Nous nous attachons, dans chaque chapitre, à utiliser les meilleures données disponibles, ou à les collecter nous-mêmes à partir de sources primaires, si nécessaire. Nous utilisons essentiellement les prix des actions cotées sur le marché officiel, qui présentent une meilleure qualité. Bien qu'il soit possible de discuter de la pertinence des indices boursiers en tant qu'indicateurs macroéconomiques ou bien en tant qu'outils de prévision, l'analyse *ex-post* des variations boursières donne une idée assez précise de la psychologie des investisseurs à un instant donné. La question ici n'est donc pas de savoir si les prix des actifs sont bien connectés aux "fondamentaux", qu'ils soient microéconomiques — données de bilans des entreprises —, ou macroéconomiques — niveau de la masse monétaire, taux d'intérêt, niveaux de production, dette, etc. Il s'agit plutôt d'utiliser des mesures basées sur des prix de marché, afin de mieux comprendre la dynamique des anticipations des investisseurs. En effet, lorsque les cours de bourse baissent, ou que la volatilité des prix augmente simultanément sur deux marchés distincts, il est possible d'en déduire qu'une crise de confiance s'est propagée d'un marché à l'autre.

Les différentes problématiques que nous développons dans cette thèse sont analysées sous l'angle des trois facteurs principaux de propagation des crises financières.

Le premier est celui de la bourse. Lors de la crise financière récente et en particulier suite à la faillite de *Lehman Brothers*, le sentiment de défiance généralisée des investisseurs était perceptible à la simple vue de la chute des cours de Bourse sur toutes les grandes places internationales. Sur le graphique ci-dessous, on peut observer aisément que, lors de la période récente, les événements financiers ont impacté simultanément les différentes bourses dans le monde.

Or, la confiance des investisseurs représente un réel enjeu pour les autorités économico-financières d'une économie. Elle se répercute d'abord sur la liquidité : si la majorité des

Figure 1: Comparaison des indices boursiers pour Paris, New-York et Tokyo

Source. *boursorama.fr*.

détenteurs de titres perdent confiance dans les entreprises ou les Etats, les ordres de vente inondent les marchés et le manque d'acheteurs fait mécaniquement baisser les prix. Kindleberger (1973) insiste sur cet argument afin d'expliquer les problèmes de trésorerie que peut entraîner la panique boursière sur l'activité des entreprises. En effet, même si la trésorerie est partiellement investie sur les marchés, de lourdes pertes peuvent provoquer des liquidations de stock et une baisse de la production. D'autre part, dans le cas d'une économie fortement endettée, cela peut engendrer des cycles vicieux tels que le phénomène de dette-déflation, rendu célèbre par Fisher (1933) dans son article expliquant la persistance de la crise aux Etats-Unis au début des années 1930. Romer (1990) analyse, quant à elle, l'impact du krach de 1929 sur la consommation de biens durables. La chute des cours provoquant une situation d'incertitude, les consommateurs diffèrent dans le temps leurs achats, car ils anticipent une baisse continue des prix, spéculant ainsi sur une éventuelle plus-value future. La chute des cours peut également avoir des conséquences néfastes pour les entreprises financières. La valorisation de leurs portefeuilles peut en être impactée car la valeur des actifs utilisés comme collatéraux peut provoquer des freins au renouvellement de prêts arrivant à échéance, pouvant déclencher alors des problèmes de solvabilité. À ce titre, il nous apparaît donc essentiel d'étudier la contagion par le marché et de ce fait, de s'intéresser à l'impact du krach de Wall Street de 1929 sur la bourse de Paris.

Le second facteur de contagion des crises financières est le poids du secteur bancaire dans ce processus. En effet, on distingue traditionnellement deux systèmes de financement de l'économie productive : (i) la désintermédiation, système au sein duquel les entreprises se financent directement sur les marchés ; (ii) l'intermédiation, avec laquelle les entreprises ont recours à des crédits bancaires. Néanmoins, lorsqu'une crise financière éclate et se transmet à l'économie réelle, les difficultés des banques sont souvent au cœur de la problématique du redémarrage de l'activité. Lors des crises financières qui ont impacté les économies émergentes dans les années 1990, leur contagion aux systèmes bancaires a mis en évidence un phénomène de "crises jumelles", comme l'ont conceptualisé les travaux de Kaminsky et Reinhart (1999). Les résultats montrent que lorsqu'une crise de la balance des paiements se produit dans une économie récemment libéralisée, des écueils dans le fonctionnement du système bancaire en découlent. Dans les années 1990, la simultanéité des crises a aggravé la situation des pays frappés par ces crises.

Les banques ont également joué un rôle prépondérant dans la propagation, puis l'intensification de la crise financière récente. Victimes d'une crise de confiance à l'été 2007, les banquiers ont douté de la solvabilité des autres établissements, réduisant alors les échanges sur le marché interbancaire. Cette situation a nécessité une intervention concertée des plus importantes banques centrales afin de restaurer le canal des liquidités, dont le succès a été finalement court et relatif. Les banques ainsi que les autres institutions financières — des fonds de pension aux *hedgefunds* —, ont accumulé des créances titrisées dans leurs bilans et "hors bilans" (*shadow banking*), ce qui a rendu l'évaluation du risque individuel et global plus complexe.

Parallèlement, le caractère universel de certaines banques, dites "systémiques " rendait d'autant plus difficile la gestion de la crise et nombre d'entre elles ont dû faire appel à l'aide des autorités monétaires afin d'être recapitalisées (Plane et Pujals, 2009). Toutefois, la décision des autorités de ne pas intervenir lors de la faillite de *Lehman Brothers* a été perçue comme un signal fort, mettant fin à la croyance du *Too Big to fail*. En réaction, s'est installé un climat généralisé de défiance, asséchant d'autant plus le canal du crédit bancaire.

Huit ans après le début de la crise financière de 2008, les banques restent au centre du débat sur la stagnation économique, notamment en Europe. Dans un contexte de taux d'intérêt

historiquement faibles, les banques n'assurent que trop peu le financement de l'économie réelle. En France, où le système financier est particulièrement tourné vers l'intermédiation, les banques ont une plus forte propension à acheter des titres de dettes publiques des États européens (comme placements refuges, jugés plus sûrs)⁶, que de financer de nouveaux projets d'investissement. Ainsi le débat sur la stagnation séculaire illustre-il ce point avec plus d'acuité (Aglietta et Valla, 2016).

Dans les années 1930, l'instabilité bancaire a également joué un rôle important dans la Grande Dépression, notamment aux États-Unis. Selon l'un des ouvrages de référence de la théorie monétariste (Friedman et Schwartz, 1963), la crise de 1929 ne se transforme en Grande Dépression qu'à la suite des crises bancaires américaines entre novembre 1930 et avril 1933. L'origine de la Grande Dépression serait liée à la panique des déposants américains qui a forcé les banques à augmenter leurs réserves pour faire face à l'effondrement de leurs dépôts. Il en a résulté une forte diminution des crédits bancaires, causant la chute de l'investissement et de la consommation qui, à leur tour, ont provoqué des faillites bancaires à répétition. Des explications alternatives ont été proposées, remettant notamment en cause l'exogénéité des crises bancaires par rapport à l'activité économique : les crises bancaires ne sont pas la conséquence seulement d'une crise de confiance, mais surtout de la baisse de l'activité réelle dans les zones où les banques font faillite (Calomiris et Mason, 2003). Une autre raison nous permet d'établir un parallèle avec la crise récente, à savoir que la faillite des banques repose en partie sur des erreurs d'investissement. Une étude récente (Postel-Vinay, 2016), portant sur les faillites bancaires à Chicago pendant la Grande Dépression, mobilise des micro-données issues de bilans bancaires afin de démontrer le lien entre l'investissement de ces institutions dans les prêts hypothécaires pendant les années 1920 et les difficultés de liquidité qu'elles ont rencontrées dans les années 1930. La question de la régulation bancaire, bien que peu développée aux États-Unis et encore moins en France, se posait donc, dès l'entre-deux guerres (cf. Chapitre 3).

Selon la littérature, l'accélérateur des difficultés en Europe durant les années 1930 aurait été la faillite du *Credit Anstalt*, banque autrichienne subissant d'importantes pertes, et qui avait alors nécessité l'intervention des autorités publiques. Malgré le concours de la banque centrale et la tentative d'un prêt international, d'importantes sorties de capitaux ont été

⁶Elles utilisent ces titres comme collatéral auprès de la BCE pour accéder à la liquidité (voir TARGET 2).

enregistrées et un contrôle des changes avait été mis en place. La Hongrie⁷ et l'Allemagne⁸ avaient subi la même situation, alors que la Grande Bretagne était également touchée par des sorties de capitaux pendant l'été 1931, ce qui avait provoqué la suspension de la convertibilité de la Livre sterling en septembre de la même année. Accominotti (2012), en proposant une analyse des bilans des banques anglaises au tournant de la crise de la Livre sterling, montre que le canal financier a joué un rôle fondamental dans la transmission des difficultés allemandes au système bancaire britannique.

Cela nous mène au troisième facteur de transmission d'une crise financière : le canal monétaire. Par "canal monétaire", nous entendons ici le canal transitant par le système monétaire international, qui évolue fortement durant l'entre-deux guerres, et ses conséquences sur les taux de change et les niveaux de prix. Dans ce contexte, la crise des années 1930 peut aussi s'expliquer par des déséquilibres issus des conséquences monétaires de la première guerre mondiale. Afin de financer l'effort de guerre, les nations belligérantes sortent de l'étalon-or et de ses contraintes sur la masse monétaire pour émettre de la monnaie. L'inflation causée par ces émissions modifie les parités-or des différentes devises : ainsi, la Livre sterling se déprécie fortement et les réserves de la Banque d'Angleterre étant limitées, elle devient alors la proie des spéculateurs. Dans le but de restaurer la parité-or d'avant-guerre, les autorités britanniques avaient mené des politiques économiques restrictives et étaient parvenues à stabiliser la Livre à sa parité d'avant-guerre en 1925. La France quant à elle, n'avait réussi à stabiliser sa monnaie *de jure* qu'en 1928, mais à la faveur d'une parité-or sous-évaluée de quatre cinquièmes par rapport à 1913. Ces mouvements ont induit une surévaluation de la Livre sterling et provoqué des entrées de capitaux en France. Les Etats-Unis, qui sont parvenus à stabiliser le dollar en 1919 après être sortis de l'étalon-or "seulement" pendant deux ans, sont également une destination privilégiée pour d'importantes quantités d'or : entre 1928 et 1932, la France et les Etats-Unis accumulent une part croissante des réserves mondiales d'or, si bien que les réserves des deux banques centrales représentent près de 60% des réserves mondiales en 1932. Or, le fonctionnement de l'étalon-or (ou plutôt ici, de l'étalon de change or⁹) implique une certaine coordination internationale. Si un pays se retrouve avec un grand stock d'or, il peut "stériliser"¹⁰ les flux entrants afin de ne pas

⁷Voir notamment les récents travaux de Flora Macher (2016) montrant que l'origine de la crise Hongroise se trouve dans le fonctionnement de son système bancaire.

⁸Ritschl and Sarferaz (2014) montrent que la crise financière allemande a eu un impact sur l'économie américaine via le canal financier.

⁹Lors de la conférence de Gênes en 1922, la plupart des grands pays s'entendent pour un retour progressif de l'ancrage des différentes devises sur l'or. A la différence de l'étalon-or qui prévalait avant la première guerre mondiale, ce nouveau système permet aux banques centrales de détenir les grandes monnaies de référence convertibles en or (livre sterling, dollar) à la place d'or physique.

¹⁰Cela revient à réduire proportionnellement l'offre de crédit dans le pays.

augmenter la quantité de monnaie en circulation et éviter une hausse des prix. Ainsi, alors que de grandes quantités affluaient vers les Etats-Unis et la France et que ces derniers "neutralisaient" ces flux par des opérations de stérilisation, les autres pays subissaient en contrepartie des pressions déflationnistes. La thèse, défendue notamment par Temin (1989) et Eichengreen (1992), souligne le manque de coopération internationale, théoriquement indissociable du cadre de l'étalon-or, comme cause de la tendance globale à la déflation au début des années 1930. Si la politique de stérilisation de la Fed pendant les années 1920, ainsi que l'impact négatif sur les prix mondiaux du tournant restrictif de leur politique monétaire en 1928 ne font pas réellement débat dans la littérature, le cas de la France semble plus ambigu. Alors que Bernanke et Mihov (2000) défendent la position de la Banque de France qui, selon les auteurs, aurait "joué le jeu" de l'étalon-or en augmentant sa base monétaire *quasi* proportionnellement aux entrées d'or, des études récentes (Irwin, 2011) remettent en cause ce rôle et l'accusent d'avoir favorisé la déflation dans le reste du monde. Il apparaît cependant qu'aucun pays n'a souhaité ou n'a été en mesure de prendre la suite de la Grande Bretagne comme centre financier international et prêteur en dernier ressort.

La poursuite d'objectifs domestiques au sein des grandes économies paraît fortement liée aux problèmes monétaires de l'entre-deux guerres. L'échec de la conférence économique de Londres de 1933, où un consensus devait être trouvé pour restaurer un ordre monétaire mondial mais où Roosevelt refuse de participer, en est le principal avatar. À la suite de la troisième vague de panique bancaire du début de l'année 1933, les Etats-Unis étaient également sortis de l'étalon-or. Aussi, le nombre de participants a-t-il été réduit à un groupe d'États européens réunis autour de la France, le "bloc-or"¹¹. Ce groupe de pays va maintenir l'ancrage sur l'or jusqu'en 1934 pour l'Italie, 1935 pour la Belgique, puis la fin du bloc-or intervient suite à la dévaluation du Franc français en septembre 1936. Outre la peur de l'inflation, les pays du bloc-or comptaient sur la stabilité du taux de change pour faire prospérer les échanges internationaux. D'après Eichengreen (1992), cet engagement à maintenir la parité-or a retardé le redressement de l'activité économique dans ces pays. Seule une sortie concertée, en coopération avec les autres grandes banques centrales, pouvait faire espérer une dévaluation des monnaies du bloc-or, conditionnée à une stabilisation de la Livre sterling. La Grande Bretagne refusant cet accord, les dévaluations compétitives se sont alors poursuivies.

¹¹Les pays en question sont la France, la Belgique, les Pays-Bas, l'Italie, la Suisse et la Pologne.

Plan de la thèse

Notre thèse se compose de 4 chapitres, et analyse les trois vecteurs de propagation énumérés précédemment¹²: marchés boursiers, systèmes bancaires, système monétaire international.

Au préalable, dans le Chapitre 1, nous mettons en évidence l'importance de disposer de sources originelles dans les recherches menées en histoire financière, en particulier lorsqu'il s'agit de constituer une base de données quantitative sur les prix des actifs cotés. Après avoir décrit les différentes bases de données recensant les actifs cotés à la bourse sur très longue durée — existantes ou en cours d'élaboration —, nous rappelons l'intérêt d'utiliser des indices de prix d'actions aussi bien du point de vue de l'analyse macroéconomique que de l'analyse financière. Nous détaillons également les biais potentiels induits par le calcul de tels indices, ainsi que les limites de certaines données en l'absence de sources originelles. Enfin, nous illustrons ce qu'implique la collecte de données sur la bourse de Paris pendant l'entre-deux guerres, notamment en termes de sources, et développons un indice de prix des actions pour les dix plus grandes banques par la capitalisation boursière entre 1918 et 1939. Cet exemple permet de mettre en exergue le nécessaire croisement des sources, qui permet de construire un indice à partir de séries individuelles propres et ajustées des variations techniques de prix induites par les opérations sur le capital des banques. En effet, ces variations ne résultant pas du jeu de l'offre et de la demande, il devient dès lors impératif de corriger les indices de ces variations afin d'éviter du "bruit" dans les données, par exemple en termes de volatilité des prix. Plusieurs techniques d'ajustement sont proposées (par les prix ou par le nombre de titres), permettant de faire face à l'indisponibilité de certaines données. Ce premier chapitre nous permet donc de présenter quels types de données sont collectées, comme elles sont "nettoyées", ainsi que la construction des indices à partir de données individuelles.

Dans le Chapitre 2, nous nous interrogeons sur la nature de la propagation à court terme du krach d'octobre 1929 sur la bourse de Paris, en comparant cet épisode au cas plus récent de la chute de *Lehman Brothers* en 2008. Afin de comparer la contagion à l'échelle internationale de ces deux crises, nous construisons un indice journalier de prix des actions françaises entre février 1929 et mars 1930, de façon à obtenir une série de l'indice CAC40. A l'aide de ces nouvelles données, nous sommes en mesure de tester et de comparer la propagation à court terme des crises survenues en 1929 et en 2008¹². Les résultats des

¹²Nous utilisons l'indice Dow Jones pour les données américaines; ce dernier est disponible en fréquence journalière sur longue période.

tests économétriques montrent une différence de comportement de la part des investisseurs lors des deux épisodes : contrairement à la panique instantanée qui s'est installée immédiatement après la nouvelle de la faillite de *Lehman Brothers* en 2008, le krach de 1929 n'a qu'une influence très limitée sur la place de Paris. En effet, nos résultats confirment l'absence d'une relation de cointégration entre les marchés français et américains en 1929, contrairement à ce qui peut être observé pour la crise de 2008. Cependant, la modélisation VAR montre que les rendements retardés à Wall Street ont un pouvoir explicatif sur les rendements présents au Palais Brongniart. Malgré la relation significative trouvée entre les deux marchés, la bourse de Paris affiche néanmoins une stabilité pendant le krach de 1929. On retrouve le même constat dans différentes archives, issues des procès-verbaux du conseil général de la Banque de France et de la Chambre Syndicale de la Compagnie des agents de change ainsi que dans les informations données par la presse financière. Tout indique ainsi que la bourse de Paris ne semble pas avoir été concernée par un événement pourtant souvent perçu dans la littérature comme le point de départ de la Grande Dépression. Ce premier résultat nous pousse donc à explorer d'autres canaux de contagion.

Comme nous l'avons rappelé plus haut, une des interprétations dominantes dans la littérature sur la Grande Dépression aux Etats-Unis est que la crise financière se serait aggravée à travers une succession de crises bancaires au début des années 1930. Le Chapitre 3 cherche à tester cette hypothèse dans le cas français à travers une analyse du risque perçu par les investisseurs sur toutes les sociétés du secteur "Banques et Institutions Financières" cotées à la Bourse de Paris entre 1919 et 1939. La littérature montre généralement que la crise bancaire française est restée relativement limitée et que la plupart des faillites a plutôt concerné des banques de province, de petite taille ou de taille intermédiaire. Pour ce qui est des grandes banques, une seule faillite d'importance est à signaler, celle de la Banque Nationale de Crédit, tandis que les autres grandes banques de dépôt ne rencontrent pas de difficultés importantes. Ce constat nous pousse à nous intéresser au caractère spécialisé du secteur bancaire français durant l'époque étudiée. En effet, un travail de classification des banques par rapport à leur activité principale, se basant sur les objets sociaux et les bilans, montre que l'on peut distinguer cinq catégories de banques et institutions financières au sein des 106 entreprises cotées dans ce secteur : les sociétés foncières et immobilières, les fonds d'investissements, les banques d'émission, les banques commerciales et de dépôts et enfin les banques d'investissement. Notre mesure dynamique du risque montre que, parmi ces cinq catégories, seules les banques d'investissement ont fait l'objet d'une prime de risque pendant la période trouble du début des années 1930. En outre, les archives du Conseil Général de la Banque de France montrent que la banque centrale a secouru les banques

en difficultés, lorsque celles-ci disposaient de suffisamment de collatéral ou en montant des plans de sauvetage avec le concours des maisons de Haute Banque¹³. Ce chapitre montre donc que la résilience du secteur bancaire français à la crise du début des années 1930 est le fait de la spécialisation des activités des banques.

Puisque la Grande Dépression ne s'est propagée en France ni par la Bourse, ni par les banques, il nous reste à examiner la question du régime de change. Comme le suggère la théorie des *Golden Fetters* développée par Eichengreen (1992), les pays ayant maintenu une parité fixe avec l'or sont ceux dont la reprise économique a été la plus lente, en particulier la France. En effet, conformément au triangle d'incompatibilités de Mundell, si le système de l'étalon-or s'accompagne d'une plus grande mobilité des capitaux, il n'offre en contrepartie que de très étroites marges de manœuvre pour mener une politique monétaire expansionniste, en cas de faiblesse conjoncturelle de la demande. L'objet du Chapitre 4 est donc d'analyser l'impact du régime de change sur l'intégration des marchés de capitaux, en particulier entre les pays du bloc or et les Etats-Unis. Pour cela, nous proposons une étude approfondie de la dynamique des corrélations et des co-mouvements entre les indices boursiers de Paris, Bruxelles et New-York. L'analyse des relations bilatérales entre ces trois marchés montre que, pendant l'entre-deux guerres, la dynamique de l'intégration financière a été fortement conditionnée par le régime de change adopté dans ces pays. En effet, nos résultats mettent en évidence qu'à la suite de l'interruption des mouvements de capitaux causée par la première guerre mondiale, l'intégration entre les marchés a été supérieure entre le milieu des années 1920 et celui des années 1930, par rapport à la fin de la grande guerre ainsi qu'à l'approche de la deuxième guerre mondiale. Ce résultat accrédite l'hypothèse d'Eichengreen (1992) ou de Temin (1989) qui insistent tous les deux sur le tournant restrictif que prend la politique monétaire américaine en 1928. Dans le cadre de l'étalon-or, la hausse des taux provoque un afflux de capitaux vers les Etats-Unis (mais aussi en France où le Franc est stabilisé également à partir de 1928) dont les réserves d'or sont stérilisées afin d'éviter une trop forte expansion monétaire. Les cours boursiers commencent à s'infléchir dès 1928 en Belgique et début 1929 en France, bien avant le déferlement de ventes qui se sont opérées à *Wall Street* à l'automne de la même année. Les pays du bloc-or, donnant la priorité à la stabilité des prix, n'ont jamais pu soutenir la demande pour freiner la déflation, et sont donc sortis de ce régime de change afin de dévaluer leurs monnaies respectives.

¹³Ce fût le cas notamment pour la Banque de l'Union Parisienne en 1932 (cf. Chapitre 3).

Chapter 1

The role of primary sources in the construction of historical stock price series: an illustration from the French banking sector during the Interwar Years

Abstract

This chapter discusses the sources of data and presents the technical aspects of designing and building historical prices of stocks listed on the French stock exchange during the interwar period. If stock price indices can be considered as reliable financial and macroeconomic indicators, a number of possible sources of bias can arise in their measurement. We then propose several methods which adjust for corporate and security events, either by using prices or capitalization. Finally, in order to illustrate and compare both methods, we construct a blue chip stock price index for the French banking sector between 1918 and 1939.

JEL Classification: C82, G12, N24

Keywords: Interwar period, Paris stock exchange, Stock index measures

1.1 Introduction

The need for high quality data in Financial History has grown throughout the years. Indeed, the recent financial crisis demonstrated the weakness of most academics and practitioners in forecasting the international financial market downturn of 2008-2009.¹ One of the reasons why most economists did not succeed in anticipating this major event is that empirical studies aiming at describing security prices movements were usually based on recent data, omitting past episodes of asset prices bubbles, stock market crashes, etc. Hence, all the lessons that could have been learnt from past events were also left aside.

In France, the introduction of "quantification" in History took roots during the 1930s. The "*Ecole des Annales*", named after the review created by Marc Bloch and Lucien Febvre in 1929, aimed at extending History to other fields of social sciences such as sociology and psychology. After the World War II, this new school of thought, led by Fernand Braudel and Ernest Labrousse, studied History with a long term approach and brought economics in the tool box of historical analysis. In the United States, the use of quantitative data was popularized by two Nobel laureates Douglas C. North and Robert Fogel and is now referred to as cliometrics. Cliometrics is a quantitative approach to economic history and it is sometimes defined as the measurement of History. It is now generally accepted as a complementary, or even essential tool in Economic and Financial History.² In fact, the epistemological change that occurred in these fields stems from the need for historical analysis to be reinforced with long run data explorations. Hence, economic historians usually mix quantitative analysis with a strong historical background.

The biggest challenge comes from both the quality and the relevance of the data as well as the transparency of the sources. Moreover, the construction of long statistical series, such as prices series, has to be carefully checked in order to avoid potential biases (Annaert et al., 2016). Indeed, computing stock prices into indices can lead to erroneous interpretation because they are generally affected by a number of events. For instance, corporate and securities events (e.g. dividend distribution, stock splits, etc.) have to be taken into account

¹However, some economists did identify early warning signs. Nouriel Roubini ("Bob Shiller is sharply shrill... and the risks of a housing-led systemic financial crisis", see <http://www.economonitor.com/nouriel/2006/08/30/bob-shiller-is-sharply-shrilland-the-risks-of-a-housing-led-systemic-financial-crisis/>) and Dean Baker ("Recession looms for the U.S. Economy in 2007", CEPR working paper) are examples of economists who predicted the global financial crisis in 2006.

²Diebolt and Hauptert (2016) gives a wide range of topics that can be studied under the spectrum of cliometrics.

in order to adjust prices series. If this is not completed appropriately, structural breaks in time series would be only mechanical and would not reflect demand/supply shocks..

The aim of this chapter is to propose and present a method for collecting and gathering historical stock market data, from archival collection to time series construction and exploitation. We focus on the Paris Stock Exchange during the interwar period for three reasons. First, data are transparent and reliable. All transactions in the Bourse were run by a limited group of brokers who operated under a State monopoly.³ In exchange for this profitable monopoly (Hautcœur and Riva, 2012), the State required a transparent system in which prices were reported in addition to the information relevant to investors on listed firms and issued securities. As a result, the archives of the Paris Stock Exchange are extremely rich (Lagneau-Ymonet and Riva, 2010) and provide researchers with various information that helps understanding the functioning of the stock market and its microstructure (White, 2007; Hautcœur et al., 2010; Hautcœur and Riva, 2012).

Second, although the interwar period has already received large attention in the economic and financial history fields, much remains to be discovered regarding stock price movements. Indeed, major financial events took place at that time. While the Wall Street crash of October 1929 is certainly one of the most famous events among them, we can also mention the dislocation of the Gold Exchange Standard and the emergence of the dollar as a prominent reserve currency (Eichengreen and Flandreau, 2009). These events impact differently investors' expectations, hence also stock prices. In addition, the Great Depression remains a standard term of comparison for today (Eichengreen, 2015).

A third reason lies in the fact that French investment banks' operations on capital were buoyant at that time, compared to other markets (bonds e.g.). As Hautcœur (1994) noted, inflation in France during WW1 and the following years provoked a change in the investment strategy of the Paris Bourse's actors. The French Stock Exchange was better known for its bond market throughout the 19th century, thanks to the price stability brought about by the Gold Standard from 1870 to 1913. This situation changed when war expenditures and reconstruction costs led to inflation.⁴ The stock market thus became more attractive. Furthermore, the banking sector was concentrated enough so that only few banks ran financial

³The latest decree regulating brokering activity was signed on April, 19th 1801. Brokers were then appointed by sovereign ordinance.

⁴While pending reparations of war damages from Germany, the French reconstruction was financed by the French Treasury though advances from the Banque de France (Blancheton, 2000).

market operations for most of the firms (regarding Initial Public Offerings- IPOs hereafter-, raises in capital, etc.) during the 1920s. On the contrary, the Great Depression resulted in reductions of capital (to absorb losses) for several firms in the 1930s. Hence, according to us, this period is very interesting to illustrate the difference between adjusted data, which take into account all the changes in the corporate and securities' life, and raw or "easy" data.

The remainder of the chapter is as follows. After describing the existing long-run financial databases in Section 2, Section 3 goes back to the advantage of having stock price indices over the long-run, as well as the potential biases they may contain. Section 4 describes the archival sources that are needed to build a stock price index for securities traded at the Paris Stock Exchange during the interwar period. In Section 5, which is the main contribution of this chapter, we illustrate our approach by constructing a new monthly stock price index for ten highly capitalized French banks. We propose two different adjustment methods: one with prices, the other with market capitalization. We then compare the results thanks to descriptive statistics and volatility measures. Section 6 concludes.

1.2 Historical financial databases : the State of the Art

Financial academics and practitioners have been interested in past securities prices fluctuations for a long time. The aim has always been to use the dynamic of realized transactions through prices' evolution in order to forecast future movements and refine portfolio management. Smith (1924) already presented methods to adjust prices from bonus shares and dividends in his calculation of return rates on a sample of common stock prices from 1882 to 1922. Since then, many researchers in finance have built small databases to justify empirically their intuition or theory. In many applications, however, these databases are built to answer one question during a specific period. Indeed, data collection and computation are not much profitable since they are time-consuming and not particularly re-used.

In the recent years, some financial research centers have been engaged in building long-run databases on asset prices at the firm level. The Center for Research in Security Prices (CRSP), an entity of the University of Chicago's Booth School of Business, was the first to initiate such a project in 1960, when computers started to give the possibilities of storing enormous amounts of data. The aim of this project was to gather and clean micro data of prices for all the securities traded at the New-York Stock Exchange (NYSE) since 1926.

Since 2006, the CRSP holds monthly data on prices from 1926 onwards and daily data starting in 1962. The Center also has managed to gather micro data on market capitalisation, dividends, trading volumes and corporate actions. To the best of our knowledge, it is the biggest and the most used database in the area of financial history.

Another financial historical source frequently used by economists is the Global Financial Data. Bryan Taylor, a former professional broker, started to collect historical security prices in 1992. The database spans more than 200 global markets and extends coverage back to 1265. The database contains individual bond and stock prices for most of the traded securities both at the London Stock Exchange (LSE) and the New-York Stock Exchange (NYSE) as these markets were the two of the most important financial places during the 20th century. But one can also find transaction prices (or bid-ask) for foreign securities (e.g. France, Japan, Italy, Sweden, Canada, etc.), sometimes from the mid-19th century. A great number of other series are available such as consumer price indices, commodity prices, exchange rates or international trade. The data comes from both historical sources such as the League of Nations (Goetzmann and Jorion, 1999) as well as secondary sources.⁵

But there are limitations to intensively use these "global" databases. Indeed, while data for stocks and bonds issued in different countries can be retrieved from these databases, they relate to securities only traded in the same places (mostly London and New York). Then using these databases carries the risk of occulting the importance of the microstructure dimension of domestic financial markets. For instance, the microstructure at the Paris Bourse is very different from the one in London or New-York; hence it should be taken into consideration. It is particularly striking when it comes to regulation issues. The fact that the brokers' seats were only available upon the agreement of the French State in France, while they werethey were licensed by auction in Wall Street may have had an impact on the market's overall volatility.

Moreover, depending on the question addressed, the use of one single trading place could be misleading. This phenomenon can be illustrated by the contagion effect across financial markets. Some studies, as the one of Bordo and Murshid (2000), look at the contagion between several State bonds issued by different countries. The idea is to look at the correlations between those bonds returns before and after different episodes of crisis, but all the bond prices are collected from the NYSE. Therefore, the question raised in their paper

⁵For the UK, stock price data for the interwar was retrieved from the *Banker's magazine*. Historical stock price data for France are taken from the *Institut national de la statistique et des études économiques* (INSEE).

rather refers to contagion between different assets traded in the same place and not contagion between different financial places. The authors look at investors' expectations on different countries' national's debt, but only with the view of Wall Street investors. But since investors act according to the rules of the NYSE, and not to that prevailing in Paris for example, this method does not allow capturing the potential differences in market microstructure that may be helpful to understand the results. To know if there is contagion between two exchanges, it is then better to look at the correlations between bonds returns traded in the two distinct bond markets.

Another aspect to be looked at is the impact of country-specific historical events on fluctuations in the prices of securities over time. As shown by Neal (1985), international capital markets were already integrated since the 18th century. Therefore, arbitrage over the same security traded in different places should lead to a homogenous price. In addition, those cross-listed securities might increase the information content in prices at the firm level, especially for developed markets, as shown by Fernandes and Ferreira (2008). These authors find a positive relationship between cross-listing and price informativeness of cross-listed stocks. Also, on the very long run, financial markets might be subject to episodes of capital controls at some point in time and this can bring prices to diverge.

More generally, the empirical foundations of the financial theory are very often tested with the same data in the literature. To our knowledge, the majority of studies aiming at testing financial theory on the long run uses one of the two databases described above, with a significant lead for the CRSP. Our goal here is to assess whether what may be observed for American securities, investors or Stock Market is or not verified elsewhere. This was the starting point of two European historical financial databases, developed first in Belgium and now in France. Both of those projects started when scholars got free and unlimited access to Stock Exchanges archives.

The SCOB (Studie Centrum voor Onderneming en Beurs) research center was founded in 1999 at the University of Antwerp. Going back to 1832, the archives of the Brussels Stock Exchange⁶ have been used to collect monthly stock prices, as well as dividend dates and amounts, but also each seasonal equity offers (SEO). Total return indices in various forms can then be computed. The database is well illustrated by Annaert et al. (2012)

⁶They also obtained the official price lists of the Antwerp Stock Exchange (1844-2002) and the Liège Stock Exchange (1902-1992).

who propose a monthly index of stock return over the period 1832-1914. This article describes precisely the sources used to collect the data and demonstrates how complex the construction of long-term stock prices series can be. In fact, in addition to the collect of end-of-the-month prices for more than two thousand stocks, a number of additional information has also been collected. For dividends, the amounts paid have been collected with the payment date and the type of dividend. Also, corporate events that may influence the assets' returns (stock splits, reverse splits, bonus shares or subscription rights) have been taken into account. Finally, the number of shares issued and admitted on the exchange also has been collected. With all these data, it is possible to develop capitalization-weighted indices. The complexity of such dataset construction comes from the variety of sources that are needed. Indeed, the sources used to collect prices are not the same than those for capital operations nor those for the number of stocks. We will see that this issue is also present when building a stock prices dataset for Paris during the interwar.

Finally, in France, the DFIH (Données Financières Historiques) project aims at collecting bi-monthly prices for all the securities traded at the Paris Stock Exchange from 1795 up to 1977. From this date, data are already computed by the Eurofidai project on a daily basis.⁷ An unlimited access to the archives of the Stock Exchange allows gathering data on securities on the one hand, and on issuers on the other hand. As we will see in Section 4, different kinds of information usually imply different sources. This project is promising for the future. First, high quality data that can be computed will enable researchers to renew the literature on the French Exchanges. Second, accurate comparisons with Belgium and the US securities will become possible since they are also characterized by high quality data. Finally, it will be possible to check whether theories, such as rational expectations, that might be true for one stock exchange (for example the NYSE) remain valid for other ones, outlining the potential impact of market microstructure.

⁷See www.eurofidai.org.

1.3 Historical stock price indices : relevance and reliability

1.3.1 Why building historical stock price indices?

The construction of stock price indices goes back to the late 19th century, when the two first indices got published around 1884 (Hautcœur, 2006). One was published in the *Britannic Banker's magazine*, the other in the US in the precursor of the *Wall Street Journal*, by the now-famous journalist Charles Dow. The latter constructed the first stock price index for American industrial firms: the Dow Jones Industrial average. As Hautcœur (2006) mentioned for the French case, the original purpose of this calculation was not intended for financial practitioners, but for economists who were seeking a measure able to proxy the macroeconomic situation. Nowadays, this type of indicator is useful to investors, macroeconomists, financial academics and economic historians. In what follows, we review the motivations behind the use of such indices.

First, a stock price index can be considered as an indicator of the general trend of the stock market. It is then very useful to observe and analyze market movements as well as its volatility. Thanks to the emergence of computer sciences and econometrics, the use of such a market indicator has become essential to academics. Whether they are used to support a theory or to invalidate it, stock prices series are present in a large number of papers. For example, Fama (1965) discusses the predictability of future stock prices. To do so, he runs tests on common stock prices in order to investigate whether or not they follow a random walk. Fama concludes that stock prices cannot be predicted.

On the other hand, Schiller (1981) proposes a measure of stock price volatility that contradicts Fama's hypothesis, by showing that stock prices fluctuate too erratically to be justified by securities events. Fama and French (1989) strike back using common stock returns to assess the relationship between business cycles and expected stock returns, which fits with the idea of rational expectations and therefore the efficiency market hypothesis. One can easily understand the interest of such analyses for practitioners in the finance industry, but stock price indices may also be of interest for macroeconomists and policy makers. In fact, the level of stock prices is often seen as a "leading indicator" of the business cycles. In the same vein as Fama and French (1988), Schwert (1989) and Estrella and Mishkin (1998) shed lights on the predictability power of stock prices on economic activity. More

recently, Schularick and Taylor (2012) have reignited the debate by looking at the different determinants of business cycles, over the long run (1870-2008) and for 14 countries. They also looked at stock market indices, among other financial and economic indicators, as a measure of financial stability. In addition to financial and macro-economists, financial and economic historians also find a great interest in stock market indices. In fact, the long-term approach is also a feature of economic or financial historical studies. Data collection (often hand-collected) related to long-term series of asset prices, is usually a work initiated by historians. Indeed, numerous studies require data collection from archival sources to run quantitative researches on past events. Frans Buelens and his co-authors constructed a database (cited above) for the Brussels Stock Exchange.

The same was done by Goetzmann and his co-authors (2001) for the New York Stock Exchange from 1815 up to 1925, completing the CRSP using the same methodology, and allowing the study of US capital markets over two centuries. Carsten Burhop (2008) collected daily prices for 27 stocks traded at the Berlin Stock Exchange from 1892 to 1913 to estimate liquidity, transaction costs and expected returns. Richard Grossman (2002) built monthly indices of British equity prices from 1870 to 1913, including more than 3000 securities.

Several papers have emphasized the interest in using historical stock market indices for Britain. Eichengreen (1982) uses industrial share prices in order to estimate the relationship between industrial assets market value and investment behavior through the calculation of Tobin's "Q" during the Victorian Britain (1870-1913). DeLong and Grossman (1993) construct an annual stock price index on the very long-run (1870-1990) in order to assess whether or not excess volatility occurred at some point in time. They look at the price-to-dividend ratio and find that it was very low during the pre-WWI era, suggesting that investors in London seemed to be quite skeptical about equities. This could explain the poor performance of stocks at that time. According to the authors, this may have played a crucial role in the British industrial decline experienced in the late 19th century.

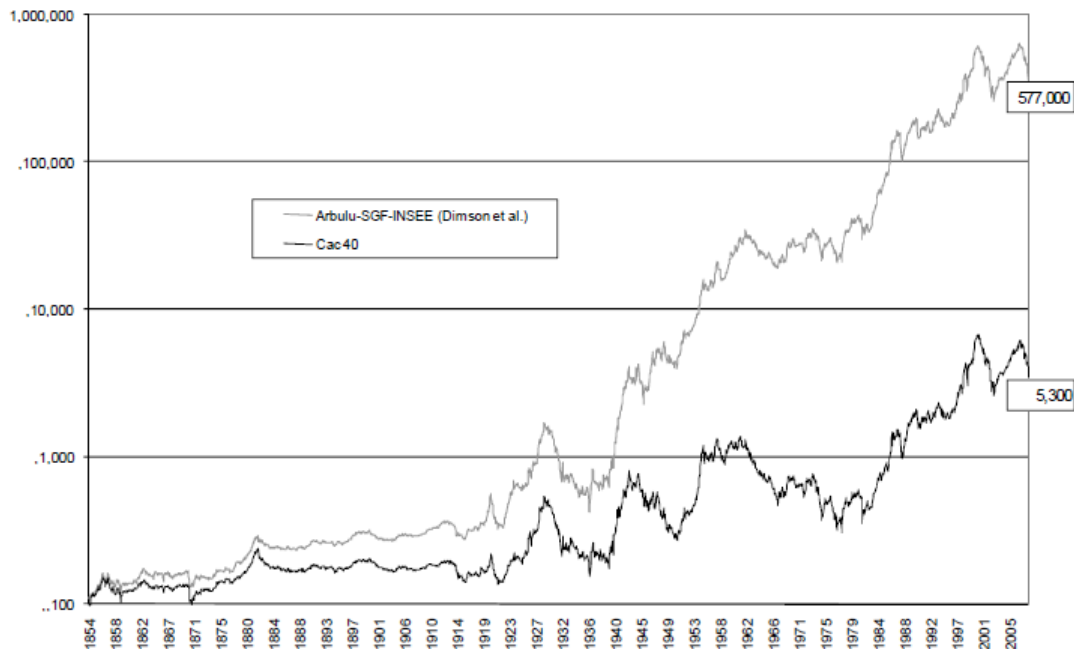
Turning to France, several authors also have showed great interest in historical asset prices, in particular for the 19th century. On the debt side, Vaslin (1999) built a capitalization-weighted index of French *Rentes* (French State bonds) from 1798 to 1914, while Rezaee (2010) proposed a corporate bonds index for the period 1838-1910. On the equity side, the first index was calculated and published in 1919 by the French government statistical office, the *Statistique Générale de France* (SGF thereafter), which consisted in a non-weighted

index, including up to 300 stocks in the interwar period.⁸ The SGF index calculation was pursued by the post-war new government statistical office (Institut National de la Statistique et des Etudes Economiques) after 1945. Arbulu (1998) used the same methodology from 1801 to 1918, totaling 232 stocks. These three indices have enabled the construction of a stock return index for the Paris Stock Exchange for two centuries. This Arbulu-SGF-INSEE index is used, among other studies, in Dimson et al. (2002) and Goetzmann and Jorion (1999) for international comparisons.

An alternative method for constructing a stock return index was proposed by Le Bris and Hautcœur (2010). They built a capitalization-weighted index of blue chips stocks⁹ for the period 1854-2007. The authors took the 40 highest market capitalization companies at the beginning of each year and collected monthly prices for each of these stocks before aggregating them into a composite index. The index was thought to reflect the overall market trend. One of the major insights in the article is the clear difference in the results of long-term performances between this index and the Arbulu-SGF-INSEE. In particular, it sheds lights on the upward bias that may occur on the long run with the use of an unweighted index, as we can observe in Figure 1.1.

⁸The reader may refer to Hautcœur (2006) for further description of the latter index.

⁹I.e. stocks of large, well-established and financially sound companies that have operated for many years.

Figure 1.1: Weighted (Cac 40) vs. Unweighted (Arbulu-SGF-INSEE) index, 1854-2007.

Notes. 1854=100 basis (allows to join the official CAC-40 at 1,000 in 1988). **Sources.** Le Bris and Hautcœur (2010), page 11.

The following section discusses the potential biases related to the construction of a stock price index, biases that may arise from data collection and computation.

1.3.2 Reliability of historical stock prices datasets

In this subsection, we mainly rely on a recent paper written by Annaert et al. (2016). As noted by these authors in their survey on the possible biases affecting the reliability of historical datasets, several issues have to be tackled before interpreting the data. With respect to general issues (not only stocks), they outline four types of problems. The first one, also described in Dimson et al. (2000), concerns the "easy data" bias. This bias stems from the reluctance of researchers to access primary sources to collect data. They more commonly rely on "second best" sources, easier to access but without relying on explicit methods of data collection. Moreover, troubled period such as wars are often ignored because of the additional work it implies to find and interpret sources. For example, wars usually generate inflation as much of the war expenditures are financed by increases in the money supply. A study that includes a war period will thus have to correct price series from inflation, which requires other sources on consumer price indices. The challenge is further increased when studying the first half of the 20th century, characterized by two world wars and one of the

most severe financial and economic crises in history.

A second issue consists in the selection bias. In finance, it may occur with blue chips indices for example. Indeed, while the index focuses on highly liquid stocks among the top market value companies, it could undermine the high performances of lower market value stocks. More specifically, the "survivorship bias" is a recurring issue for long-run analyses. Indices are usually computed with companies that survived during the period of analysis and do not include issuers that failed, which leads to an upward bias in the results.

When comparing different stock exchanges, another obstacle may emerge from the non-synchronicity of trading. Beyond problems related to the time zones, which might be different from one market to another, holidays are different from one country to the other (whether it is for religious or national purposes), and some stock exchanges do not open on the same day. For example, the Paris Stock Exchange was open on Saturdays until 1936 whereas the New York Stock Exchange (NYSE) kept on opening on Saturdays up to 1952. For daily series, those differences have to be taken into account, in order to avoid noise in the sample when estimating the relationship between assets traded on two distinct exchanges. Likewise, for the sake of appropriate cross-market comparison, attention should also be paid to the market microstructure of a given exchange. As stated by Annaert et al. (2016), the "price discovery system" can vary across exchanges. Examples can be found in the difference between order-driven markets and price-driven markets, or by the adoption or not of fixings. Those elements of market microstructure may influence the behavior of prices, notably in terms of transparency and liquidity.¹⁰

Finally, the "delisting bias", defined as a corporate event such as a bankruptcy, liquidation, merger or a simple migration to another market (for example from the official list to the OTC market) can affect the average return of an index.

While all the potential bias cited above should be considered for both stocks and bonds, hereafter we only focus on those that may affect stock prices. First, the reporting of stock prices is not always the same. With respect to frequently traded stocks, the reported price is a transaction price. But for less liquid assets, bid-ask prices may be reported, as it was

¹⁰Cf. Hasbrouck, J. 2007. *Empirical Market Microstructure. The Institutions, Economics, and Economics of Securities Trading*. Oxford University Press.

the case for the NYSE,¹¹ while no prices at all were reported at the official list of the Paris Bourse (but the last trading price was reported with its date on a side column). For other assets, such as State bonds traded in Paris, the price is expressed as a percentage of the par-value of the asset. It is the same for insurance companies' stocks traded during the 19th century. This is one of the reasons why data collection for historical prices can be time consuming: the sources must be carefully examined.

A major feature of stocks is the right for investors to gain dividends at a regular frequency. It is especially important to include them in the calculation of total returns. Nevertheless, as the price's fluctuation due to the dividend payment is approximately of the order of the dividends,¹² it has no important consequences on prices' behavior. Conversely, security or corporate events may have a huge impact on a given stock price series. Most importantly, capital operations such as stock splits (or reverse stock splits), bonus shares or increases in capital through subscription rights significantly affect stock prices. Since the associated fluctuations are "mechanical" (as opposed to a variation resulting from new information), they have to be adjusted for. For example, if the capital is doubled, e.g. by issuing the double of the number of shares with the same face value, the stock market price will be roughly divided by two. But this variation has nothing to do with investors' expectations on the future of the company, or with the supply and demand for this particular stock. So if there is no adjustment for this operation, it will generate noise in the series. Given that the information needed for adjustments such as corporate events are not always published on the official list, it is usually necessary to look for other sources than the official list. For Belgium, data on these operations are collected from several yearbooks. It is the same for Paris, the calculation of a stock price index requires no fewer than three different sources. This is what we will show in what follows.

¹¹This feature allows researchers to proxy liquidity thanks to the quoted spreads when no trading volumes are available. It can also be used as a measure of competitiveness among securities markets, such as in Brown et al. (2008).

¹²For example in Paris at the end of the 1920s, the *Crédit Lyonnais* paid a dividend of 45 francs (before taxes) on a stock whose market value fluctuated around 3000 francs.

1.4 Collecting data on the Paris Stock Exchange for the interwar period

1.4.1 The Official list

As mentioned in Section 1.2, the Paris Stock Exchange was run by a stockbroker guild that was mandated by the State to operate every transaction at the official market. As a consequence, transparency was key to attract investors and allowed the development and the success of the Paris Stock Exchange throughout the 19th century. The aim of the Minister was to get transparency in exchange for the monopoly given to the guild. The *Compagnie des Agents de Change* (CAC hereafter) had to report a lot of information on the official list of the Bourse, i.e. the daily bulletin of quotations. Investors had access to multiple information on securities traded on the official market: *Le Parquet*. In addition, the CAC began publishing yearbooks containing information on issuers in 1880. Finally, they also held a register of the guild's decisions (*Avis et Décisions*) on securities events such as listings, delistings or corporate events that may have consequences on the list (e.g. operations on the capital, as we will see in the dedicated sub-section).

At the beginning of the 19th century, spot prices for government debt, the Banque de France's share and some exchange rates were the only information reported on the official list. But the need for other data grew along with the size of the stock market resulting in a stream of available information consistently growing. At the end of the 19th century, over one thousand securities were traded on the Paris' Bourse's floor: *Le Parquet*. Information was more detailed with the inclusion of interests and dividends, as well as the last quotation of the previous day, for every security. For the already existing forward market, forward prices were mainly reported for the next liquidation, as well as repo rates for the repo market and its corresponding settlement price.¹³ The latter were also used for what could be referred to as an option market with several prices corresponding to different premia and settlement dates. Around 1900, the official list was about ten pages long. Exchange rates were also available for a dozen countries, in addition to gold and silver quotations.

¹³Forward prices are reported on the list from 1844 onwards, even if the forward market became officially legal in 1885 (Lagneau-Ymonet and Riva, 2012).

During the interwar, the number of traded securities doubled relatively to the end of the 19th century: over two thousands stocks, corporate and state bonds were listed. According to estimates based on the DFIH database,¹⁴ this number reached more than three thousands during the 1930s. This estimate is consistent with the findings of Hautcœur (1994). Despite the proscription of new issues of foreign securities on the Parisian market, a growing number of stocks was listed for three main reasons. First, the self-financing ability of French companies was too weak regarding the reconstruction needs after the war. Second, the post-war inflation encouraged savers to turn to other securities than bonds connected to money. Finally, the banking sector (especially commercial banks) sought new profits because of the decrease in deposits. One of their new sources of profits was to take part of new stocks issues on the primary market (not very competitive at that time) through fees and commissions. Exchange rates for about twenty countries were reported on a side table at the end of the 24 pages daily bulletin. For London and New-York, forward exchange rates were available for one, two and three month maturity.

New information was added in 1920, the number of securities listed on the market for each stock was reported, easing the calculation of weighted indices. Also, a table for subscription rights appeared at the end of the bulletin. At that time, in case of an increase in one company's capital, a subscription right was needed to participate to the operation with a preferential offer for existing shareholders.¹⁵ This right, materialized by the next coupon to be detached, was quoted on a side market in order to allow non-existing shareholders to participate. In addition, the *Avis et Décisions*, mentioned above, were reported at the end of the bulletin starting in 1920. This was important in terms of transparency considering small savers as it gave an easy access to the modalities for capital operations.

The Official list included three dimensions:

◇ The type of market

The major part of the official list was dedicated to the spot market. The prices reported are all transaction prices. For most of the securities, between one and three prices are reported. They can go up to twenty for the most highly traded ones. It is not always enough to make a proper intra-day prices analysis, but it might be used as a proxy for liquidity (see for example Corwin and Schultz, 2012) since trading volumes

¹⁴Estimations are available upon request from the author.

¹⁵It consisted in a discount on the stock's current market price.

are not reported.¹⁶ Although the forward and the option markets represented a small part of the bulletin, it is estimated to be by far the most active market in terms of transaction volumes (see Lagneau-Ymonet and Riva, forthcoming).

Securities admitted on the forward and option markets were generally the ones of highly capitalized firms with frequently traded securities. Assets listed on those markets were traded, for the most part by a minimum quota of 25 securities or multiples.¹⁷ For these derivatives markets, several data are available in addition to spot prices. Four forward prices are reported: opening, closing, lowest and highest. Usually, these prices are reported for the next settlement date, unless the settlement day is the day of the bulletin. In the latter case, settlement prices are reported as well as the ones for the next settlement date. The difference in the reporting of spot and forward prices lies in (i) the fact that small savers buy and sell on the spot market while speculators operate on the forward market, so this is a way of protecting small savers by giving more transparency; and (ii) the volumes traded on the spot market allowed to report all of them while too many forward prices would have had to be reported. The repo rate between two settlement dates is also reported, next to the compensation price on which the repo rate is based, for all the securities traded on the forward market.

Finally, an option market, or *marché à primes*, was available for investors at the Paris Stock Exchange. Contrary to the forward market where a firm commitment to close the deal is required, the option market is "conditional" to the option owner. The latter pays a premium that he might lose if he does not close the deal. Different premia were usually proposed and they were always proportional to the security's market value.¹⁸ Concerning the information available for this market, lowest and highest prices were reported with respect to both the settlement dates and the different premia offered. Those prices are particularly hard to read because the columns in which they appear are denominated for the forward market only and do not correspond for the option market. Moreover, the different settlement dates are not detailed so one must pay attention to the way they are depicted (see Appendix B). This market has not been

¹⁶In 1931, the stockbroker guild started to report a daily transaction volume index, but only for a few securities: 1 stocks, 6 corporate bonds and 4 French state bonds. This index started to be published by the *SGF* in July 1932, though on monthly basis.

¹⁷In 1930, the stockbroker guild introduced quotas of 5 and 10 for stocks with high market value. See Frédéric François Marsal, *Encyclopédie de banques et de bourses*, volume 5, p. 89.

¹⁸For example, the premia on the share Banque de France goes from 100 to 1000 francs while the market price is above 1200 francs. For most of the securities traded around 500 francs, the premium is of 20 or 40 francs.

much studied by historian economists. In addition to the fact that the sources have only been available until recently, the difficulty to read the source and collect option market data makes it an open field for future research, e.g. on rational expectations or to compute an implied volatility index (like the VIX for the US market nowadays) for the Parisian market.

On the official list, forward and option markets were gathered on the same pages.

◇ The type of security

For each market, securities were ranked by their nature. In general, French State bonds and bonds guaranteed by the State were listed first, then the stocks, the corporate bonds and finally the foreign State bonds. Then, for each type of asset, the securities were ranked by issuers in alphabetical order.

◇ The business sector

For each type of security, the list was organized by business sector. There were between 15 and 20 different sectors for the spot market, more or less 10 for the forward and option market during the interwar time frame. It is interesting to follow the evolution of the sectors since it gives insights on the structure of the real economy. For example, a sector for petrol and chemicals companies appeared in the 1920s. Also, the sector *Valeurs diverses*, which included stocks that cannot be put in larger sectors, moved towards more details during the interwar. Sub-sectors appeared in the list, such as "Food, breweries and hotels", "Cement works and quarries" or "department stores. The appearance of such sectors shows the diversity of companies funded through the stock market.

1.4.2 The yearbooks

In 1880, the stockbroker guild published its first yearbook: *Annuaire de la Compagnie des Agents de Change*. The idea was to give investors access to information on every firm listed on the official market. This series is available up to 1936 (Lagneau-Ymonet and Riva, 2010). The yearbooks are organized by the type of issuer (public or private). Information on public issuers such as the French State, French local authorities or foreign States broadly consists in the description of the issued bonds (size, interest rates, amortization, issue dates, maturity and so forth.).

Information on private companies is more detailed. For most of the private issuers, we can find:

- the legal status of the company and its possible evolution over time;
- a description of the business activity;
- the address of the headquarters ;
- a detailed description of the capital share: the original amount with the corresponding number of shares and their denomination and every operation on the capital with the date of the operation, the amount raised (or reduced) with the corresponding number of shares and the issue price;
- information on the board (number of members, mandate duration, number of shares required) and on the distribution of the benefits among shareholders, board members and reserve funds;
- descriptions of all the securities issued so far by the company: in those yearbooks, the description is especially detailed (up to the physical description of the security). The Initial Public Offering (IPO) and issue dates are also reported at the end of the descriptions; and finally,
- the name and function of each member of the board.

Besides information on issuers, the yearbooks also provide the highest and lowest foreign exchange rates for over twenty countries. Moreover, it depicts the taxes on securities according to their nature (stock or bond), whether the issuer is private or public, French or from abroad and finally, according to the type of market. Finally, the laws on joint stock companies are detailed.

As stated above, its collection ends up in 1936. But another series of yearbooks was published during the most part of the 20th century. The series *Desfossés*, linked to the name of this private editor, started to publish yearbooks of the same use that the CAC's. In the first editions from 1907 to 1911, focus was put on companies listed on the Over The Counter (OTC) market.¹⁹ The 1912's edition and the following ones gathered issuers from

¹⁹Transactions did not only take place on the official market. Smaller capitalizations, as well as some foreign State bonds that did not fulfill every requirements to be listed on the official list, were traded on an unofficial market called *La Coullisse*.

both the OTC and the official list. The series end up in 1980, hence they cover the full interwar period. The yearbooks' content is quite similar to that of the CAC. The two main differences lay in the fact that in *Défossés* yearbooks (i) securities are not described in detail, and (ii) balance sheets are reported for almost every private company listed. However, since there were no accounting rules yet,²⁰ it is very difficult to clean and standardize the balance sheet's items.

1.4.3 The *Avis et Décisions* (decisions register)

In this register, published at the end of the official list starting in 1920, one can find several types of information. The general purpose of the register was to report all decisions that may affect the official list. For example, listings (resp. delisting) in case of an IPO (resp. failure) are all reported. Securities' admissions or removals from the forward market list (e.g. if a stock traded only on the spot market is admitted to trading on the forward market or on the option market) are also mentioned. Companies' calls for the part of share to be paid are also disclosed²¹ since this operation changes the paid up share capital. The amount of a company's share capital can change over time, therefore the modalities of share capital transactions (increase, reduction, merger ect.) provides an important information. As we mentioned above, a coupon detachment often occurs in connection with the capital increase of a company. The consequence for the list is that the share is listed twice: with the coupon attached and with the coupon detached²² and it represents then two lines on the list (see Appendix B). In this type of decision, we can find the exact modalities of the operation and the exact date when the coupon was detached. We will see in the following section that this is important when it comes to adjusting stock price series.

1.5 Building a price-weighted index : an illustration from major French banks listed at the Paris Bourse

In this section, we illustrate how to use the sources described in the previous section, to build historical stock prices and by avoiding as much as possible the potential bias due to

²⁰The first chart of accounts in France was developed in 1943.

²¹Usually, only one quarter of the share is paid-up by investors during subscriptions, the rest being due to payment within a few years.

²²This lasts until the subscription is closed, which is usually within two weeks.

data availability described in Section 1.3.2.

In a first step, we have to select a number of stocks. Obviously, this choice depends on the question we address. Our aim here is to give a picture of the French banking sector. Indeed, it is interesting to study how banks operated in the difficult environment of the 1930s, after the boom of the 1920s. Such an index has already been calculated by the *Statistique Générale de France* (SGF) for the interwar. However, it suffers from several drawbacks. In fact, it was published for the first time in 1927 and included 13 banks: *Banque de France*, *Banque d'Algérie*, *Banque de Paris et des Pays Bas*, *Banque Transatlantique*, *Banque de l'Union Parisienne*, *Comptoir National d'Escompte*, *Crédit Commercial de France*, *Crédit Foncier de France*, *Crédit Lyonnais*, *Comptoir Central de Crédit*, *Société française de report et de dépôts*, *Société Marseillaise*, *Sous-Comptoir des Entrepreneurs* (*Bulletin de la Statistique Générale de France*, July 1927, p. 390). Then it was revised in 1932 and included 7 additional banks: *Crédit Mobilier Français*, *Société Générale*, *Crédit Industriel et Commercial*, *Société Bordelaise de Crédit Industriel*, *Société Alsacienne de Banque*, *Société Nancéienne de Crédit Industriel et de Dépôts*, *Compagnie Algérienne* (*Bulletin de la Statistique Générale de France*, January 1932, p. 249).

The weights that are applied to stocks are the same, regardless the size of the capitalization. This method then implies that large capitalizations such as the *Crédit Lyonnais* (over 1.2 billion francs of average capitalization over the period) have the same weight than, for example, the *Crédit Commercial de France* (respectively around 260 million francs). If the inclusion of more stocks makes the index more representative, it also causes the distribution of weights to be even more biased.

Our index includes 10 banks with a high market capitalization. The included banks are the following: *Banque de France*, *Banque d'Algérie*, *Banque de Paris et des Pays Bas*, *Banque de l'Union Parisienne*, *Comptoir National d'Escompte*, *Crédit Commercial de France*, *Crédit Foncier de France*, *Crédit Lyonnais*, *Banque de l'Indochine* and *Société Générale*. Moreover stocks issued by those banks are frequently traded: during the study period, they are all listed on the forward market for at least several years or even for the entire period. For all, we collected monthly spot prices on the official list.²³ Once the individual series collected,

²³We would like to thank David Le Bris for sharing his data on some of the banks included in our index. See Le Bris and Hautcœur (2010).

they need to be carefully checked and adjusted.

When Arbulu (1998) built his index for the 19th century, he relied on the adjustment methods used for the SGF-INSEE composite index. Arbulu cites a manual written by two French statisticians (Palangié and Laforest, 1959) who detailed the way to adjust prices from securities events. The author adopts the same method as the statisticians who build the SGF index in 1927. Palangié and Laforest (1959) were already aware of the potential downward bias caused by an increase in the capital stock. Therefore they proposed an adjustment method which has been (mostly) the same since then. The idea is rather simple: when the capital stock increases, it results in a mechanical variation of the stock price which has nothing to do with news (cf. Section 1.3.2). Indeed, in most capital increases, when new shares are issued the company usually determines the selling price, adding a premium to the nominal value of the shares.

Considering an owner of old stocks who can subscribe to new stocks at a preference price e for q_2 new shares in exchange of q_1 old shares. The owner of q_1 old stocks then owns $q_1 + q_2$ stocks. The adjustment proposed for an individual stock is the following:

$$q_1 a + q_2 e = (q_1 + q_2) n \quad (1.1)$$

with e the issue price; q_1 , the number of old shares; q_2 , the number of new shares; a , the market price of the stock (coupon attached) and n , the market price of the stock (coupon detached). e is known and a can be observed so it gets easy to deduct the theoretical value of n , noted n' .

Since we have ex-post prices, we can also observe n and deduct the theoretical value of a , noted a' . We then have two ratios $\frac{a}{n'}$ and $\frac{a'}{n}$.

Statisticians in 1927 considered that the average of those two ratios will give the best theoretical value of $\frac{a}{n}$. They argue that even if the "accidental" variation of the price is mainly due to the detachment of the subscription right, some part of the variation is always due to supply and demand mechanism, as long as observed prices are market prices. So, the aim of this adjustment is to correct prices movements from mechanical variations (i.e. variations not explained by supply/demand factors). The idea is that the observed ratio

$\frac{a}{n}$ doesn't take into account the effect of supply and demand, whereas its theoretical value does (Laforest and Palangié, 1959).

We can illustrate this adjustment with the increase in the capital stock of the *Crédit Lyonnais* that occurred in March 1929. In early 1929, 500 000 shares of 500 francs in face value were quoted on the exchange, representing a capital stock of 250 million francs. In March, in order to increase its capital by 150 million Francs, the company decided to issue 300 000 new shares. The corresponding *Avis et Décision* stated that all the new shares were of the same category (ordinary shares) and had the same face value. But the company issued its new shares at a premium, with an issuing price of 2000 Francs for a market price above 4000 Francs.²⁴

Following the same adjustment method, to get one new share we have: $5a + 2000 = 8n$.

We take a as the last observed price before the operation, here $a = 4375$. The theoretical value of n is given by:

$$n' = \frac{(5 \times 4375) + 2000}{8} \text{ and } \frac{a}{n'} = 1,466$$

We do the same with n as the first observed price after the operation, here $n = 3270$. The theoretical value of a is given by:

$$a' = \frac{(5 \times 3270) + 2000}{8} \text{ and } \frac{a'}{n} = 1,426$$

The average of $\frac{a}{n'}$ and $\frac{a'}{n}$ is then 1,4458 and will be the adjustment coefficient we will apply on the price series after the issue date.

Another type of adjustment consists in taking into account the market capitalization through the number of shares (market capitalization method). The idea here is even simpler: since market capitalization is equal to the share's price multiplied by the number of shares at the date t , we only have to change the number of shares for the first price after the operation.

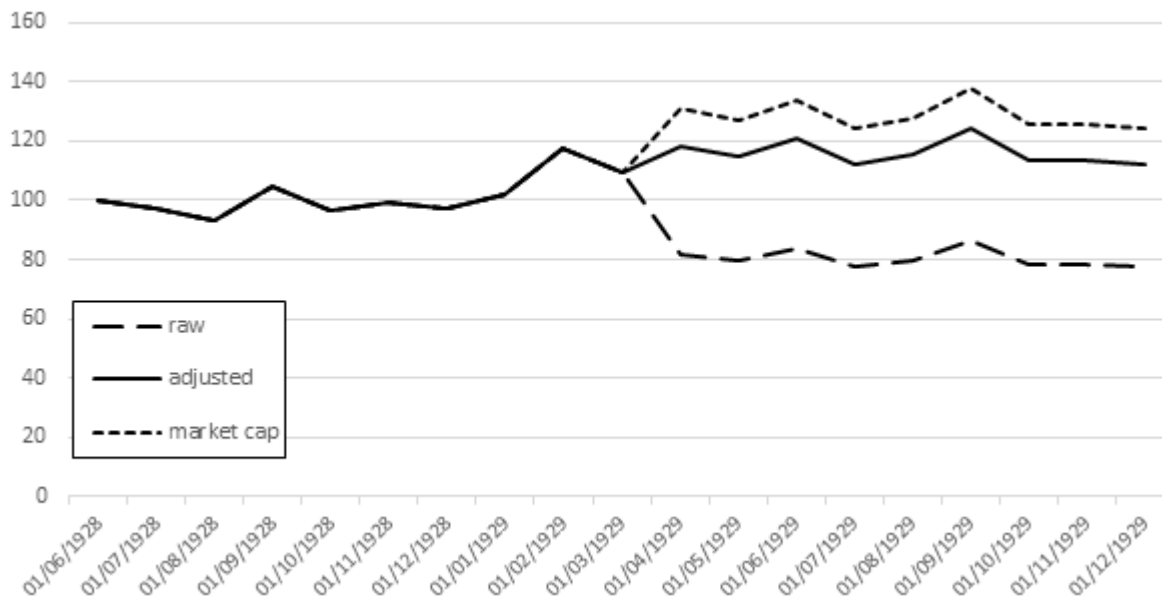
²⁴Bulletin de la cote, *CAC*, 03/11/1929, p. 23.

Considering the previous example, this means multiplying every market prices by 500 000 until the operation, and by 800 000 thereafter.

Another issue on the sources used has to be clarified. We previously mentioned that the number of shares was reported on the official list next to the denomination. However, for a reason that is not explained in the archives of the stockbroker guild, the number of shares is always updated on the official list around six months after the operation. The update of the number of shares also appears in the *Avis et Décisions*, but on the day of the update, therefore six month after the operation as well.

Figure 1.2 shows the evolution of each series according to the adjustment method, base 100 in June 1928.

Figure 1.2: Raw, Adjusted, and Market capitalisation indices for the share of Crédit Lyonnais



Notes. The series are expressed in indices with June 1928 as the reference date (ie, June 1928=100).

Sources. Author's calculation.

The figure well illustrates the downward bias due to the detachment of the coupon. Following the capital increase, the raw price of the share mechanically decreases by more than 25%, while increasing by roughly 8

Once we collected every raw price for each individual stock, we used the yearbooks to study the evolution of the capital stock for each of our 10 banks. We used mostly the *Desfossés*

yearbook of 1945 in order to capture every corporate event that might affect raw prices.

One could disagree by saying that such corporate events do not occur that much and that price adjustment would not change the story. However, here we argue that at least over the period examined and for the ten stocks²⁵ considered, 18 large-scale operations on capital stock occurred.

But the difficulty here is that the yearbook does not report the exact date of the operation. At best, the month is specified, but sometimes the year is the only information available. One could try to detect the jumps with econometrical methods (see for example Barndoff-Nielsen and Shepard, 2006), but the period under study is known to be quite volatile because of several reasons and in particular the Great Depression.²⁶ Moreover, these econometric methods are used to detect uncertainty shocks, while we want to capture mechanical jumps due to capital operations. Instead, we have detected jumps by identifying the date when the biggest monthly variations for each stock occurred and compare it with the date of the capital operation. To make sure we are not mistaken, we have also checked the dates by using the official list. We know that when such operation occurs, the stock appears on the official list on two distinct lines (one coupon attached, the other coupon detached) for at least two weeks. As we said earlier, during this time span, there is always an *Avis et Décisions* detailing the operation's modalities (issuing price, number of old shares and new shares, etc.). This allows us to calculate the adjustment coefficient and to know when we need to compute the "new" number of shares in our series.

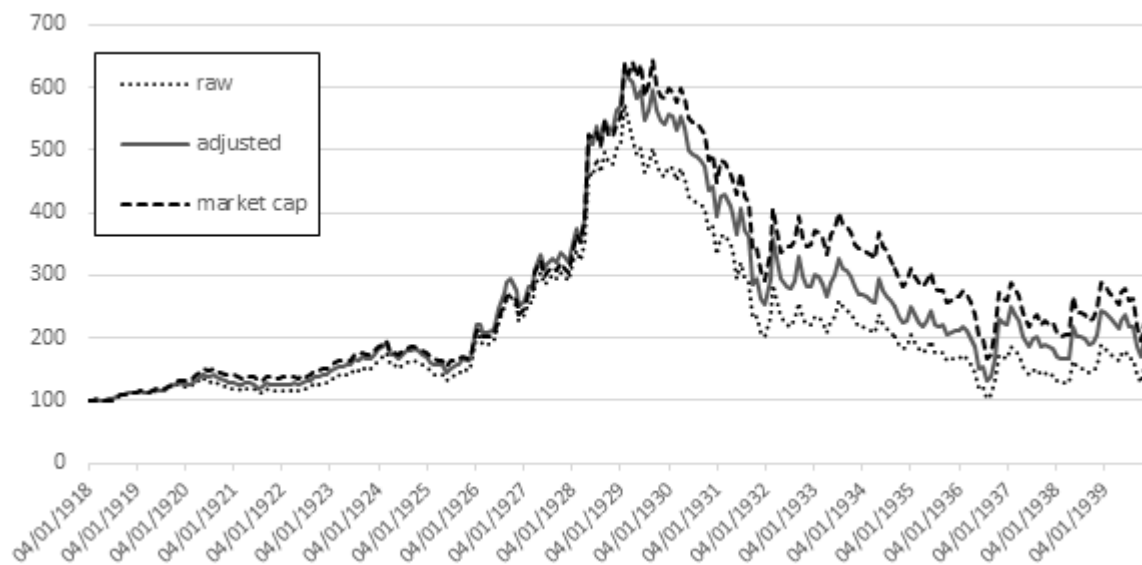
Table 1.B.1 in the Appendix reports the type of operation and the corresponding adjustment coefficient for our sample.

Figure 1.3 reports the index computed in three different ways: i) by adjusting prices; ii) by adjusting market capitalization and iii) without any adjustment.

It is interesting to note that during the boom phase up to 1928, the series track each other remarkably well. However, during the year 1929, when capital stock increases are operated by 6 of our 10 banks, we observe an average spread between the raw prices and the adjusted

²⁵Actually 8 banks because neither the Banque de France nor the *Banque d'Algérie* did operate on their capital stock.

²⁶Mathy (2014) does the exercise on the Dow Jones during the Great Depression.

Figure 1.3: Top Ten French banks during the interwar

Notes. All series are expressed in basis 100 at the beginning of the period in 1918. **Sources.** Authors' calculation

prices of approximately 100 basis points. Then, the downward bias of the non-adjusted series is well illustrated and shows that the boom would have been under-estimated if only raw prices had been used.

A second observation can be made on the indices in level. We can see that if a capitalist invested 100 Francs in 1918, he would have obtained different returns in 1939 depending on the adjustment method. Results are depicted in the following table.

Table 1.1: Outcome of 100 Frs. invested in 1918

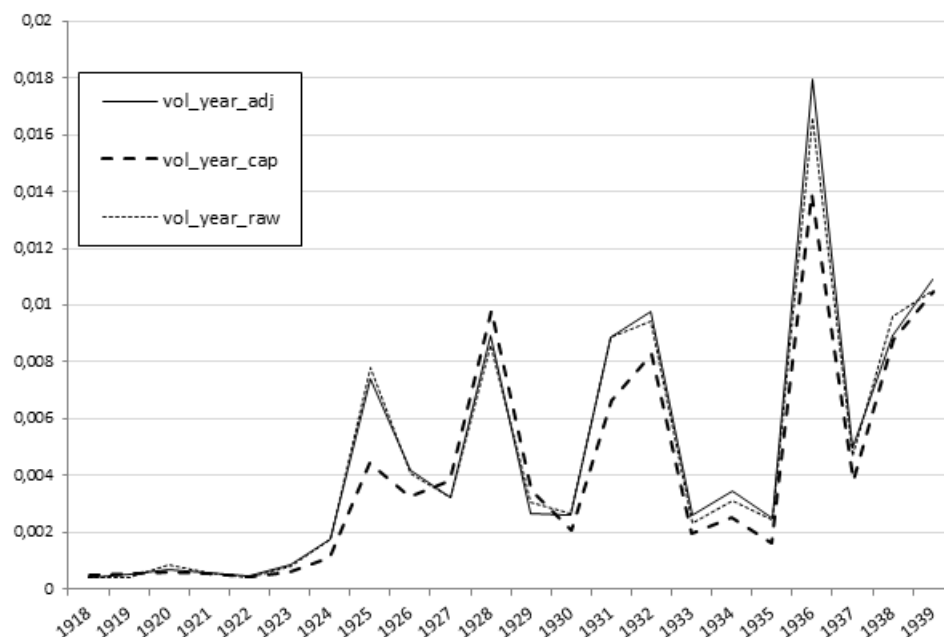
DATE	RAW	PRICE-ADJUSTED	MARKET CAPITALIZATION
1918	100	100	100
1939	181.2	243.7	267.2

Table 1.1 shows clearly that the gains are underestimated when prices are not adjusted. Indeed, the index weighted by capitalization performs better than the un-weighted / price-adjusted one. Another observation can be made with regards to the reversal date. For both the raw and the price-adjusted indices, the date when stock prices start to decline occurs on February 1929. For our weighted index, the highest level of prices appears in September 1929.

We log-differentiate the series in order to get the returns for the raw (R_{raw}), the price-adjusted (R_{adj}) and the capitalisation-weighted (R_{cap}) indices. We also divide our sample in two sub-periods: the bull market up to mid-1929 and the bear market from mid-1929 to the end of 1939. A quick look at the descriptive statistics (reported in Appendix A) confirms our previous observations. In level, the mean of both returns is almost null over the full sample, positive during the first sub-period and then negative from 1929 onwards. The skewness coefficient is also consistent with our periodization: almost equal to 1 during the entire period, around 2 during the first sub-period and inferior to 1 during the second sub-period. The kurtosis coefficient is always above 3, which suggests that the distributions are all leptokurtic (i.e. the probability of extreme events to occur is higher than for a Gaussian). Such a result is quite usual in financial series. However, when we look at the sub-samples, the kurtosis coefficient is higher during the 1920s than during the Great Depression, meaning that the probability of extreme events was higher when stock prices were increasing.

Finally, we examine the volatility of these three indices. We calculate the realized volatility from the annualized squared log returns of the three indices. Figure 1.4 plots yearly realized volatility for the three indices.

Figure 1.4: Volatility yearly average



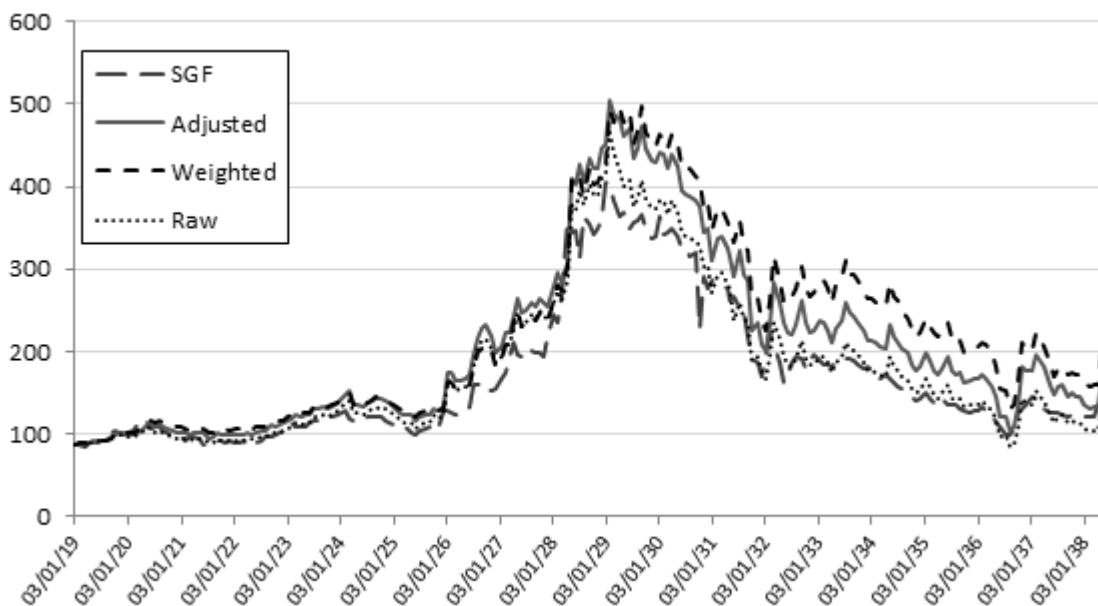
Notes. Sources. Authors' calculation

The volatility of the capitalization-weighted series is below than the two equally-weighted series. This result is consistent with the intuition that smaller capitalizations are more

volatile on average. It is an important feature because the best composite index representing the overall market for the Paris Stock Exchange during the interwar is the blue chips, capitalization-weighted index of Le Bris and Hautcœur (2010). So in order to make comparisons, portfolio modeling or, for example, to calculate abnormal returns, it is more relevant to use also a capitalization-weighted index for the banking sector.

For a matter of comparison, we also collected the SGF index for banks, including more stocks (13 until 1932, 20 thereafter). Figure 1.5 plots our three indexes and the SFG index. Years 1918 and 1939 are not reported because of a lack of sources, the rest has been hand-collected. Data are reported on the basis of 1913 equal to 100.

Figure 1.5: Comparison with former SGF index



Notes. The reference date is 1913 in order to allow for a meaningful comparison with the SGF. **Sources.** Author's calculation and the *Bulletin de la Statistique Générale de France* (various issues) for the SFG index.

Surprisingly, the SGF index is closer to our non-adjusted series. Since the SGF prices are supposed to be adjusted, it means that smaller capitalizations performed less well than the top capitalizations of the sector, which is confirmed by the fact that our weighted series is higher in level than our price adjusted (but equally-weighted) series.

1.6 Conclusion

In this chapter, we have proposed a method for collecting and analyzing historical stock prices movements. After describing the main historical databases for financial series, we have focused on the French stock market during the interwar. We have detailed the primary sources which essentially come from archival sources of the Paris Bourse and which provide high quality data. We also have proposed two different adjustment techniques in order to adjust data for capital operations. The outcome of this work is the construction of two adjusted indices for the French banking sector from 1918 to 1939: one equally-weighted, the other weighted by market capitalization.

What are the implications of adjusting stocks indexes to account for market capitalization? One important finding is that the boom and investment gains during the interwar period tend to be under-estimated if raw prices are used. Another implication is that the capitalization-weighted series has a weaker volatility, compared to the two equally-weighted series.

Appendix

1.A Descriptive statistics

Table 1.A.1: Descriptive statistics

	FULL SAMPLE: 1918-1939			BULL PERIOD: 1918-1929			BEAR PERIOD: 1930-1939		
	R_{raw}	R_{adj}	R_{cap}	R_{raw}	R_{adj}	R_{cap}	R_{raw}	R_{adj}	R_{cap}
Mean	0.0026	0.0034	0.004	0.012	0.013	0.014	-0.079	-0.008	-0.073
Min	-0.233	-0.233	-0.2	-0.1	-0.12	-0.09	-0.233	-0.233	-0.2
Max	0.32	0.32	0.297	0.281	0.281	0.296	0.32	0.32	0.25
Skewness	1.018	1.054	1.06	2.07	1.99	2.18	0.946	1.001	0.938
Kurtosis	7.78	7.53	7.09	12.89	12.64	13.15	5.03	5.86	5.46
Observations	253	253	253	137	137	137	116	116	116

1.B Banks considered

Table 1.B.1: Banks considered

BANKS	TYPE OF OPERATION ON THE CAPITAL STOCK	AMOUNT IN MILLION FRANCS	ADJUSTEMENT COEFFICIENT	DATES	DESCRIPTION	SOURCE
Crédit Lyonnais	Increase	153	1.446	03/1929	"En 1929, il a été porté à 408 millions par l'émission à 1000 francs de 300 000 actions A et de 6 000 actions B à 665 francs."	DF 1945
Société Générale	Increase	125	1.12	03/1929	"Porté en mars 1929 à 625 millions."	DF 1945, p. 303
Comptoir Nationale d'Escompte	Increase	50	1.077	1920	"Porté en 1920 à 250 millions."	DF 1945, p. 287
	Increase	150	1.4425	05/1929	"Porté en mai 1929 à 400 millions."	DF 1945, p. 287
Crédit Foncier de France	Increase	37.5	1.023	12/1920	"Porté à 300 millions en décembre 1920, par l'émission à 600 francs de 75 000 actions (...)"	DF 1945, p. 345
	Increase	75	1.15	06/1932	"Porté à 375 millions en juin 1932 par l'émission à 1 600 francs de 150 000 actions."	DF 1945
Banque de Paris et des Pays-Bas	Increase	50	1.2135	1919	"Porté en 1919 à 150 millions par l'émission à 750 francs de 100 000 actions."	DF 1945, p. 274
	Increase	50	1.132	1921	"Porté en 1921 à 200 millions par l'émission à 750 francs de 100 000 actions."	DF 1945, p. 274
	Increase	100	1.353	1929	"Porté en 1929 à 300 millions par l'émission à 1250 francs de 200 000 actions."	DF 1945
Banque de l'Indo-Chine	Increase	36	1.25	1920	"En 1920, le capital a été porté à 72 millions par la création de 48 000 actions de 500 francs dont 24 000 émises à 1 330 francs offertes aux actionnaires et 24 000 émises à 1 600 francs."	DF 1945
	Increase	48	1.66	07/1931	"Au 30 juin 1931, les actions existant alors ont été entièrement libérées par un appel de 25 francs et en juillet 1931, le capital a été porté à 120 millions par l'émission au pair de 96 000 actions dont 48 000 ont été réservées à l'État et 48 000 offertes aux actionnaires."	DF 1945
Crédit Commercial de France	Increase	40	1.5	1920	"Porté en 1920 à 120 millions par l'émission à 575 francs de 80 000 actions nouvelles (assemblées générales des 30 avril 1919 et 21 février 1920) ."	CAC 1918-1921 T1, p. 608
	Increase	55.2	1.1495	02/1929	" Porté en février 1929 à 210 millions, par l'émission) 1000 francs de 102 400 actions O et de 8000 actions P nouvelles. "	DF 1945, p. 288
Banque de l'Union Parisienne	Increase	20	1.208	1919	" Porté en 1919 à 100 millions. "	DF 1945, p. 279
	Increase	50	1.1	1920	" Porté en 1920 à 150 millions."	DF 1945, p. 279
	Increase	50	1.214	1929	" Porté en 1929 à 200 millions. "	DF 1945, p. 279
	Decrease	195.8	0.66	1934	" Ramené en 1934 à 104 200 000 francs. "	DF 1945, p. 279
	Increase	100	1.57	1934	"Porté aussitôt à 200 millions par l'émission à 535 francs de 200 000 actions nouvelles à 525 francs, réservé aux porteurs à raison d'une action nouvelle pour deux anciennes. "	DF 1945, p. 279

1.C Capital operations

- Forward and option prices

Figure 1.C.1: forward and option prices on the official list in 1930

DÉSIGNATION DES VALEURS	- Jouissance courante	COMPTANT	COURS DU TERME				JOURS DE LIQUIDATION							
			Reporté Liq. à l'autre	Cours de coupon	Cote de la veille	1 ^{er} cours	Plus haut	Plus bas	Dernier cours	De 15 Janv. - Reporté... 15 Janvier	De 15 Janv. - Débiéurs... 15 Janvier	De 21 Janv. - Reporté... 21 Janvier	De 21 Janv. - Débiéurs... 4 Février	
FONDS D'ÉTAT FRANÇAIS 3 %	janvier 30	88 75 70 75 80 80 70 75 80 85 65 70 80	0 135	89 70	88 35	en liquid.	88 30	88	85 60	88 60				
			...	...	...	au 31	88 30	88	85 60	88 60				
			...	...	...	Pr. au 31	88 30	88	85 60	88 60				
			...	...	...	Pr. au 15	88 30	88	85 60	88 60				
			...	...	...	Pr. au 15	88 30	88	85 60	88 60				
			...	...	...	Pr. au 31	88 30	88	85 60	88 60				
			...	...	...	Pr. au 15	88 30	88	85 60	88 60				
			...	...	...	Pr. au 15	88 30	88	85 60	88 60				
			...	...	...	Pr. au 15	88 30	88	85 60	88 60				
			...	...	...	Pr. au 15	88 30	88	85 60	88 60				

Prices in the red frame are forward prices. Only one price is reported for the upcoming settlement date, whereas four prices are reported for the following settlement date ("au 31"): opening, higher, lower and closing price.

Prices within the blue frame refer to the option market. Here the reading is trickier. As for the forward market, each line corresponds to a settlement date. But in order to read the prices, one must not refer to the column's names. Prices should be read by couples: for example, the two prices framed in yellow are lower and higher price for an option of 1 franc and for the settlement date of the 31st of the current month.

- Consequence of a capital increase on the official list

Here we illustrate what happens on the official list when *Crédit Lyonnais* increased its capital in 1929.

↪ Before the operation, there is one line for the stock with coupon attached.

Figure 1.C.2: Quotations for the *Crédit Lyonnais*' stock on March the 6th

Lyonnais, act. A 500 fr., t. p. (ex-c. 65)..	25 sept. 28	4375	4370	4360	4350	4335	4330	4325	4320	4310	4300
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↔ The day the operation begins, a new line appears with coupon detached. The two lines will remain until the subscription is closed on March 11th.

Figure 1.C.3: Quotations for the *Crédit Lyonnais*' stock on March the 7th

Lyonnais, a. A 500 f., t. p. (dr. etc. 66 att) ○	25 sept. 28	4295	4285	4280	4275	Jusqu'au 11 mars inclus						
(ex-droit, ex-c. 66).	25 sept. 28	...	4270	4260							

↔ The day after the subscription is closed, only the line with coupon detached remains:

Figure 1.C.4: Quotations for the *Crédit Lyonnais*' stock on March the 12th

Lyonnais, a. A 500 f., t. p. (ex-dr., ex-c. 66) ○	25 sept. 28	3315	3310	3305	3300	3275	3265	3275		
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Chapter 2

The reaction of the Paris bourse to the US crashes: 1929 and 2008*

Abstract

We compare the reaction of the Paris bourse to the US crashes during both the 2008 and the 1929 crises. Accordingly, we propose a new dataset of daily French stock prices from February 1929 to March 1930 that we combine to the already existing daily series of the Dow Jones. We also use newspapers and minutes from the Banque de France and from the Paris Stock Exchange's brokers syndicate in order to confront quantitative data with historical narratives. We finally run contagion tests in both periods, using adjusted correlation coefficients to test for pure contagion. In 1929, the Paris stock market does not exhibit any reaction to the New-York crash, while there is strong evidence of a clear contagion in the recent crisis. Our results then highlights a significant difference between the two crises and provides strong evidence that the Great Depression spread to other countries through other channels than stock markets.

JEL Classification: G01, G15, N22, N24

Keywords: Financial contagion, Global financial crisis, Stock markets

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2.1 Introduction

The world has been affected by an economic and a financial crisis that started in 2008 in the US stock markets and then has spread all over the world. Most of the economists quite agree that the only comparable crisis is the Great depression of the 1930s (Eichengreen and O'Rourke, 2009; Bordo and James, 2010; Almunia et al., 2010; Fratianni and Giri, 2015). Like the Great Depression, the financial crisis in 2008 also started in the US before spreading all over the planet. But, focusing on France, this paper shows that the two phenomena exhibit a crucial difference: the French stock market remained perfectly insensitive to the US crash in 1929 while it slumped in 2008. This absence of contagion is consistent with the low integration of the two markets we document in 1929 despite the importance of capital and commercial flows between the two countries. As a consequence, the channels of propagation to the rest of the world of the two US crisis are different.

The US stock market crash is usually seen as the starting point of the Great Depression. But the channel(s) through which the US crash propagated to other countries, especially to France, is still an open question. A large part of the debates about the Great Depression has to do with the reasons and mechanisms of this propagation. A first commonly accepted explanation lies in the fixed exchange rates of the Gold Exchange Standard leading to a transmission of negative demand shocks (see for instance Eichengreen, 1992). The financial contagion is also suspected to propagate shocks from one market to another (see Temin, 1993). However, to the best of our knowledge, it seems that up to now, no study has been dedicated to investigating whether such a transmission channel was at play, except on inadequate monthly data. This lack of evidence can be easily explained by the fact that daily data are difficult to collect in order to observe the short term reactions of foreign stock markets. Thus, even implicitly, most of the existing literature precludes the stock market as an important channel of transmission. It has become more problematic since the crisis of 2008 exhibits a very strong correlation among international stock markets after the outbreak of the US crash.

France was one of the most impacted countries by the Great Depression with a fall of about one-third of its industrial production. The devaluation of the Sterling in September 1931 has been seen for quite some time as the true starting point of the local version of the Great Depression (Sauvy, 1984). A propagation of the US crash in France could be suspected in 1929 for several reasons. France and US are often seen as having shared similarities at the

eve of the Great Depression, such as sharp accumulation of gold and declining consumer prices. The commercial trade between the two countries was as important before 1929 than before 2008. Capital flows were also very large without any capital control. Moreover, during the 1920s, the French stock price enjoyed a rise similar in magnitude to the one observed in New-York.

In this paper, we carefully investigate the short term reaction of the Paris Bourse in the six months following both the US crashes of October 1929 and Lehman failure in 2008. To measure accurately the behavior of the French market in 1929 we build a new dataset of daily stock prices collected at the archives of the French Bourse (conserved at the French Ministry of Finance). Our results show that the the French stock market remained surprisingly stable during the 1929 US crash. This stability assertion is supported by four kinds of evidence: (1) a descriptive measure of the stability of the French market prices during the US crash, (2) the absence of any structural breaks in the French series in 1929, (3) the stability of the volumes traded in Paris and (4) several narratives of the practitioners of that time.

These evidences provide a clear demonstration that the propagation of the Great Depression is not the result of a contagion of the stock market crash. Thus, we lend support to the view that the Great Depression has not be transmitted through stock markets. To our best knowledge, it is the first study aiming at proving the absence of any contagion of the Wall Street crash to Europe, using data on a daily basis.

A second contribution of our paper is the characterization of the relationship between the French and US markets which provides a preliminary investigation of the reasons to explain the different reactions to the two US crashes. Previous studies indicate important differences in the behavior of the two markets. The US market exhibits a strong volatility during the Great Depression compared to the stable level reached after this period (Schwert, 1997). In France, the highest level of volatility is experienced ten years later, at the end of the World War II (Le Bris, 2012).

Using our daily dataset, we investigate more deeply the relationship between the two markets in both 1929 and 2008. There is no doubt that the US stock market has affected the French one in the recent period but it is less clear in 1929. Despite the leading role of the US economy at that time, the two markets remain broadly independent. We do observe an

influence of the US market on the French one but this influence remains weak. Our evidence supports the findings of Mauro et al. (2002, 2006) that the modern global financial system suffers from contagion whereas the historical financial system of the pre-world War I era was less prone to it. We show that it is still true during the interwar period, at least between the US and France.

An important implication of our research concerns the relevance of comparisons that have flourished since 2008, between these two historical financial crises. Most of these studies stressed the similarities between the two episodes. For example, Peicuti (2014) makes an interesting list of analogies, highlighting some stylized facts that show the parallels between the periods 1921-1929 and 2001-2007. In particular, the rapid growth without contraction, the increase in global liquidity and the absence of inflation are common to both France and the US for those periods.¹ Moreover, the international spillover effects are a strong common feature of both crises. Grossman and Meissner (2010) also compare the two international crises and try to draw lessons from them in terms of both trade and financial linkages, although without empirical tests. More recently, Mehl (2013) conducted an empirical analysis to assess the role of global volatility shocks, using monthly data spanning from 1885 to 2011. One of his results is that the two most severe global stock market volatility shocks are the late October 1929 stock market crash at the NYSE and the collapse of Lehman Brothers in 2008. Our paper tempers the similarities between the two crisis highlighting one crucial difference which is this absence of any contagion from the US to France (and one could generalize to continental Europe) after the 1929 Wall street crash.

The remainder of this paper is organized as follows. After a presentation of the historical context in section 2, the dataset is described in Section 3. In Section 4, we highlight four lines of evidence that demonstrate the absence of any specific movement in the French stock market in 1929. After a brief survey on the contagion literature, we test for the presence of contagion after the crash at the NYSE in both 1929 and 2008 in section 5. Accordingly we estimate VAR / VECM models in order to characterize the relationship between the French and the American stock price indexes. Our results show a clear contagion in 2008 but not in 1929. Section 6 concludes.

¹France actually experienced inflation in the early 1920s, but it stopped in late 1926 after the *de facto* stabilization of the Franc.

2.2 Historical background

Several characteristics of the 1920s context suggested that the US crash could have found an echo in France. France is often seen in a position similar to the US and sometimes as co-responsible for the Great Depression; "For the positive question of what caused the Depression, we need only note that a monetary contraction began in the United States and France, and was propagated throughout the world by the international monetary standard" (Bernanke and James, 1991). The two countries were accumulating gold at the end of the 1920s; France controlled 17 % of the world's gold reserves in 1929 compared to only 7 % in 1925 (Irwin, 2010). Indeed, the French franc returned to a form of gold standard in 1926 at an undervalued rate. As a consequence France enjoyed "excessive" trade surplus paid in gold leading to an "excessive" accumulation of gold. The two countries suffered from "self inflicted" price contractions at the eve of the Great Depression with a fall of wholesale prices of 11 % in France between January 1929 and January 1930 and of 4 % in the US (Bernanke and James, 1991). This initial "favorable exchange rate" of the Franc in the Gold Exchange Standard did not prevent France from strongly suffering from the Great Depression; the French industrial production of 1937 was 28 % lower than the one observed in 1929 (Landes, 2000 p. 534).

A second reason to expect a transmission of the US crash to France in 1929 lies on the strong commercial links between the two countries. Indeed, trade flows between the two countries were about the same in 1929 than in 2007. In Table 2.1,² we report the the importance of bilateral trade between the two countries, for 1929 and 2006.

Table 2.1: Importance of bilateral trade between France and the U.S.

	1929 (in billions FRF)	2006 (in billions \$)
Exports to US	3,33	37,04
Imports from US	7,16	23,51
Imports + Exports (I)	10,49	60,55
French GDP (II)	378,66	2325
Importance of bilateral trade (I/II)	2,77%	2,60%

²We collected the French imports-from and exports-to US in 2006 (US census) we sum these two amounts and divide by the French GDP to obtain a measure of the importance of bilateral trade. The same is done for 1929 using commercial data from the SGF (1931).

The importance of the trade with the US was slightly higher in 1929 (2.77 % of the French GDP) than in 2006 (2.60 %).

A third reason can be found in the situation of the French stock market in 1929. During the 1920s the French stock market exhibited an increase in nominal terms comparable to the one observed in the US. Studying the international correlations among the major world equity markets over 150 years, Goetzmann et al. (2001) showed that the correlation between Paris and New York's equity markets during the interwar reached the second highest level just after the recent period. Indeed, after 1921, the two markets both followed an upward trend that remained uninterrupted after 1925, exhibiting roughly the same magnitude (151 % in New-York and 134 % in Paris between January 1926 and October 1929 according to the S&P and the Historical CAC 40). Moreover, Paris was not a small peripheral market but was seen in the early 1930s as the most important financial place of continental Europe (Jacques, 1932).

A last reason stands in the importance of capital flows between the two countries. Our present study ends in the early 1930s, when controls on capital flows were not that important, allowing large international flows (Obstfeld and Taylor 1997, Mitchener and Wand-schneider 2014). In fact, capital controls were introduced in 1931 and afterwards, when the UK went out of the gold block and imposed controls on foreign exchanges. Apart from standard foreign direct investments, there were also financial flows resulting from the debt of WWI. According to Keynes (1978),³ the total amount of the debt that France was supposed to reimburse to the US after WWI reached 485 millions sterling pounds, which represented roughly one third of the total European indebtedness toward the US. The big picture was that France received German payments and then used this money to reimburse the loans granted by the US as planned by the Dawes (1924) and the Young (1929) plans. France, the second-ranking debtor, did not do anything until 1926, and in the five following years disbursed on average \$32 million per year to the United States government.

³The Collected Writings of John Maynard Keynes, Vol. 16, p. 420.

2.3 Data

Regarding French stock prices during the interwar period, only monthly data are available. The two most common sources are the stock price index of the League of Nations and the one of the *Statistique Générale de la France* (i.e. the National Institute for Statistics). Both of those indexes are unweighted. More recently, Le Bris and Hautcoeur (2010) have constructed a Blue Chips index of French stock prices weighted by market capitalization over 150 years, but the frequency is also monthly.

To build the French market daily prices of 1929, we collected daily spot⁴ prices for forty individual stocks listed at the official list⁵ of the Paris Bourse. Those stocks are the forty highest market capitalizations at the beginning of 1929 as identified by Le Bris and Hautcoeur (2010). Our dataset covers the period from February 1929 through the end of March 1930.

We reconstruct a blue chip weighted index, HCAC 40 (H for Historical), for which the daily return is given by:

$$R_{HCAC_t} = \frac{\sum_{i=0}^{40} \text{number of share}_i \times \text{price of share}_{t+1}^i}{\sum_{i=0}^{40} \text{number of share}_i \times \text{price of share}_t^i} - 1$$

For each stock,⁶ we collected the daily closing price. If a stock has no transaction price for a given day, we use the last transaction price. It allows to avoid fluctuations due to a lack of liquidity. Indeed, if we do not report the last transaction price, we will get a negative return of 100% every time the stock is not traded.

This index allows us to interpret most of the movements of the French equity market since the aggregated market capitalization of our forty firms represents around 60% of the total market capitalization of the Paris Bourse at this time (Le Bris and Hautcoeur, 2010). A blue chips index does reflect the overall market (Annaert and al., 2011). The daily data of 2008, spanning from May 2007 up to August 2009, are from Euronext CAC 40. We

⁴The Paris Stock Exchange had already a forward market and an option market but we only collected prices for the spot market.

⁵There was already an OTC market inside the Paris Bourse, but all the data we collected only concerns the official market.

⁶The complete list of stocks we used are reported in Appendix 1.

checked whether our index could be biased since some companies might be more prone to international fluctuations than others. Typically, the banking sector could suffer more from exogenous shocks like the Great Crash of October 1929, than companies which have their business totally located in France (e.g. railroads). For that matter, we also computed indexes on the sectoral level (reported in Appendix 1) by distinguishing a banking index, that includes all of the nine banks we have in our database, and a "French only" index that include railroads, utilities and coal mines firms. Figure 2.A.2 presented in Appendix 1 shows that the trends seem to be similar between the two sub-indices and the aggregated one. This result is also confirmed by testing for differences between means and variances of the returns on stock indexes.⁷

For U.S. data, we use the Dow Jones Industrial index. While 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 short term movements. Additionally, it is the single source of daily data for the 1929 period. We also take the Dow Jones for the recent period in order to have the same measure in both periods.⁸

2.4 1929 in the French stock market: a peaceful period

We present a set of stylized empirical facts to demonstrate that the French stock market was not affected by any specific phenomenon in 1929.

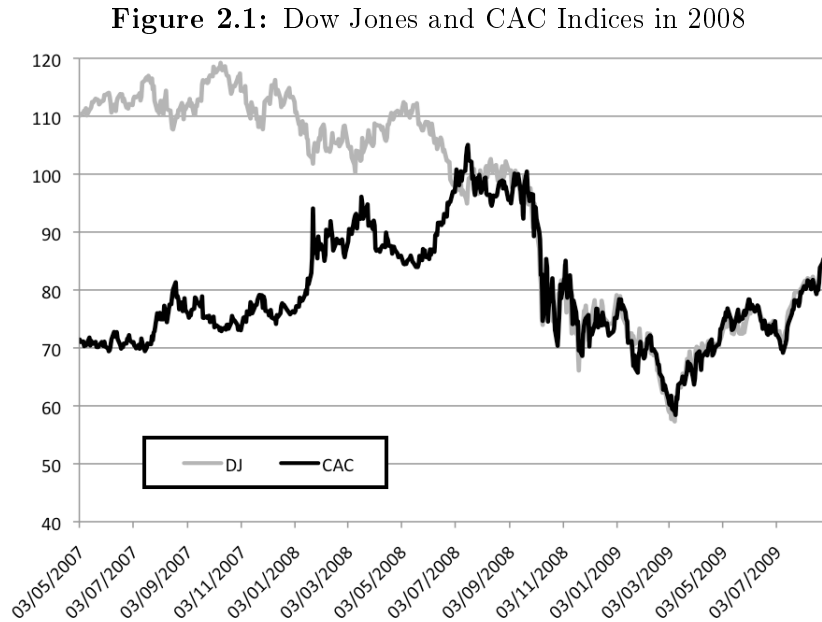
2.4.1 Descriptive analysis

It is well-known that the French market, like other international markets, closely followed the US crash after the failure of Lehman brothers (Figure 2.1). Despite few differences in the behaviours of the two markets in the previous months, we graphically identify that the two markets evolve closely after the Lehman failure.

The story is really different when we look at the 1929 case (Figure 2.2) since no shock occurred on the French stock market after the crash at the NYSE. It is quite surprising to observe that even the worst days in the NYSE seems to have no impact on the Paris'

⁷Results are reported in Table 2.A.2, in Appendix 1.

⁸We checked if the results would be different by taking the S&P 500, but the correlation between the S&P and the Dow Jones is 0.99 for the period.



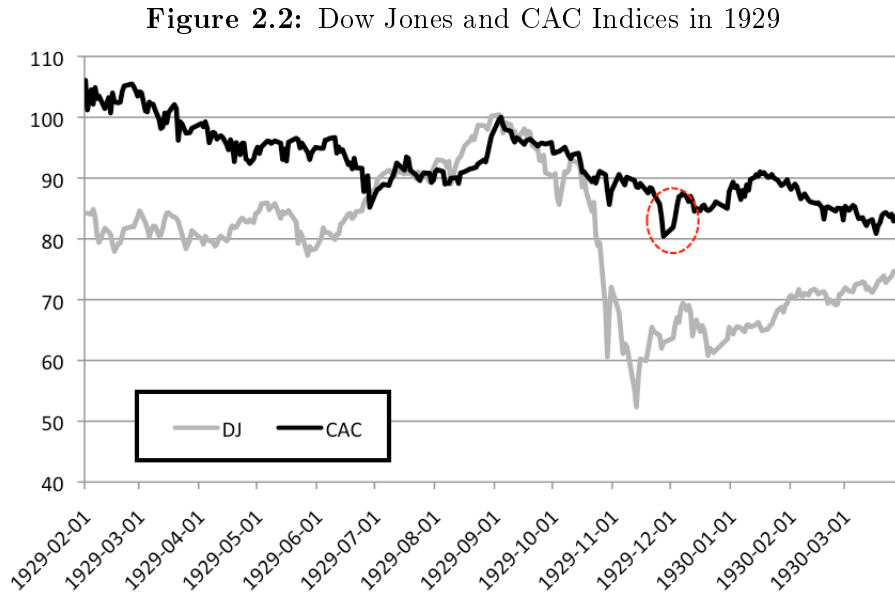
Notes. Base 2008M09=100. **Source.** Dow-Jones, Federal Reserve of Saint Louis; CAC, calculation from authors.

market; 1929 October 28, the Dow Jones fell by 13.47% while the French index decreased only by 0.60% and 2.99% the day after when the Dow Jones suffered another fall of 11.73%. After these two days, the loss reached 23% in New-York and only 5% in Paris. The only sharp decrease that we can observe is in late November (red dashed circle), so more than a month after the crash. This absence of any contagion of the US crash is really different from what was observed during the last financial crisis.

In Appendix 2 are reported the graphs of the returns on the indexes in both periods. We easily observe that the magnitude of the volatility of the French index in 1929 is much lower than the American one. It is quite different in 2008, where the magnitude of the volatility is very high for both indexes. Moreover, we can see volatility clusters in each graphs but the French index in 1929, the Historical CAC 40 does not exhibit any particular volatility structure, whereas recent financial series are featured by asymmetric volatility.

2.4.2 1929 in France does not exhibit any structural break

A more formalized test to check the presence of a specific activity in 1929 in France is to compare the stability of the parameters when we model the stock returns. As in recent



Notes. Base 1929M09=100. **Source.** Dow-Jones, Federal Reserve of Saint Louis; CAC, calculation from authors.

series, unit root tests⁹ (not reported) lead us to use returns, rather than the series in level to get stationary series. A first glance at the data indicate that the volatility of the returns does not seem to have a particular structure: the high volatilities are not clearly followed by other high volatilities and it is the same for low volatilities. It seems then legitimate to use linear specifications.

We use the Box and Jenkins (1970) methodology in order to specify the best ARMA process to model R_{CAC_t} . We estimate an autoregressive process at the order 1 (AR(1)):

$$R_{CAC_t} = \alpha_0 + \beta_1 R_{CAC_{t-1}} + \varepsilon_t \quad (2.1)$$

Table 2.1: Results

Variables	Coefficient	Std. Error	<i>t</i> -statistic	<i>p</i> -value
α_0	-0.0005	0.0006	-0.8051	0.42
β_1	-0.2299	0.0555	-4.1394	0.00***

Notes. *** denotes significance at the 1% confidence level.

⁹ADF and Perron tests have been used to detect the trend for both series. Results show that they are all I(1).

The estimation output shows that the estimated β_t is significant. Moreover, after testing for the absence of autocorrelation and homoscedasticity¹⁰ on the residuals, we find that ε_t follow a white noise. It is important to notice that we do not detect any ARCH effect, which is usually the case for equity returns (especially at a daily frequency). This feature allows us to test for the stability of the parameters. Indeed, since there are no issues on the residuals, we are able to apply a basic Chow test by estimating the model (2.1) in two sub-samples, before and after the crash at the NYSE in late October 1929.

Table 2.2: Chow Breakpoint Test: 10/28/1929

F -statistic	Log likelihood ratio	Wald Statistics
2.63	5.29	5.26
(0.073)	(0.071)	(0.072)

Notes. Sample: 2/05/1929 - 2/31/1930. p -values are reported in parentheses.

The p -value of the F -test $(2,296) = 0.0736 > 0.05$: the null hypothesis is rejected at the 5% confidence level. The parameters are stable before and after the crash. The crash in New-York has no effect on the nature of the stock price variations in Paris. As a robustness check, we applied the Bai and Perron (2003a) breakpoint test that has the advantages of (i) relaxing the assumption of a known breakdate, in addition to (ii) allowing for multiple breaks. Again, the test confirms the Chow test, there are no breakpoints evidenced. Results can be found in Table 2.B.1, in the Appendix.

2.4.3 The volumes traded in the Paris bourse remain stable

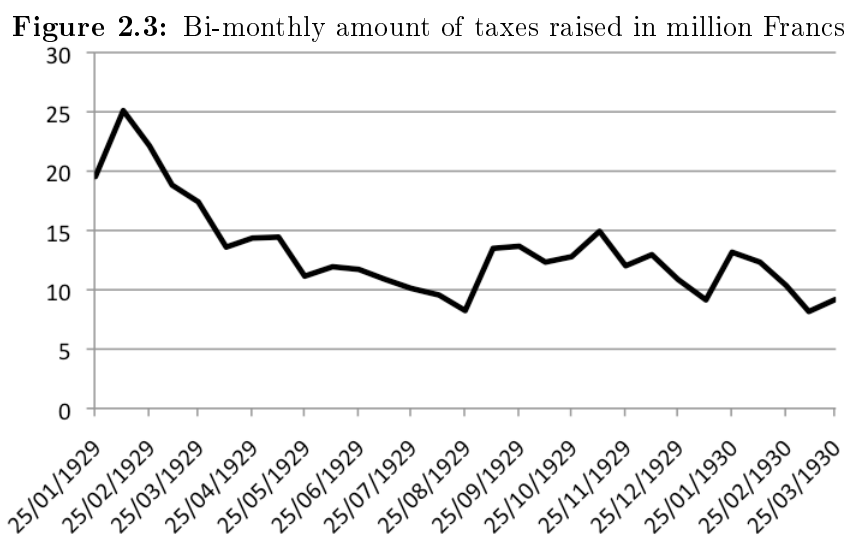
A third evidence of the absence of any specific phenomenon in France in 1929 is the stability of the trade volumes. The increase of the quantity of stocks traded in NYSE during the crash is a common knowledge. Even in the absence of a violent price movement in France the US crash could have had consequences in the French market through specific movements leading to a rise of the volumes traded.

When researchers in history of finance study the Paris Bourse, a prominent weakness is the lack of data about the volume traded. We tried to solve this issue by collecting two series that we take as proxies for the volumes: the tax on financial transactions and the amount of *compensations* reported by the brokers. However, both series have several limits that we

¹⁰We used a Ljung-Box test based on the correlogram of the residuals to detect the presence of autocorrelation and an ARCH test for the homoscedasticity.

discuss below.

The first one relates to the tax on financial transactions which is available on bi-monthly basis. The tax levies a fixed rate on the total volume traded at the Paris Bourse for securities listed on the official list, for both the spot and the forward markets. Since we only have spot prices, linking spot prices to this proxy of the volume traded can result in a potential upward bias that is difficult to estimate. We can assume that this bias is constant overtime. Moreover, the two series have not the same frequency: our stock prices are daily and the tax is only available every two weeks. Figure 2.3 exhibits this series:

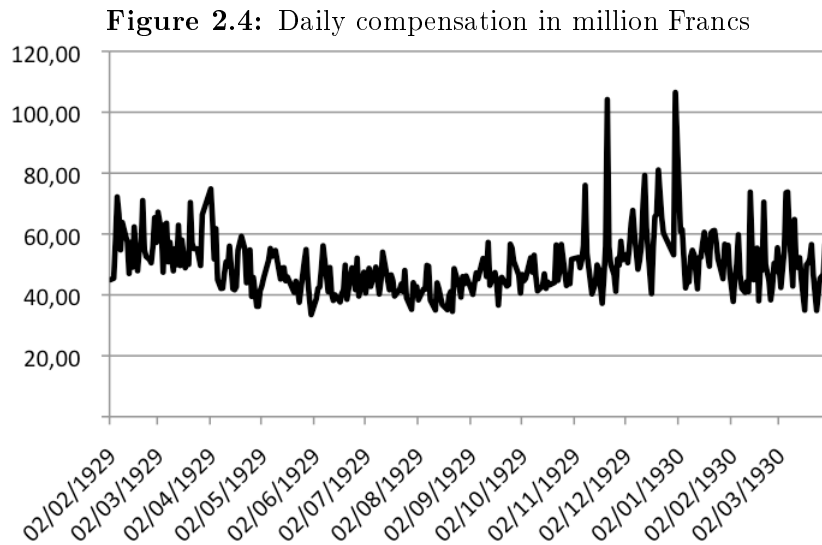


Source. Authors.

Our second proxy for the volume traded is the daily amount of *compensations* reported by the *Service des compensations*.¹¹ This serie is available on a daily frequency and moreover, it only concerns the spot market. Nevertheless, there is another potential bias, once again very hard to estimate. When a broker executes an order for a client, another broker has to compensate for the amount of the transaction, by an order of his own clients that goes on the opposite way. But if a broker has already two clients giving him opposite orders, he can compensate by himself and then does not have to ask a colleague. In this case, the compensation is not reported in the brokers company's balance sheet.¹² This also constitutes a downward bias but we can again assume that it is constant over time. Figure 2.4 illustrates this series:

¹¹At the Paris Stock Exchange, both the delivery of the securities and their payments were centralized by the *Service des compensations* after each trading sessions in order to limit cash transportation.

¹²Until 1987, a brokers company called *Compagnie des Agents de Change* had the monopoly on all the transactions at the Paris Bourse, but the institution had to remain accountable by the State.



Sources. Authors' calculation.

We can see that the volumes are pretty stable except for the end of the year 1929 where some pics appear in November and December, so few weeks after the crash at the NYSE. The first peak occurs on November 21st and could be explained, as we will see in the next subsection, by a wave of sale orders for foreign accounts. This seems to indicate some sort of lagged impact on the Paris Stock Exchange, corresponding to the only sharp decline in the French stock prices we can observe on Figure 2.2. The second peak corresponds to the last trading day of the year on December 31st. According to the newspaper *Le Temps* of January 1st, this trading session is featured by massive sales of industrial stocks, in particular in the electricity sector.

2.4.4 Narratives of practitioners

In this subsection, we look in financial newspapers and in the archives of both the minutes of the *Banque de France*, and the *Compagnie des agents de change*. We also looked at some research papers published by French economists at the time. The aim is to check if the story told by the contemporaries fits with our three quantitative evidences previously exposed.

Jean Dessirier (1930), a famous French analyst of the stock exchange, noticed that French asset prices did not follow the downturn of US equity prices. He insisted on the French monetary situation, featured by "the maintenance of an easy monetary situation, despite

the international tension". He explained that the French stock market hung on because of the nature of French investors compared with the American investors, much more prone to speculation.

The French monetary situation of the late 1920's and the early 1930's has been much studied in the literature about the Great Depression and its links with the Gold Standard.¹³ The macroeconomic environment was marked by an increasing amount of gold reserves during the period 1927-1932, while the authorities kept the monetary base stable by increasing the cover ratio (Irwin, 2011). We have looked at the bi-weekly reports of the board of governors of the *Banque de France* over the period and found some interesting statements. Indeed, Emile Moreau explicitly warned against the monetary circulation movements in early 1930¹⁴ and especially in terms of gold inflows coming from abroad. In May 1930, he even planned to decrease the discount rate after the Bank of England decreased its own, in order to prevent additional gold inflows. This suggests that monetary authorities were most concerned with price stability.

We also looked at the bi-monthly minutes of the *Compagnie des Agents de Change*. The only bear market they mentioned occurred on December the 5th. However, they do not explain the reasons of this downturn. They only focus on the announcement made by the new government that the fiscal surplus will be invested in the economy and therefore that there were no reasons to be pessimistic.

Finally, we went through financial newspapers in order to find some citations that would explain the price movements observable on Figure 2.4, as well as the decrease in the prices depicted on Figure 2.2 (dashed circle). We can read in *Le temps* of November the 18th that "rumours on failures in Germany did participate, to a certain extent, in the fall of the prices" and that "before going back to business, the Paris' Bourse is waiting to know the evolution of Wall Street". These quotes suggest that what happened in other financial places seemed to influence the behaviour of investors in Paris at that time. However, and more interestingly, the editions of November 21st, 22nd, 26th and 27th all present the same explanation for the slump of late November: a wave of sale orders coming from foreign accounts, "in particular from Germany and Eastern European countries". However, they pointed out that those

¹³We can cite, among others, Hamilton (1987), Bernanke and James (1991), Eichengreen and Temin (1996), Irwin (2012).

¹⁴See bi-weekly minutes of the *Banque de France* from 1930/01/02; 1930/01/23; 1930/01/30; 1930/02/20; 1930/03/20.

sales were quite well absorbed by French investors, which is confirmed by our data because the prices do not fall very sharply and for a short period. However, it is also mentioned that the monetary situation is playing a large part in the the favourable performance of the stock exchange: "The widecomfort of the monetary situation appears, regarding the stock market, at the same time than the excellent position of the stock exchange".

The study of those historical sources seems to confirm the descriptive analysis of our data. In the next section, we estimate and compare the relationship between the returns of the Dow Jones and of the CAC 40 in both periods.

2.5 The presence of contagion in 2008 but not in 1929

2.5.1 A survey on contagion

The concept of contagion has been widely studied in the economic and financial literature since the early nineties, mostly because of the succession of currency and banking crisis that occurred in emerging markets, such as Mexico in 1994, Thailand in 1997 or Russia in 1998. The common feature of those crises is that they spread to other countries, sometimes to bordering countries, as with Malaysia and Indonesia after the shock in Thailand, but also extending much further, as the one that occurred in Russia, where consequences could be observed, for example, in Brazil. The contagion phenomenon is defined in many ways in the literature. Forbes (2012) lists eleven different definitions¹⁵ throughout 22 years of research between 1990 and 2012, showing the difficulty of finding a consensus on the meaning of "Contagion". Despite this wide variety of definitions, two main concepts usually describe the mechanism: the fundamental-based contagion, which is based on macroeconomic fundamentals analysis, and the pure contagion¹⁶, which results from a change in investors' behavior whose expectations are considered self-fulfilling.

The first approach is particularly well highlighted in Kaminsky and Reinhart (2000). The authors shed lights on fundamental-based contagion by focusing on the transmission channels through which a crisis could spread from one economy to others. By analyzing both

¹⁵See in Forbes (2012) Table 1 p. 42.

¹⁶Also known as "shift-contagion."

trade and financial linkages, they provide the following interesting results : first, the probability of a crisis to spread is highly nonlinear: it rises sharply if the group of countries is already adversely affected by the crisis. Also, they find out that during crisis which took place in the 1990s, financial linkages between countries appeared to better explain contagion patterns, than trade linkages. However, it is hard to distinguish clearly between the two linkages.

On the contrary, the second approach does not consider macroeconomic fundamentals but rather focuses on direct interactions between markets or countries. Masson (1998) defines contagion as the result of a change in investors' expectations, regarding the information available. Those expectations being self-fulfilling, the market switches from one equilibrium to another after a negative shock, but without necessarily affecting the economic fundamentals of the shock-hit country. Forbes and Rigobon (2002) make an important distinction between contagion, defined as "a significant increase in cross-market linkages after a shock to one country (or a group of countries)", and the one that could be referred to as "interdependence" which is characterized by cross-market linkages between countries in crisis times, but also in more tranquil periods. This idea empirically translates into the difference between simple correlation and contagion, according to the authors. These definitions have been refined in the subsequent literature. In our paper, we have chosen to use the definition provided by Boyer et al. (2006) because it fits better with the data we collected (i.e. stock price blue chips indices) : this definition assumes an "excess correlation between stock markets during periods of high volatility, with "excess" defined as a significant increase in cross-market correlations for investable stocks (relative to less accessible stocks)".

But this extensive literature not only provides many definitions of the contagion phenomenon, it also offers several methods for measuring it. Forbes (2012) summarizes the different methodologies to measure contagion in five general empirical strategies. The first, used in the precursory study of Eichengreen et al. (1996) looks at the probability of the occurrence of a crisis in one country when there is a crisis elsewhere. The use of probabilistic models requires data on many markets (or countries) with many episodes of tranquil / crisis periods while our question is whether contagion occurred between only two countries (France and US) and for two episodes of crisis (1929 and 2008). The second strategy consists in focusing on cross-market correlations in order to assess the increase in cross-market linkages after a shock as an evidence of contagion. We will follow this strategy because it fits

with our data and with the definition of contagion we have opted for. However, this method has been criticized for being too restrictive. Indeed, Forbes and Rigobon (2002) showed that markets were actually "interdependant" in all states of the world, and that the increase in the correlation coefficients was due to the high volatilities in crisis periods. The correction of this heteroscedasticity bias has led to much less evidence of contagion. The third strategy identified by Forbes, involving VAR models, is less conservative. The impulse-response function is used to measure the significance of the transmission of a random shock from one market to another. Since there is no correction for the heteroscedasticity bias in crisis periods, the evidence of contagion is more frequent in the papers using this method. To overcome limitations in analysis of correlation coefficients, researchers have used GARCH specifications in order to assess spillover effects by using the volatility of assets' prices instead of the mean of assets' prices. This fourth approach is interesting because it allows the variance of the returns to vary across regimes. The recent literature using this specification has focused on sophisticated forms of GARCH models such as the STCC-GARCH, using a transition variable to assess the switch from tranquil to crisis periods. In most of the literature that uses non-linear models to fit with smooth transition on financial markets, the VIX ¹⁷ is commonly used as the transition variable. But this latter is measured on American option prices. The American market is then assumed to be the most powerful stock exchange; an hypothesis which doesn't necessarily hold during the interwar period with (at least) an equally important London Stock Exchange. Moreover, to our knowledge, it is impossible to construct such an index for the interwar period since historical option prices are not available, except for Paris. Finally, a last approach looks at co-exceedances and extreme value theory. The idea, introduced by Bae and al. (2003) is to test whether extreme returns are correlated across markets. If this approach doesn't rely on econometric methods, it lacks robustness because the sample of extreme negative returns is often too small, which is the case with our french data.

Empirically, to the best of our knowledge, only three papers investigated international contagion across financial markets around the Great Depression. Bordo and Murshid (2001) test the existence of contagion in financial markets during several financial crisis episodes, including the interwar period. They calculate correlation coefficients (adjusted for heteroscedasticity) among prices of several foreign government bonds traded at the NYSE. However, in their study, high bilateral cross-market correlations are not necessarily indicative of contagion. Indeed, high correlations between assets traded within the same stock exchange could be instead the result of a liquidity stress on this particular stock exchange. In

¹⁷Usually defined as an index of "implicit" volatility.

order to identify the main factors of crisis propagation during the Depression, Accominotti (2011) relies on Principal Component Analysis (PCA) performed on both bond spreads, stock market returns and an index of Exchange Market Pressure. His results suggest that the global stress of the early 1930s is mainly due to liquidity issues on the international capital markets, with a pic in 1931 when the UK left the Gold Exchange Standard and provoked a capital flow reversal. More recently, Maveyraud and Parent (2015) have studied the propagation mechanisms of the money market between the UK, the US and France during the interwar. The authors look at the spillover effect on monthly short term interest rates (3 month) by using a BEKK-GARCH specification with structural break. They are interested in testing whether their results fit with the Golden Fetters hypothesis of Eichengreen (1992), that the gold standard is the key to understanding the Depression. We analyze here the existence of contagion between the NYSE and the Paris Bourse by testing whether the NYSE crash of late 1929 triggered a short term downward spiral in french stock prices. Compared to the above-mentioned papers, we use daily data instead of monthly data. The rationale for using daily data to test for contagion is to capture the volatility assets' prices attributable to investor response to news. Contagion is associated with negative investor sentiments and expectations, and is typically beyond the explanatory power of aggregate indexes. Daily data permit an investigation of how market psychology is transmitted from one economy to another.

2.5.2 Cross market correlations

The test we propose is based on the correlation contagion test framework developed by Forbes and Rigobon (2002). In particular, to remove the heteroskedasticity bias caused by increasing volatility in stock market returns of the source country during crisis periods, we introduce the adjusted correlation coefficient.

Based on the scale-dependent covariance and variance, the Pearson correlation coefficient between our two stock index returns R_{DJ_t} and R_{CAC_t} , is given by:

$$\rho_{R_{DJ_t}, R_{CAC_t}} = \frac{\text{Cov}(R_{DJ_t}, R_{CAC_t})}{\sigma_{R_{DJ_t}} \times \sigma_{R_{CAC_t}}}$$

Where $\sigma_{R_{DJ_t}}$ and $\sigma_{R_{CAC_t}}$ are the standard deviations of respectively R_{DJ_t} and R_{CAC_t} .

Looking at this definition, we notice that an increase in the volatility of the stock market where the crisis occurs, causes a mechanic rise of ρ because the variance of the returns is going to increase in this market after the shock. Therefore, Forbes and Rigobon (2002) propose to calculate an adjusted correlation coefficient given by:

$$\rho_i^* = \frac{\rho}{\sqrt{1 + \delta[1 - \rho^2]}}$$

where

$$\delta = \frac{V_{RDJ}^c}{V_{RDJ}^t} - 1$$

V_{RDJ}^c and V_{RDJ}^t are scale-dependent variances during crisis periods and tranquility periods.¹⁸ δ is the relative increase in volatility in stock market returns of the Dow Jones.

To test whether the variation in the adjusted correlation coefficient is significant, we employ the Student test:

$$\begin{cases} H_0 : \rho_1^* = \rho_2^* \\ H_1 : \rho_1^* > \rho_2^* \end{cases}$$

with ρ_1^* the adjusted coefficient during the crisis period and ρ_2^* in the normal period.

The t-stat is given by:

$$t = (\rho_1^* - \rho_2^*) \sqrt{\frac{n_1 + n_2 - 4}{1 - (\rho_1^* - \rho_2^*)}}$$

Where n_1 and n_2 are respectively the number of observations in the crisis and the calm period.

Table 2.1 reports the calculation for the two sub-periods.

As can be seen from Table 2.1, there is evidence of contagion for 2008 ($|-2.68| > 1.96$) but not in 1929 ($|-1.037| < 1.96$). This result confirms our previous conclusions concerning the absence of any impact of the NYSE crash to the Paris Stock Exchange.

¹⁸The crisis period starts in October for 1929 and in September 2008 for the recent period.

Table 2.1: Adjusted Correlation Coefficients

	1929		2008	
	pre-crisis	post-crisis	pre-crisis	post-crisis
ρ	0.0003	0.15	-0.0379	0.1798
σ_{RDJ}	0.0133	0.0324	0.0131	0.025
V_{RDJ}	0.0002	0.001	0.0002	0.0006
δ	4.935		2.642	
ρ_i^*	0.0001	0.0622	-0.0199	0.0953
t -stat	-1.037		-2.68	

2.5.3 VAR specification

To investigate more deeply the short-run reaction of the French stock market to the US crashes of 1929 and 2008, we employ VAR/VECM specifications. Such model has been firstly used for lower frequency (i.e. monthly or yearly) macroeconomic time series, starting with Sims (1980). However, studies such as Masih and Masih (1997) use this methodology on daily financial time series to analyse the impact of the 1987 crash on the co-movements among different markets. Chien-Chung Nieh and Cheng-Few Lee (2001) also use it to characterize the relationship between stock prices and exchange rates among the G7 countries at a daily frequency.

In this paper, we apply those models to test whether there are differences in the relationship between the returns in both periods. In addition, as mentioned above, it is also used in the contagion literature in order to assess the impact of a shock emanating from another market¹⁹. But Forbes (2012) describes this measure as not enough conservative because it generally does not adjust for heteroscedasticity. Nevertheless, we use this methodology in order to get an indicator of financial interdependence across markets, as in Favero and Giavazzi (2002).

2.5.3.1 The co-movements between American and French stock returns in 2008

Having checked that all stock price series are I(1) we conduct the Johansen cointegration test (Johansen, 1991). 2.C.1 in Appendix 2 reports the result of the test procedure. The result suggests the existence of a long run relationship between R_{CAC_t} and R_{DJ_t} .

¹⁹See for example Constancio (2012) who uses error correction models to assess contagion during the eurozone crisis.

Because there is at most one cointegration relation, we now conduct variance decomposition analysis on the basis of the vector error correction method (VECM) and examine the short run dynamic property of the US and French stock markets. Estimation results are reported in Annexe 3, Table 2.C.2. The cointegrating equation is given by:²⁰

$$LCAC_{t-1} = -2.65 + \underset{(20.87)}{1.18} LDJ_{t-1} + z_{t-1}$$

With z_{t-1} the lagged residuals.

As all variables are in log form, the coefficients can be interpreted as elasticities. So 1 percent increase in the US index is associated with 1.18 percent increase in the French index.

Results for the short term relationship are also interesting:

$$R_{CAC_t} = \underset{(-1.06)}{-0.0005} - \underset{(-11.37)}{0.45} R_{CAC_{t-1}} + \underset{(24.63)}{0.82} R_{DJ_{t-1}} + \underset{(8.01)}{0.35} R_{DJ_{t-2}} - \underset{(-3.10)}{0.04} z_{t-1}$$

The coefficient of the error-correction term of the French index carries the correct sign and it is statistically significant, with the speed of convergence to equilibrium of 4 percent. But if we take LDJ_t as endogenous, the error correction term becomes non-significant (See Table 2.C.2). This result means that there is one restoring force towards the long term equation: the two series co-move in the long term and if there is a deviation from the mean, it is $LCAC_t$ that will adjust. Therefore, LDJ_t is the driving force in this long term relationship. On the short-term, R_{CAC_t} depends significantly on his own lagged value and on the lagged values of R_{DJ_t} . Once again, if we take R_{DJ_t} as the endogenous variable, we can see that it only depends on his own lagged values: R_{CAC_t} has no influence over R_{DJ_t} in the short term.

Those results are consistent with what we expected: the US market is the leader and the French market follows the US during that period.

2.5.3.2 The co-movements in 1929

We run the same cointegration test on our 1929 sample,²¹ leading us to rely on a VectorAutoRegressive (VAR) model as we fail to reject the presence of a long-run relationship.

²⁰ t -stats are reported in parentheses. All results are available in the Appendix 3, Table 2.C.2.

²¹Results are reported in Appendix 3, Table 2.C.3.

First we test for Granger causality between R_{CAC_t} and R_{DJ_t} in order to choose the endogenous variable. We ran several tests for each number of lags up to 6. Results are reported in Appendix 3. We can see that for any lag from 1 to 6, the null hypothesis of R_{DJ_t} not causing R_{CAC_t} is rejected, while the opposite is only verified when we take one lag. This suggests that we should take R_{CAC_t} as endogenous. Following Engle and Granger's methodology (1987), we estimate VAR with p lags, chosen as to minimize the information criteria, hence $p = 3$. Finally, we estimate:²²

$$R_{CAC_t} = a_0 + b_1 R_{CAC_{t-1}} + b_2 R_{CAC_{t-2}} + b_3 R_{CAC_{t-3}} + c_1 R_{DJ_{t-1}} + c_2 R_{DJ_{t-2}} + c_3 R_{DJ_{t-3}} + \varepsilon_t \quad (2.2)$$

Table 2.2: Estimation Results of (4.1)

Variable	Coefficient	Std. Error	t -statistic
a_0	-0.0006	0.0007	-0.85
b_1	-0.22	0.06	-3.87
b_2	-0.01	0.06	-0.24
b_3	-0.07	0.06	-1.34
c_1	0.18	0.03	5.39
c_2	-0.007	0.03	-0.21
c_3	0.01	0.03	0.31

As one can note in Table 2.2, the only significant coefficients are associated with $R_{CAC_{t-1}}$ and $R_{DJ_{t-1}}$. This means that the only useful information helping predicting the returns of R_{CAC_t} is contained in $R_{CAC_{t-1}}$ and $R_{DJ_{t-1}}$. In this case, we estimate a second VAR(p) with $p = 1$. The new relationship we estimate is given by:

$$R_{CAC_t} = a_0 + b_1 R_{CAC_{t-1}} + c_1 R_{DJ_{t-1}} + \varepsilon_t \quad (2.3)$$

Table 2.3: Estimation Results of (2.3)

Variable	Coefficient	Std. Error	t -statistic
a_0	-0.005	0.007	-0.76
b_1	-0.25	0.05	-4.82
c_1	0.18	0.03	5.82

Nonetheless, for $p = 1$, the results of the Granger causality test show that there are feedback effects, meaning that we can use both variables as endogenous. The estimation output of the VAR(1) (reported in Annexe 2) gives us the same estimation with R_{DJ_t} as the endogenous variable:

²²The complete estimation output is reported in Appendix 3.

$$R_{DJ_t} = a_0 + b_1 R_{CAC_{t-1}} + c_1 R_{DJ_{t-1}} + \varepsilon_t \quad (2.4)$$

Table 2.4: Estimation Results of (2.4)

Variable	Coefficient	Std. Error	<i>t</i> -statistic
a_0	-0.0004	0.001	-0.35
b_1	-0.26	0.09	-2.72
c_1	0.11	0.57	1.86

For both equations, the coefficients of the lagged values of the indexes are significant at the 10% confidence level. Consequently, it is hard to determine which market leads the other, compared to what is observed in 2008.

However, the two markets seem to be much less integrated in 1929 compared to 2008. This is interesting in the sense that the indexes we studied do not have cross-listed securities, so the presence of contagion in 2008 in addition with the cointegration relationship between the indexes on the same period is consistent with the presence of herd behaviour between investors all over the planet. The story was very different in 1929.

2.6 Conclusion

The main objective of this chapter was to investigate the reaction of the French stock exchange to the US crash both in 1929 and 2008. Accordingly, we implemented the Forbes and Rigobon (2002) test of contagion that consists in performing a correlation test in pairs of countries. Three main findings emerged from our study. First, we show that 1929 and 2008 crisis are different regarding the international propagation of the US crash. Despite freedom of capital movements and the traditional relations between France and the US, there is no crash or event specific movement at the Paris bourse in 1929. Financial globalization doesn't seem to matter for the international propagation of the 1929 crash, contrary to the 2008 crisis. Second, the French market exhibited a lower volatility at this time even before the crash. Third, this absence of any contagion of the US crash in 1929 confirms that other channels than stock markets may explain the spread of the Great Depression from the US to the rest of the world. This absence of contagion of the US crash in 1929 is consistent with the weak relationship between the two markets at that time.

The independence of the two stock markets at the end of the 1920s can be explained by several elements. First, the stability of the French stock market in 1929 could be the result of the monetary situation. After the excessive devaluation of the Franc in 1928, France accumulated gold thanks to its commercial surplus. These important gold reserves in France could motivate investors to keep investing in French stocks. In addition, we can highlight an important difference between France and the U.S. in terms of money markets. In fact, U.S. companies refinanced themselves with short term credit on the money market via commercial paper. There was no such market in France, but a national "discount system"²³ which might have isolated French companies from international fluctuations on the money market.

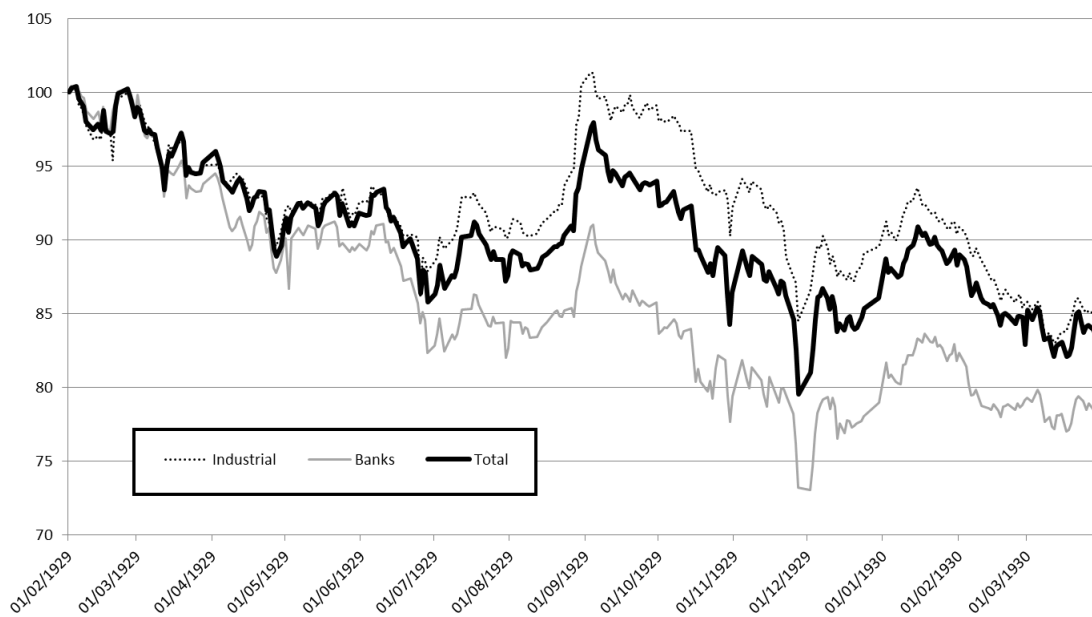
It could also be the effect of the nature of the components of the French stock market.

²³See on this point: Baubeau P. (2004), "Les "Cathédrales de papier" ou la foi dans le crédit. Naissance et subversion du système de l'escompte en France, fin XVIII, premier XXe siècle," PhD dissertation, Université Paris Ouest Nanterre-la Défense

Appendix

2.A Data

Figure 2.A.1: Sub-indices in 1929



Notes. base 1929M02=100. Source. calculation from authors

Table 2.A.1: Index Composition

SECURITY	SHARE IN THE INDEX	NUMBER OF SHARES	PRICE ON JANUARY 4 th 1929	MARKET CAPITALIZATION
Canal maritime de Suez	17,87%	446 796	24 600	10 991 181 600
Banque de France	6,97%	182 500	23 500	4 288 750 000
Saint Gobain	5,44%	410 000	8 160	3 345 600 000
Crédit Foncier de France	4,88%	600 000	5 000	3 000 000 000
Brasseries Argentine Quilmès	3,53%	240 000	9 040	2 169 600 000
Mines de Lens SC	3,37%	2 050 000	1 010	2 070 500 000
Banque de Paris et des Pays-Bas	3,34%	400 000	5 140	2 056 000 000
Crédit Lyonnais	3,32%	500 000	4 090	2 045 000 000
Banque de l'Indo-Chine	3,24%	144 000	13 850	1 994 400 000
Société Générale	3,06%	1 000 000	1 880	1 880 000 000
Produits chimiques d'Alais et Camargue	2,71%	400 000	4 170	1 668 000 000
Mines de Courrières	2,48%	1 080 000	1 411	1 523 880 000
Nord (Chemins de fer)	1,96%	525 000	2 300	1 207 500 000
Mines de Marles	1,96%	1 040 000	1 160	1 206 400 000
Comptoir Nationale d'Escompte	1,91%	500 000	2 355	1 177 500 000
Paris Lyon Méditerranée	1,90%	800 000	1 460	1 168 000 000
Mines d'Anzin	1,77%	400 600	2 725	1 091 635 000
Etb Kuhlmann	1,63%	720 000	1 395	1 004 400 000
Banque de l'Union Parisienne	1,56%	300 000	3 190	957 000 000
Banque de l'Algérie	1,47%	50 000	18 050	902 500 000
Raffinerie Say	1,46%	368 156	2 440	898 300 640
Mines d'Aniche	1,41%	320 000	2 715	868 800 000
Sarre et Moselle	1,41%	400 000	2 170	868 000 000
Houilles de Blanzy	1,40%	600 000	1 435	861 000 000
Banque Nationale de Crédit	1,39%	500 000	1 705	852 500 000
Cie Parisienne de distribution d'électricité	1,39%	400 000	2 130	852 000 000
Sté Lyonnaise des Eaux et d'Eclairage AJ	1,38%	250 000	3 390	847 500 000
Mines de Vicoigne et Noeux SC	1,35%	600 000	1 380	828 000 000
Charbonnages du Tonkin	1,33%	64 000	12 800	819 200 000
Union d'électricité	1,31%	800 000	1 008	806 400 000
Air Liquide	1,30%	600 000	1 335	801 000 000
Penarroya	1,28%	585 000	1 345	786 825 000
Orléans (Chemins de fer)	1,22%	600 000	1 255	753 000 000
Cie de Béthune	1,19%	85 000	8 600	731 000 000
Forges et Acieries du Nord et de l'Est	1,18%	440 000	1 655	728 200 000
Citroën	1,14%	400 000	1 760	704 000 000
Mines de Dourges SC	1,14%	285 000	2 460	701 100 000
Est-Lumière	1,13%	675 000	1 026	692 550 000
Ouest Parisien	1,12%	840 000	820	688 800 000
Est (Chemins de fer)	1,10%	584 000	1 160	677 440 000
Total	100%			61 513 462 24 s

Notes. In francs. Source. Authors' calculation.

Table 2.A.2: Sub-Indices (Industrial, Banks) vs. Total (HCAC 40) index

VARIABLE	MEAN	VARIANCE
	<i>t</i> -test	<i>F</i> -test
Industrial	-0.149 (0.88)	1.364 (0.007)
Banks	0.260 (0.79)	1.219 (0.08)

Notes. Tests were applied on stationary data. ^a denotes rejection of the null of equality in mean (or variance). *p*-values are reported in parentheses.

2.B Break tests

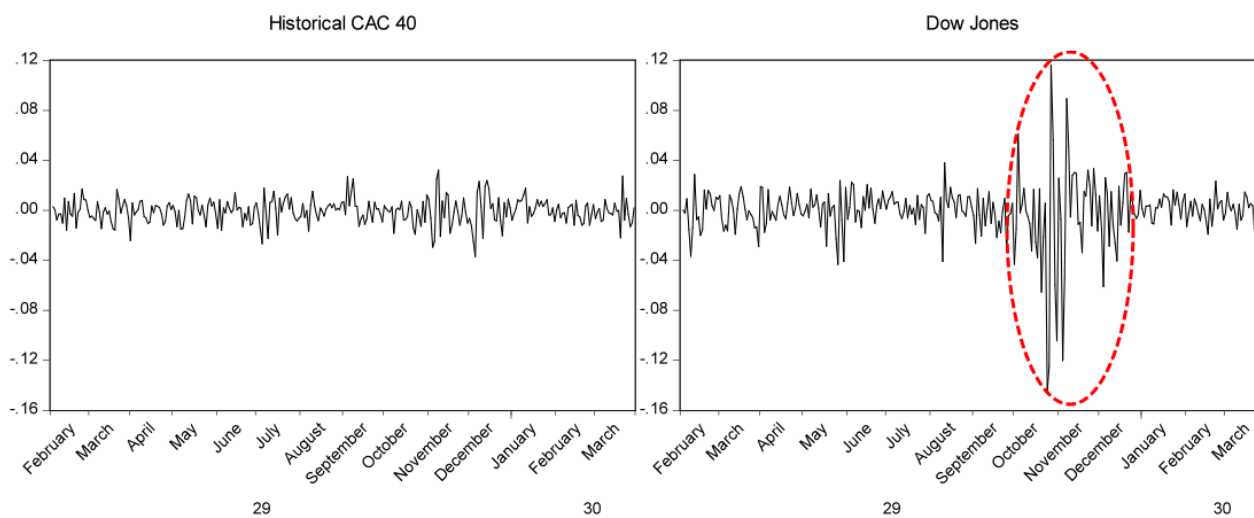
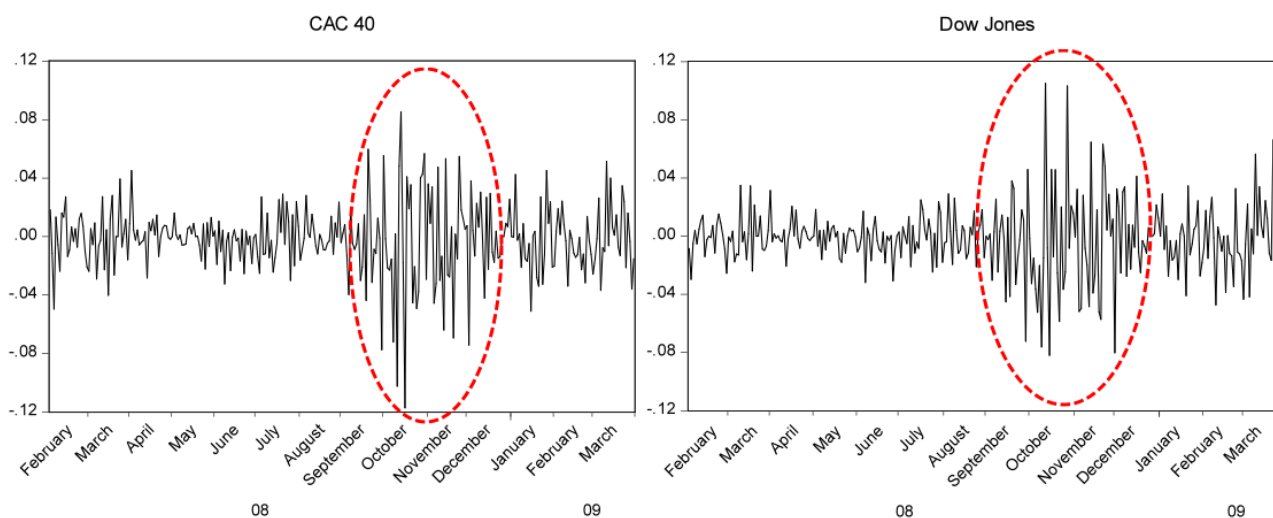
Figure 2.B.1: Stock returns volatility in 1929**Figure 2.B.2: Stock returns volatility in 2008**

Table 2.B.1: Robustness - Bai and Perron (2003) multiple breakpoint test

Test of $1 + L$ globally determined breaks			
Breaks	F-Statistic	Weighted F-Statistic	Critical Value
1	1.61	1.61	8.58
2	3.05	3.63	7.22
3	3.12	4.50	5.96

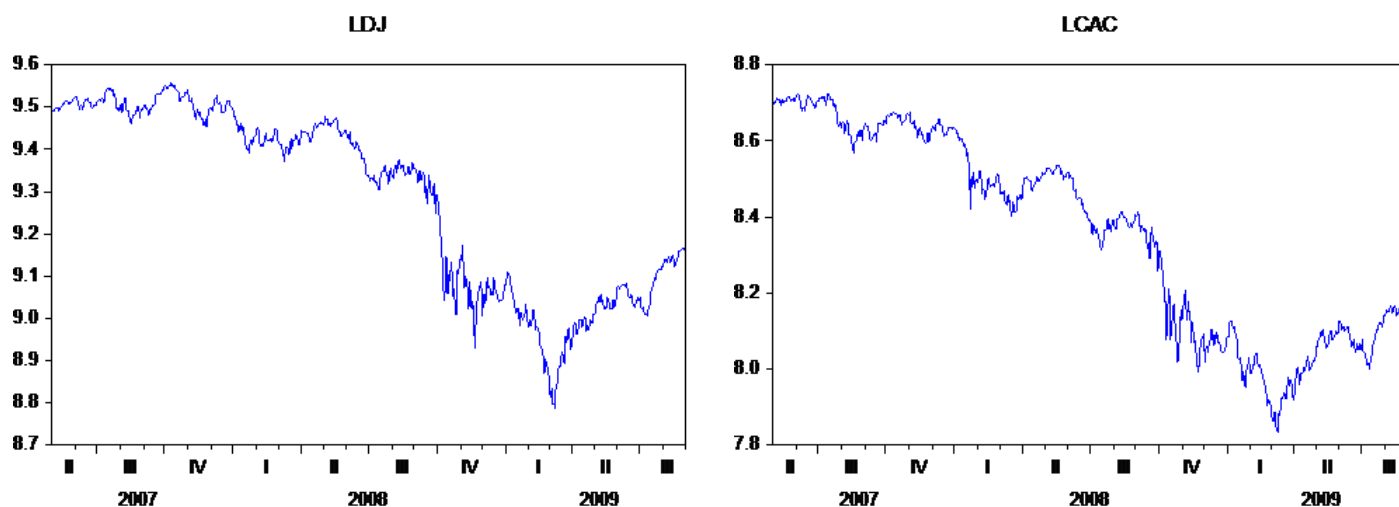
Test of $L + 1$ vs. L sequentially determined breaks			
Break Test	F-Statistic	Weighted F-Statistic	Critical Value*
0 vs. 1	1.61	1.61	8.58

Notes. * refers to critical values computed by Bai and Perron (2003). We employ a trimming percentage on the data of 15%. To allow for a serial correlation in the errors, we specify a quadratic spectral kernel based on HAC covariance estimation using pre-weighted residuals. In each case, the statistics do not exceed the critical values, therefore we do not reject the null hypothesis of no breaks in the *LCAC* series.

2.C Long-run analysis

- The Great Recession

Figure 2.C.1: The co-movements between American and French stock returns in 2008



Notes. Both series in levels seem to have a downward trend. Regarding the unit root tests, there are both $I(1)$, we can then suppose there is a constant term in the error correction model.

Table 2.C.1: Trace test results

HYPOTHESIZED NUMBER OF CE(S)	EIGENVALUE	TRACE STATISTIC	0.05 CRITICAL VALUE	<i>p</i> -VALUE
None	0.032	20.738	15.494	0.007
At most one	0.001	1.077	3.841	0.299

Notes. Sample: 5/04/2007 - 8/31/2009. $20.7 > 15.5 \rightarrow$ We reject the null hypothesis of no cointegration relationship. $1.07 < 3.8 \rightarrow$ We accept the null hypothesis that there is at most one long-run relationship between the two variables.

Table 2.C.2: Vector Error Correction Estimates

COINTEGRATING EQUATION		z_{t-1}	
$LCAC_{t-1}$		1	
LDJ_{t-1}		-1.185 (0.056)	
Intercept		2.649	
ERROR CORRECTION		$\Delta LCAC$	ΔLDJ
z_{t-1}		-0.041 (0.013)	0.004 (0.018)
$\Delta LCAC_{t-1}$		-0.456 (0.040)	-0.044 (0.055)
$\Delta LCAC_{t-2}$		-0.030 (0.027)	-0.025 (0.038)
ΔLDJ_{t-1}		0.827 (0.033)	-0.159 (0.046)
ΔLDJ_{t-2}		0.355 (0.044)	-0.092 (0.061)
Intercept		-0.0005 (0.0005)	-0.0007 (0.0007)
Observations		606	
R-squared		0.58	0.04
F-stat		170.60	5.11
AIC		-5.77	-5.13

Notes. Sample 5/7/2007 - 8/31/2009. Standard errors are reported in brackets.

- The Great Depression

Table 2.C.3: Trace test results

HYPOTHESIZED NUMBER OF CE(S)	EIGENVALUE	TRACE STATISTIC	0.05 CRITICAL VALUE	<i>p</i> -VALUE
None	0.015	7.169	15.497	0.558
At most one	0.008	2.541	3.841	0.111

Notes. Sample: 2/05/1929 - 3/31/1930. $27.17 < 15.5 \rightarrow$ We accept the null hypothesis at the 5% confidence level, thus there is no cointegration.

Table 2.C.4: Pairwise Granger causality test

Number of lags	$p = 1$	$p = 2$	$p = 3$	$p = 4$	$p = 5$	$p = 6$
$R_{DJ} \rightarrow R_{CAC}$	< 0.01	0.481	0.264	0.377	0.374	0.451
$R_{CAC} \rightarrow R_{DJ}$	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Notes. The probabilities of incorrectly rejecting the null of no causality are reported above.

Table 2.C.5: VAR(3) Estimates

	ΔLDJ	$\Delta LHCAC$
ΔLDJ_{t-1}	0.215 (0.056)	0.184 (0.034)
ΔLDJ_{t-2}	-0.352 (0.056)	-0.007 (0.034)
ΔLDJ_{t-3}	0.265 (0.058)	0.011 (0.035)
$\Delta LHCAC_{t-1}$	-0.131 (0.097)	-0.227 (0.058)
$\Delta LHCAC_{t-2}$	-0.129 (0.099)	-0.014 (0.059)
$\Delta LHCAC_{t-3}$	0.071 (0.092)	-0.074 (0.055)
Intercept	-0.0004 (0.0001)	-0.0006 (0.0007)
Observations	298	
R-squared	0.19	0.14
F-stat	12.11	8.21
AIC	-4.83	-5.84

Notes. Sample 2/07/1929 - 3/31/1930. Standard errors are reported in brackets.

Table 2.C.6: VAR(1) Estimates

	ΔLDJ	$\Delta LHCAC$
ΔLDJ_{t-1}	0.106 (0.057)	0.184 (0.032)
$\Delta LHCAC_{t-1}$	-0.259 (0.095)	-0.255 (0.052)
Intercept	-0.0004 (0.001)	-0.0005 (0.0007)
Observations	300	
R-squared	0.03	0.15
F-stat	5.04	26.48
AIC	-4.67	-5.82

Notes. Sample: 2/05/1929 - 3/31/1930. Standard errors are reported in brackets.

Chapter 3

The French financial sector during the interwar: What lessons can be drawn from the stock market?

Abstract

While the banking crisis of the 1930s is traditionally considered to have been relatively more limited in France than in other European countries, the literature highlights however that French investment banks faced the greatest difficulties. The purpose of this chapter is to test this hypothesis with a new dataset including stock prices of all listed companies within the "banks and financial institutions" sector at the Paris Stock Exchange over the period 1919-1939. The main activities of our banks' sample are characterized by a high heterogeneity, spanning from real estate to investment banking, through commercial and deposit activities. Our results show that during the 1930s, investment banks were indeed riskier than deposit and commercial banks, relative to the overall market.

JEL Classification: G01, G21, N24

Keywords: French banking sector, Financial risk, Interwar period

3.1 Introduction

The recent global financial crisis of 2007-2008 highlighted the role of banks as a propagation mechanism of the US real estate crisis into the global economic crisis. In 2016, one of the greatest concerns was the solvency and the systemic risk of the European banking system. During the summer, Italian banks such as *Banca Monte dei Paschi* raised concerns because of their exposure to bad loans. After the Brexit vote, analysts raised the issue about the long-term viability of the continued participation of Italy in the eurozone.¹ During late September, Deutsche Bank's problems have raised concerns of a potential global financial crisis similar to that of 2008. After the US Department of Justice demanded a 14 billion dollars claim to settle allegations of mis-selling mortgage securities, the DB's hedge funds reduced their exposure to the largest German private bank in late September. It resulted in growing concerns on the whole European banking system followed by a decrease in large European banks' share prices.² In the beginning of 2016, banks stocks already suffered from investors' uncertainty on both sides of the Atlantic, and especially European and French banks: in January 2016, *Société Générale* and *Banque Nationale de Paris*' shares dropped by roughly 20%, caused by investors' fear about both energy prices and low interest rates.³ Moreover, concerns about another financial system collapse due to the banking sector's fragility made the French newspaper pages.⁴

On a historical perspective, the crash of 1929 and the following depression of the 1930s was also a period of extreme financial stress and real consequences to the world economy. In particular, during the interwar period, French banks were similar in many ways to those of today. In addition to a low regulatory environment, French banks benefited from a powerful central bank with large gold reserves, able to play the lender of last resort if necessary. However, one striking difference lies in a more specialized banking system at that time with most banks specialised in one type of activity.

The Great Depression put a lot of pressure on banks. The Austrian banking crisis of 1931 is often seen in the literature as the trigger of the Central European crisis and the worsening depression in Western Europe.⁵ Many country studies have examined the banking sector's

¹<http://www.marketwatch.com/story/why-italys-bank-crisis-could-be-ticking-time-bomb-2016-07-21>.

²Financial Times, September 30th 2016.

³<http://money.cnn.com/2016/02/05/investing/bank-stocks-worse-than-oil/>.

⁴Les Échos, February 12th 2016.

⁵Accominotti (2012) provides empirical evidences of the international contagion of the 1931 crisis.

behavior during the interwar. For example, Billings and Capie (2011) state that the British banking system withstood to the effects of the Sterling crisis thanks to the relative strength of the joint-stock commercial banks. Looking back over the past two centuries, Turner (2014) also emphasizes the stability of the British banking system in the 1930s. However, the picture was rather different in Italy. Battilossi (2009) shows that governance failures in the Italian leading banks enhanced excess risk-taking and made them more prone to crises during the interwar period. In France, original works tended to underestimate the role of the banking sector in the economic crisis of the 1930s. Its impact on the origins of the 1930s economic crisis in France was not much examined. There were two opposing approaches on the origins of the 1930s economic crisis in France.⁶ According Alfred Sauvy (1984), French difficulties could be attributed to the Sterling crisis of 1931 and the misalignment of the French franc.⁷ Jacques Marseille (1980) pointed out the downturn of the French industry, due to a small expansion of the domestic market, compared to the increase in productive capacity.⁸ The role of the banking sector is therefore not so much highlighted in this debate. However, the difficulties faced by the French Banking system at that time start to become an important issue in the literature of the 2000s. The archives of two of the largest banks in difficulties during the 1930s - the investment bank *Banque de l'Union Parisienne* and the deposit bank *Banque Nationale du Cr dit* were explored by Bonin (2001, 2002). Lescure (2004) by exploiting archives on failures showed that local and regional banks suffered tremendously during this crisis. Finally Lacoue-Labarthe (2005) evidenced that France was experiencing banking panics in the early 1930s which depressed economic activity by raising the cost of financial intermediation.

The aim of this chapter is to give some additional analyzes on this topic by using a new dataset of individual stock prices for all the firms listed at the Paris Stock Exchange in the sector "banks and financial institutions" between 1919 and 1939. More specifically, we assess the risk exposure of the French banking system by distinguishing banks according to their activities. We show that banks with a high risk exposure were mostly investment banks, suggesting that specialization made the banking sector as a whole more resilient to the financial shock.

The remainder of the chapter is structured as follows: Section 2 reviews the literature on French banks during the interwar and the consequences of both the economic expansion of

⁶The reader can find a summary in Mour 's famous book: *La politique du franc Poincar  (1926-1936)*, Paris, Albin Michel, 1998.

⁷Sauvy, A., *Histoire  conomique de la France entre les deux guerres*. Paris, Economica, 1984.

⁸Marseille, J, *Les Origines inopportunes de la crise de 1929 en France*, *Revue Economique*, 31(4), 1980.

the 1920s and the crisis of the 1930s. Section 3 presents the data we used in this study. Section 4 provides an empirical study of risk exposure of banks, compared to the overall stock market. Section 5 concludes.

3.2 Historical background

In this section, we first focus on the main features of the French banking sector during the interwar, we then describe the course of events by dividing the whole period in the two following sub-periods: (i) the economic expansion of the 1920s, and (ii) the downturn of the 1930s.

3.2.1 A specialized French banking sector

One of the main evolution of the French Banking system occurred during the period 1848-1875. According to Bouvier (1973), this evolution was a quantitative "revolution", since the founders of the "new" banks only imported the innovations of the decades 1820's and 1830's coming from Great Britain.⁹ This revolution was reflected in the possibility for banks to extend the volume of their total equity (capital and reserves), and by seeking to increase deposits. These "new" banks were then much larger than they were during the first half of the 19th century. Indeed, they sought to increase deposits and at the onset of the World War I, the four largest banks had expended their deposit and current accounts from 285 million francs in 1860 to over 5.5 billion in 1913 (Bouvier, 1973).

While the French banking system kept constant features from the end of the 19th century up to the World War II, it was different from both the system prevailing in Grand Britain or in continental Europe. In France, powerful banks, i.e. with large gathered resources, were commercial and deposit banks with a national network (*Crédit Lyonnais*, *Comptoir National d'Escompte*, *Société Générale* and *Crédit Industriel et Commercial*). In those banks, capital was not so high but deposits were very important¹⁰ and devoted to short term credit with mainly discount operations. Particularly after the crisis of the *Union Générale* in 1882,

⁹The law permitting the establishment of joint-stock companies was voted in 1826 (Copartnership Act) in England, in 1825 in Ireland, while Scottish banks already had a quasi-joint-stock status, allowing unlimited liabilities. See Turner (2014).

¹⁰E.g. *Crédit Lyonnais*. in 1919: capital share of 250 million francs, deposit (à vue) over 1.5 billion francs. Source: Desfossés yearbooks 1918-1921.

Henri Germain, founder of the *Crédit Lyonnais*, stressed that short term resources should correspond to short term uses.

Especially before 1914, these banking principles only allowed only small benefits per unit given the low level of interest rates and the stability of prices thanks to the Gold Standard. But overall gains allowed to maintain profits and dividends at a high level. Bouvier (1973) characterises those banks as having small links with large industrial firms, even if some could be both board members of entities in the two sectors.

The literature usually distinguishes commercial and deposit banks from business banks with large investments in the industrial sector in both national and foreign markets.¹¹ This separation between deposits and investment bank activities is, as we will see, often seen as the main explanation of the resilience of large deposit banks during the 1930s. But the distinction between these two groups of banks (all of which had been created between 1852 and 1875) only rose after the difficulties of the 1880's. Before the crash of the *Union Générale*,¹² all large banks had both investment and deposit activities, and could then be referred as "Universal" banks. In fact, this banking model was dominant in the continental Europe, particularly in Germany and to some extent, in Belgium,¹³ while the British system had already made a clear separation between investment and commercial banks. The distinction between the two activities in the French banking model occurred at the end of the 19th century and operated until 1945. Levy-Leboyer and Lescure (1991) explain that from the 1880's, the second stage of France's industrialization provided new opportunities for the banking system. However, the authors note that local and regional banks benefited more from those new investment opportunities than large national banks, more worried about their liquidity. Indeed, Bazot (2014) depicts the French banking system of the *Belle époque* as a combination of three major actors: the central bank and its network of branches, the national deposit banks and the local and regional banks. Despite the potential negative effects of having a central bank at the core of the credit system in terms of banking competition and credit restriction, Bazot (2014) shows that the positive effects of information collecting and local interventions outweighed the negative ones. However, the remarkable growth in France from the late 19th century to World War I, could be more attributed to

¹¹*Banque de Paris et des Pays-Bas, Banque de l'Indochine, Banque de l'Union Parisienne* are the most cited ones.

¹²The famous crisis of 1882, when the decline and failure of one bank put the Paris Stock Exchange under large liquidity difficulties. See White (2007).

¹³See Tilly (1998).

the mature capital market than to the efficiency of the banking system.

Returning to the interwar period, an important feature was that French banks enjoyed almost complete freedom to operate, a freedom much greater than after 1945.¹⁴ Indeed, the laws of 1863 and 1867 on joint stock companies allowed banks to be freely constituted and without any control from institutions. The State did not legislate on the banking sector before the early 1940's, when the "bank regulation act" of 1941, allowed the *Banque de France* to limit discount facilities and therefore control liquidity, but also when the four largest deposit banks were nationalized in 1945.

3.2.2 The impact of the French economy over banks between the wars

The interwar period can clearly be divided in two phases (i) an economic expansion in the 1920s. and (ii) a long downturn in the 1930s, with different consequences on French banks.

3.2.2.1 The 1920s: industrial growth, inflation and monetary instability

On the real economy side, the French economy of the 1920s is characterized by a strong industrial growth. The French industrial production doubled from 1921 to 1929 and its growth rate was the highest among the European countries.¹⁵ This expansion was driven by a transfer from low productive sectors (e.g. textile, leather) to high productive sectors (e.g. steel, chemicals, mechanical industries). However, even though the productive industries were boosted by the Great War, the economic consequences for France were overall critical. In fact, Caron and Bouvier (1979) show that if the revenue of those industrial firms rose during the war, their benefits did not because most of the revenue was kept for self-financing. This industrial growth had consequences on banking policy: in the early 1920s, business banks got closer to domestic industries in order to benefit from the reconstruction and the modernization of French equipment. They increased their capital in 1920 (among others, *Banque de Paris et des Pays Bas*, *Banque de l'Union Parisienne* and *Banque de l'Indochine*). Industrials started to sit on some banks' board, while financiers kept a large

¹⁴The seminal work of Bonin (2000) provides a well documented analysis of this topic. See *L'apogée de l'économie bancaire libérale française (1919-1935)*

¹⁵See Caron and Bouvier (1979).

majority (Bouvier 1979).

The monetary aspect of the period has been well studied and is very interesting to understand its implications on banks' policy. When WW1 started in 1914, France, along with Great Britain, abandoned the Gold Standard to follow expansionary monetary policies in order to finance the war effort. According to Blancheton (2000), France financed the war mostly by issuing debt (74%), the rest being financed by an increase in taxes (15%) and by the advances of the *Banque de France* (11%). The situation of public finance did not recover after the war because the French Treasury (*Mouvement Général des Fonds*) anticipated that Germany would pay for war damages as France did to Germany after the Franco-Prussian war in 1871. At that time, both the Central bank and the Treasury still thought that the return to the pre-war parity of the Franc could be manageable. They tried to adopt a deflationary monetary policy, by containing the circulation of money under a certain ceiling.¹⁶ Once they finally figured out that Germany would never be able to pay the entire amount of the reparations, the Treasury faced its obligations by using indirect advances of the *Banque de France* (via commercial banks) as shown by Blancheton (2000). This increased the monetary base velocity and led to speculative attacks against the Franc in 1925-26. The monetary consequences of the war were then heavy and numerous: (i) the end of the Gold Standard, (ii) the convertibility of the paper Franc suspended, (iii) inflation in the fiduciary circulation, (iv) the government indebted vis-à-vis the *Banque de France* and finally, (v) the Franc under pressure on the foreign exchange.¹⁷

What were the consequences on the banking sector? First, a share of the traditional customer base of French banks, the bond holders, was hit by inflation. Therefore, banks reached out to other new clients: the sellers and producers, and firms in particular. On the asset side, if the nominal deposits did not increase faster than prices, the depreciation of the Franc affected banks' resources. After a constant growth during the *Belle Époque*, the increase of bank money slowed down during the 1920s, before decreasing during the depression. According to Bouvier (1979), the deposits of the top four French commercial banks decreased from 36 to 26 billion francs from 1931 to 1936. However, business and commercial banks did not equally suffer from inflation. It was easier for deposit banks, thanks to their large national network, to follow inflation by raising the nominal value of

¹⁶Up to April 1925, the main objective of the monetary policy was to keep the fiduciary circulation under 41 billion francs. Because the authorities could not manage to stay beyond this ceiling, it caused the great scandal of the "fake balance sheets", described in detail in Blancheton (2005).

¹⁷See Hautcoeur and Sicsic (1999).

their deposits (and therefore their corresponding volume of credit).

A second consequence was the tendency of the banking sector to increase its activity of security issuer on the stock exchange and the corresponding securities services (holding securities, coupon and dividend detachment, tax levy and so forth). In fact, the share of the volume of issued securities from private companies accounted for the majority of the total of issued securities during the period 1924-1932, while for the periods 1915-1923 and 1933-1938, the share of State and local government securities was higher. This is also confirmed by Hautcoeur (1994), who highlights this evolution in the French banking activity during the interwar: the inflation experienced in the early 1920s made banks looking towards other profits. In particular, Hautcoeur (1994) states that while during the pre-war period, the securities issuing activities were dedicated to business banks, the drop in deposits made also commercial banks turning into these activities, especially because listed companies' financial operations increased substantially during the 1918-1929 period. Yet, Bouvier (1979) relativizes this idea by stating that the securities service had high costs.

A third effect of the monetary instability lies in the activity of banks on the Foreign Exchange market. According to Bouvier (1979), the "stabilization" of the French franc in 1928, by a devaluation of four fifth of its prewar parity, pushed French banks to multiply operations on the foreign exchange market. In fact, the large fluctuations due to the end of the Gold Standard made this market more profitable for speculators,¹⁸ and hedging activities against currency risk became essential. Moreover, France did not put in place foreign exchange controls, even during the 1930s. According to Bouvier (1979), the year 1928 registered the record level for the item *Banquiers et correspondants* which reached 22% of the asset side of the balance sheet. It was even higher for business banks: from less than 4% in 1914, the weight of this item reached 8,5% in 1923, 20% in 1926-30 and 23,5% in 1939. The author depicts the interwar period as being very important in terms of internationalization of banking operations.

3.2.2.2 The 1930s: banking crisis and economic depression in the literature

The economic crisis of the 1930s did not come forward before the early month of 1931, but lasted longer, compared to many other countries (Caron and Bouvier, 1979). In the

¹⁸Even though the French *Cambistes* were already making arbitrages on foreign exchanges, but gains was potentially low.

literature, the main banking crisis started in late 1931-early 1932 as a consequence of the Sterling crisis of September 1931. Bouvier (1979) studies the sequence of events through the length of deposit volumes for the largest commercial banks. According to the data of the *Crédit Lyonnais*, the highest volume of deposits held by the four largest commercial banks¹⁹ reached its peak in June 1931. In the following months, deposits started to decrease, which coincided with the Hoover moratorium on reparations and war debts, and the Sterling crisis of September. The slump in deposits slowly accelerated in 1932 and the following years, reaching a trough in September 1936 before the devaluation of the French Franc and the subsequent end of the Gold Block. On the credit side, a reversal trend occurred at the beginning of the 1930s: from 30 billion francs in 1920, they reached 79 in 1929, 61 in 1934 and 74 in 1938. The author claims that the increase in the late 1930s was more the result of the growing inflation after 1936 than a real surge in economic activity.

An important feature of the French banking crisis of the 1930s is the resistance of large banks to failures. Indeed, 276 joint-stock banks²⁰ failed between 1929 and 1937 but among them only one was considered large, the *Banque Nationale de Crédit*. The addition of small local bankers and *maisons de coulisse*²¹ increased the number of failures to 670 (Lescure, 2004).

However, important banks also experienced difficulties. The *Banque de l'Union Parisienne* (BUP) is a famous case, detailed in Bonin (2001). The bank suffered from its investment in Central and Oriental Europe. After the failure of the Austrian Creditanstalt, a confidence crisis took place while the BUP was investing in Hungary, Austria, Romania and Czechoslovakia. Despite a drop of 600 million francs in the deposits, the bank benefited from the solidarity of the Parisian place,²² on the request of the Minister of Finance, to face its obligations in late 1931. A fund was created by six banks (among others the *Crédit Commercial de France*) to help the BUP to deal with these cash-flow issues. As we already mentioned above, the *Banque Nationale de Crédit* experienced important difficulties that forced the bank to fail. Bonin (2002) shows that despite the intervention of the authorities

¹⁹*Crédit Lyonnais, Société Générale, Comptoir National d'Escompte de Paris and Crédit Industriel et Commercial.*

²⁰A joint-stock bank combines features of a general partnership, in which owners of a company split profits and liabilities, and a publicly-traded company, which issues stock that shareholders are able to buy and sell on an exchange.

²¹Small entities trading securities on the Over the Counter market of the Paris' Bourse.

²²Banks that could be referred as "private" banks in the sense they are not joint-stock companies but rather old family banks: in French: *Maisons de Haute Banque*. The six banks are: Demachy, Hottinguer, Mallet, Mirabaud, Neufville and Vernes. See Bonin (2001).

to ensure the liquidation of the bank in 1932, a panic taht occurred in February of that year forced its closure. Lacoue-Labarthe (2005) see this event as a starting point of a contagion of failures among regional banks and national bank's branches.

Levy-Leboyer (1995) shed lights on the international money market to explain the outbreak of the banking crisis: the increase of interest rates in the US, causing the panic in Wall Street in late 1929, threatened the European captal markets. American capital flew back to the US and French banks also suffered from those movements. Between 1930 and 1935, the contraction of credit was of the same magnitude than in Germany and in Belgium and twice as high as in Netherlands and in Switzerland (Levy-Leboyer, 1995). But the dramatic distress of 1931, when German and Austrian banks failed and the convertibility of the Sterling pound to gold got suspended, was not seen as contagious for the French banking system. Indeed, the reserves of the biggest banks increased substantially in the early 1930s (from 973 million francs to over 5 billion from 1928 to 1932 for the *Crédit Lyonnais*). In addition, long-term interest rates started to decrease with the stabilization of the Franc in 1928, and went from 7% to 3.5% in 1931, while short-)term interest rates went below 2% in 1930-32, i.e, below the the english and american levels.²³ However, in 1932 the cost of credit in France went above the english and american levels, and even above the other Gold-Bloc countries (Belgium, The Netherlands, Switzerland, Italy and Poland). The out-flow of capital to London and New-York in 1933-34, probably due to investors seeking for profitability after the suspension of the US dollar's convertibility to gold in 1933,²⁴ raised the difficulties of the French banking system and hence, reinforced the economic crisis up to the devaluation of the French franc in 1936.

While the literature generally supports the idea that the French banking crisis was not as deep as in other countries, Lescure (2004) mitigates, however, this view. According to him, the overall banking system resisted quite well to the crisis from a macro-financial point of view. But Lescure (2004) shows that the large national banks, for the most part, did not experience the worst difficulties while local and regional banks suffered from lots of failures. The resilience of the banking sector was then explained by the strength of large banks, specialized and characterized by a balance sheet's structure devoted to liquidity, while universal and decentralized smaller banks failed. The author adds that the severity of the crisis' issue cannot be answered only by looking at failures. Indeed, numerous banks such

²³Levy-Leboyer quotes sources from the League of Nations.

²⁴After the US's departure from gold, American stock prices started to rise again.

as the *Banque de l'Union Parisienne* or the *Banque Nationale de Cr dit*, were restructured or dissolved and re-founded without any juridical procedures.

3.2.2.3 The French banking crisis of the early 1930s as seen by the Central Bank

In this sub-section, we go through the minutes of the Conseil G n ral of the Banque de France in order to provide (i) an in-depth investigation of the role of the Central Bank in the management of the crisis and (ii) a first insight on market sentiments at that time.

First of all, the French monetary authorities mention two episodes of banking crisis. The first one occurred from October 1930 to January 1931. In the minute of the Conseil G n ral of December 26th, 1930, we can read: "The banking crisis, which brutally occurred at the end of October, caused numerous failures among banks related to our establishment. No matter how much we supported the ones who asked for our intervention, we could not avoid the failure of banks that had either suffered from losses, or invested their deposit into activities that, according to our statutes, may not justify our intervention".²⁵ The scope of the crisis seems however limited. Only twelve failures are mentioned: 8 for local and regional banks, four "important" in Paris, among which the *Oustric*²⁶ bank and the Soci t  Financiere de Paris. Only those last two hold the Central Bank's attention. It is said that the liquidation for these two private banks will take some time, but "according to the available information, large losses should not be feared".

The second stage of the banking crisis took place with the Sterling crisis of September 1931. The Central Bank uses the movements in its commercial portfolio to describe the timing of the two episodes of banking crisis: "The first credit crisis (from October 1930 to January 1931) increased the portfolio from 4.7 billion to 7.4 billion francs. The recovery, which occurred during the first semester of 1931, gradually decreased the amount of the portfolio at 4 billion francs on July 1st 1931. The second credit crisis (September 1931) provoked a movement of a similar magnitude. The portfolio went from 4.2 billion to 6.7 billion within a month. This increase of 2.5 billion is made of 1 billion francs of commitments only for the *Banque Nationale de Cr dit* (...). Since November 1st, the portfolio constantly decreased until reaching its level of the first semester of 1930, before the first credit crisis occurred."²⁷

²⁵ Author's translation.

²⁶ This famous case is depicted in Sauvy (1984).

²⁷ Minute of the Conseil G n ral, March 17th 1932. Author's translation.

A description of the portfolio is then presented in detail. After mentioning three banks that could generate risk because of their very specialized activities (i.e. *Marret Bonnin* and *Messein Bedarrides*, specialized in the diamond business, and the *Banque d'Extension Commerciale & Industrielle*, specialized in refinancing commercial paper), it is clearly said that: "Besides those three banks, the composition of the portfolio does not contain any particular risk". Here we will focus on the first three (and main) cases in terms of "commitments" to the *Banque de France*.

Banque de l'Union Parisienne:

The bank, which had an equity capital of 200 million francs at that time, was engaged towards the Central bank to the amount of 391 million francs: "The discounted bills, insignificant during the first semester of 1931, increased following the treasury needs due to massive deposits withdrawals. The maximum was reached on February 16th with 421 million francs and it seems like it will be quickly reduced." The Central bank does not seem to be worried about this case: "The situation is improving, especially thanks to recent cash inflows, rising stock prices and finally with the upcoming merger with the *Crédit Mobilier*".

Banque Nationale de Crédit:

This bank was already in liquidation since February 26th, and the amount engaged was of 145 million francs: "Discounted bills that amounted to 200 million in the course of 1930, reflected twice but in different moments, particularly sharp increases, owing to numerous refund claims from customers. In the aftermath of the first crisis during winter in 1930-31, commitments rapidly returned to their previous value, thanks to restored trust and confidence from depositors. In contrast, a much more serious panic took place at the end of September 1931, which led to a sudden dramatic increase in commitments. Between September, 16th and October, 16th 1931, pledges went from 291 to 1.497 million. Since then, they have been gradually reduced to their current amount of 257 million, the latter being broken down into 185 million various commercial prints and 72 million prints representing receivables' fundraising. These commitments are guaranteed as follows: on the one hand, those that were assigned before December, 31st 1931, amounting to 108 million, a guarantee totaling 205 million has been given to the Bank of France and provided by the main credit institutions. On the other hand, commitments subsequent to December, 31st 1931, currently about 144 million, are guaranteed up to one-fifth of their amount, by blocked funds in a particular account opened at the *Banque Nationale de Crédit*. The ensemble is supported

by a pool of securities whose value seems to be set to 40 million. Hence, commitments do not put the Banque at endue risk."

Crédit Commercial de France:

"After moving around 50 million francs, the engagements quickly raised during the last quarter of 1931. The maximum was reached on November 1st with almost 523 million francs. Since that date, this amount is in constant decline. Commercial paper and bank acceptations are related to the Northern and Eastern textile industry, as well as large firms in the chemical and metalworking industry".

The *Crédit du Nord* is also mentioned for having important difficulties during the second semester of 1931. "Its engagements rose from 63 to 605 million francs between July the 1st and November the 1st, following the panic of depositors and the worsening of the textile industry crisis."

According to the minutes of August 25th, by the summer of 1932, the French banking crisis was over: "For the last two month, it (the portfolio of discounted bills) shows a relative stability after the large decrease of the first months." From 6.5 billion on January 19th, it went down to 3.2 billion in late August. The Central bank explained this reduction by "the ending of the banking crisis, which was the reason for easing access to liquidity".

The descriptions detailed above confirm the view of a banking crisis that was, as a whole, contained, but also a crisis that only hit certain types of banks, more prone to lend to industrial businesses. In the following sections, we aim at completing this picture by examining stock market's perceptions on the banking sector which, to the best of our knowledge, has not yet been done with high quality data.

3.3 Data and banks' classification

To empirically address the issue of the French financial sector's stability during the interwar period, we rely on stock price data instead of either balance sheets or failures, which are usually analyzed in the literature. Lescure (2004) shows that data on failures are incomplete while balance sheets may only be studied in a descriptive way since data are not available

on a regular frequency for a sufficient number of banks.²⁸ This is why we opt here for a new bi-monthly bank share index including all companies from the "banks and financial institutions" sector listed at the Paris Stock Exchange from 1919 to 1939. We also use the business purpose, as depicted in the yearbooks, as well as balance sheets data in order to define the main activity of the banks.

3.3.1 Prices, number of shares and market capitalizations

The banks index is built by collecting both individual stock prices and the corresponding number of shares for each of the listed companies in the banking sector. The total index includes 106 joint-stock companies among which we identify several different categories of financial institutions. Before getting to these categories, one should note that our index does not include insurance companies nor private banks (also called *Maisons de Haute Banque*). Even if the literature shows that the latter accounted for an important share of the banking operations made in Paris at that time, data on those banks are not published and they are not listed on the Paris stock exchange.

The index is weighted by the market capitalization for two main reasons: i) using market capitalization instead of prices alone allows to adjust from the firm's operations on capital such as stock splits or seasonal public offerings without calculating adjustment coefficients;²⁹ ii) the standard stock price index for the overall Parisian market for our study period is the monthly cap-weighted index developed by Le Bris and Hautcoeur (2010),³⁰ which includes the top forty market capitalization for each year over the period 1854-2007. It is then more accurate to choose the same type of adjusted indexes if we want to compare our sectoral index to the overall market's one.

²⁸Two projects aim at filling this gap: The DFIH project collects yearly balance sheets for every listed company through the yearbooks of the Exchange (*Annuaire Desfossés*), while the Sysri-30 project collects balance sheets data coming from the archives of the *Crédit Lyonnais*. The latter gathered information on more than 400 banks between roughly 1900 and 1940.

²⁹See Chapter 1.

³⁰The author would like to thank David Le Bris for sharing his data on the 1919-1939 period.

However, we are not able to use this standard index for two reasons: (i) we want to keep the bimonthly frequency of our dataset in order to run robust rolling estimations with a sufficient number of observations;³¹ as well as (ii) for trading synchronicity because bimonthly data coming from the Data for Financial History (DFIH) database refer to end-period and mid-period while Hautcoeur and Le Bris (2010) use beginning period prices. We then construct a bimonthly CAC 40 for the interwar period, based on the composition of the index developed by Hautcoeur and Le Bris (2010).³² We also use the number of securities to adjust the series from operations on the capital.

To assess the price of risk, we calculate the equity premium which measures the excess return above the risk-free return. We use bimonthly prices of the asset considered to be the risk-free asset at that time at the Paris' Bourse: the Rente 3%.

To evaluate the statistical properties of our series, , we run both the Augmented Dickey-Fulher and the Phillips-Perron unit root tests on the returns series on both sub-periods. The results of both tests indicate that all of the return series on both sub-periods are stationary.³³

3.3.2 Business purposes, balance sheets and banks classification

The definition of bank activities is a sensitive issue. Indeed, if the law does not even allow to differentiate financial and non-financial corporations, it certainly does not help to differentiate financial institutions between themselves. As Brambilla (2010) shows for the period from mid-19th century up to 1914, investment banks often adopted different patterns among continental European countries such as France, Germany and Italy. The author uses a comparative quantitative approach to distinguish between banks according to their activities by calculating the proportion of investment activities in total asset. Nevertheless, he first excludes banks according to their "relevance in investment banking, in fostering industrial development and for their significant role of their respective financial systems". The issue is different for us since we include all banks and financial institutions listed at the Paris Stock Exchange between 1919 and 1939. Here, we first look at the business purpose for each of our companies as it is reported in the yearbooks of the stock exchange. Then,

³¹With bimonthly data, a four years' window allows to have almost one hundred observations per estimations.

³²The index includes the 40 highest market capitalizations listed at the Paris Stock Exchange at the beginning of each year.

³³Results are not depicted, however they are available upon request to the author.

for the companies that cannot be classified according this criterion, we use the balance sheets of 1929 to differentiate the banks that are more invested in securities and financial participations before the crisis of the 1930s.

3.3.2.1 Business purposes

The first step of our classification process consists in identifying the business purpose of each of our 106 companies. This information, available in a short paragraph, is based on the juridical statutes of the company and published on the yearbooks of the stock exchange.³⁴ We look for keywords to make a first distinction among the companies' main activities. For example, many companies of our sample have activities mostly in the land and the real estate sectors. Those institutions do not run typical banking operations such as discounting bills or commercial paper, nor loans to industrial firms. They only deal with mortgage loans and land or real estate operations. So, we classify every company with a business purpose including the following keywords: *mortgage loans, land and real estate operations, mortgage backed credit / real estate / land backed loans* and so forth, in the "Real Estate and Land banks" category. This allows to gather 37 firms in this category.

We follow the same method to distinguish banks that enjoyed the privilege of being licensed to issue national bank notes. Entities mentioning in their business purpose *the privilege to issue bills* or *the right to issue bearer bills or payable on demand*, are gathered in the "Banks of issue" category. This category includes 8 banks and in particular the Bank of France and the colonial banks.

Finally, we do the same in order to identify "Investment funds" banks. This latter is composed of firms that invest their capital in securities (stocks, corporate or government bonds), provide their advice when companies want to go public or pool their capital to participate in subscription of newly issued shares on the market. As those entities are not involved in usual banking operations such as discount or lending, we exclude from this last

³⁴We used several issues of the *Desfossés* yearbooks (1931, 1936 and 1945) and one edition of the official "CAC" yearbooks (1918-1921) to cover our whole sample. We use various editions for two reasons: i) because some companies are listed and / or delisted during our period of interest; ii) it allows to check if there is any evolution in the business purpose of a company. For our sample of banks and financial institutions, the business purpose is reported from one edition to the other with the exact same text, suggesting that as long as there are no changes in the juridical statutes, the business purpose remains the same.

category the remaining banks of our sample that do not mention in their business purposes keywords such as: *discount operations, credit and advances, every banking operations*; but instead mention keywords like: *buying and selling securities, pooling capital or financial participations*. This category covers 7 companies.

Finally, a further 54 banks still remain to be classified in another way. As balance sheets data are also available in the same yearbooks, we run a cluster analysis based on these data, as in Bambrilla (2010).

3.3.2.2 Balance sheets

France did not adopt generally accepted accounting principles before 1943. Therefore, there are no standards for the balance sheets' items during the time period of our study.³⁵ Nevertheless, we are mainly interested in information about securities and financial participations. More specifically we seek to discriminate between banks that have a higher involvement in the real economy and in industrial development ("Investment banks") and banks that are more devoted to usual banking operations such as discounting bills or collecting deposits. To make this distinction, we compute, for each of our 54 remaining banks, the ratio of securities and financial participations over the total asset.

The value of this ratio is reported in Table 3.B.1. It seems difficult to identify a clear distinction between what we will call "Investment banks" and the remaining observations. Indeed, the distribution of this ratio within this sample does not allow to observe a clear cut between what we will call "Investment banks" and the remaining observations. Moreover, there is no threshold identified by the literature above which a bank should be considered as an investment bank. To circumvent this problem, we split our sample of 54 banks into two sub-samples, according the average value reached by the ratio: "Investment banks" correspond to banks with a ratio higher than the average ratio and the other banks are considered as "Deposit and commercial banks". We do not propose a classification based on the median ratio. Indeed, it would lead us to consider the *Crédit Industriel et Commercial (CIC)* as an "Investment bank" while this bank is traditionally seen as one of the most important French deposit bank even though its network of branches is not as widely

³⁵Balance sheets have been standardized in the *Desfossés* yearbooks from 1936, but it became less precise as the standardization reduced the number of published items. Moreover, most of our accounting data were retrieved from the yearbook of 1931 which displays the balance sheets of the end of the year 1929, so before the banking crisis.

spread as the ones of the *Crédit Lyonnais* or *Société Générale* (Bazot, 2014). On the other hand, our classification leads us to include the *Banque Transatlantique* in the "Deposit and commercial" category while it is sometimes seen as an investment bank (Thiveaud, 1997).

3.3.2.3 Final classification

Finally, the mix of qualitative and quantitative approaches described above leads us to distinguish between five categories of banks and financial institutions. Table A.1 to A.5 report, for each category, the names of these banks and financial institutions as well as their average market capitalizations over the period 1919-1939 for each categories. We also report the average annualized historical volatility over the same period in order to get a first overview of the variations in the banks' market value.

The realized volatility has been calculated as:

$$\sigma_i = \Omega_R \times \sqrt{24} \quad (3.1)$$

Where σ_i stands for the realized volatility for the bank i ; Ω_R the standard deviation of the past 24 observations (i.e. one year considering the bimonthly frequency of our dataset).

Instead of computing the mean of these realized volatilities per category, we first compute sub-indices weighted by market capitalization and then compute an average realized volatility for each of the sub-indices.³⁶ The results, reported in Table 3.1, are quite in line with our initial intuition: banks that have the less volatile market value are the commercial and deposit ones, while the investment banks and investment funds, both more invested in securities and financial participations, have the most volatile market value.

However, the average annualized volatility is not the best criteria to assess the risk exposure of a company or a group of companies. First, this measure is not stable over time and second, it does not take into account the volatility of the overall market. The next section presents a measure of the risk exposure that overcomes these issues.

³⁶For a similar variation, we give more weight to large market capitalizations. We consider this method as a better way to estimate the average realized for a given category.

Table 3.1: Average annualized volatility per sub-indices: 1919-1939

EMISSION	23.11
DEPOSITS AND COMMERCIAL	16.19
INVESTMENT	25
INVESTMENT FUNDS	31.57
LAND AND REAL ESTATE	18.93

Source. Author's calculation.

3.4 The French banking sector seen by the stock market

In this section we seek to evaluate the risk of the French banking sector during the interwar period. We first measure this risk on an aggregated level in order to quantify the risk of the sector as a whole. The second step consists in analysing the risk according to our five types of banks. In doing so, we can assess the differences in investors' behaviour with respect to bank specialization. Finally, we study the risk relative to the overall market on a more disaggregated level, i.e. at the firm's level.

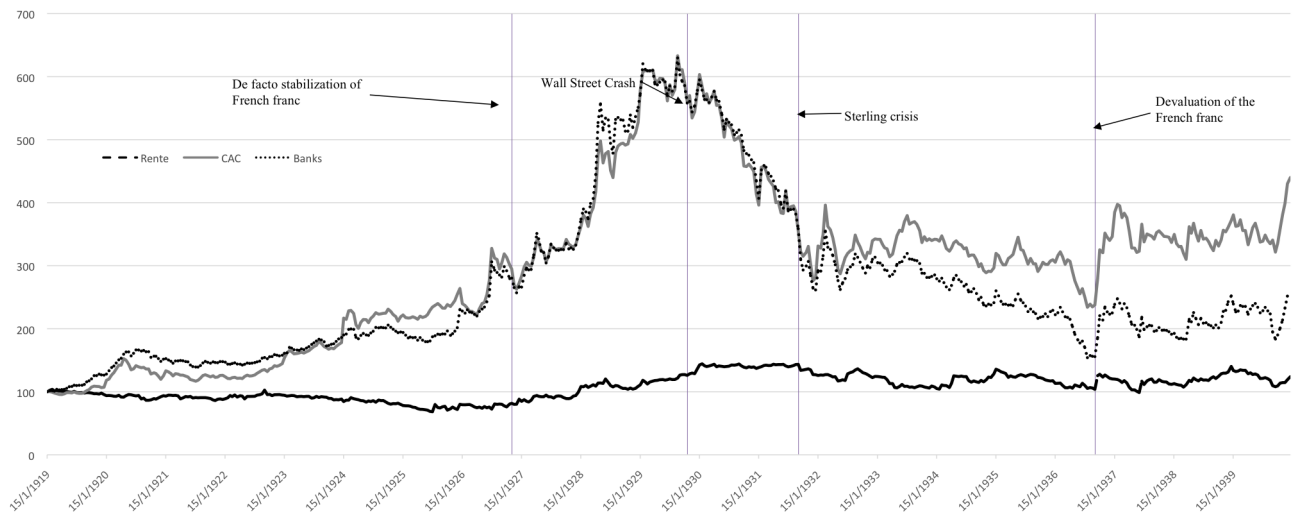
3.4.1 The banking sector

A first glance at the data in level gives us an overview of our three series. Figure 4.1 represents the share index of the overall market, of the banking sector and the risk-free security index over the period 1919-1939.

Both the overall and the bank-share indices seem to fluctuate together, while the Rente 3% varies only very slightly. It is interesting to observe how the data capture historical events. We can see that the *de facto* stabilization of the French franc boosted the banks stock prices, as well as the devaluation of 1936. On the contrary, the sterling crisis seems to accelerate the decrease in stock prices in late 1931. Finally, the impact of the Wall Street crash of October 1929 over the banking sector index does not seem straightforward.

In order to assess the stability of the banking sector, we rely on the methodology of Reinhart and Rogoff (2009), also used by Turner (2014) for the English case. It consists in using bank-share prices relative to the overall stock market. Reinhart and Rogoff (2009) consider this method superior to the study of failures, but difficult to implement over the long-run due to data availability. We then compare the returns of our banking sector index

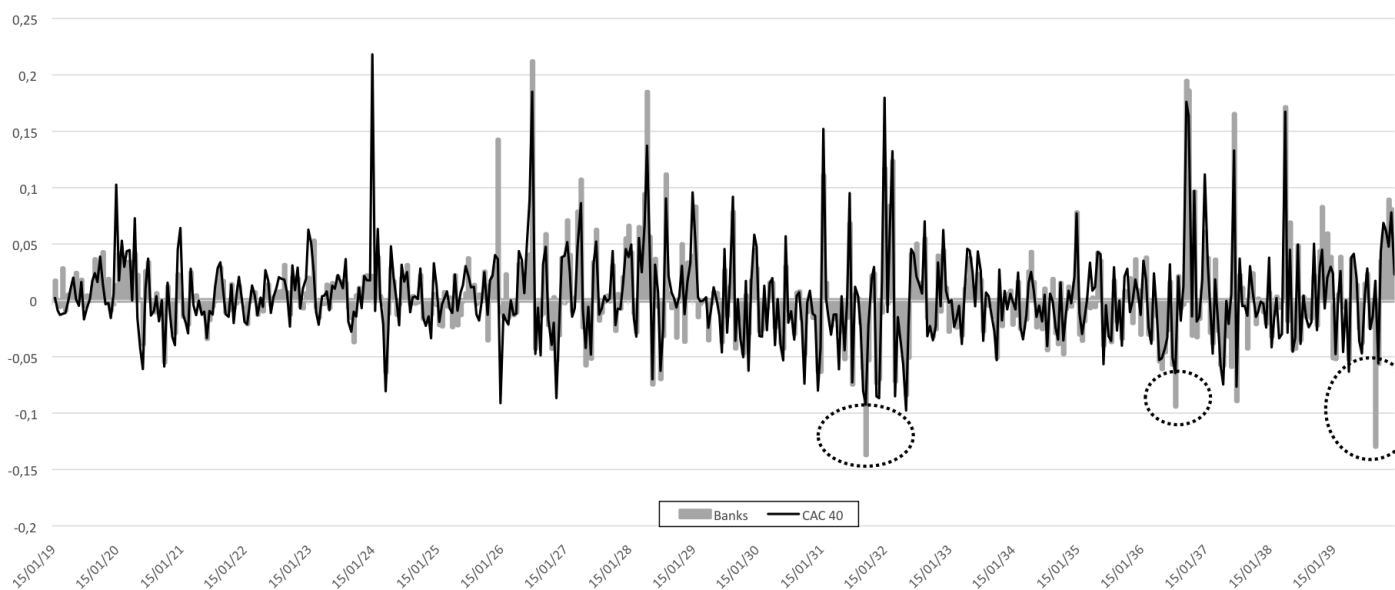
Figure 3.1: CAC 40, banks and Rente 3%, 1919-1939, base 100 in 1919



Source. Author's calculation.

calculated on a bimonthly basis relative to the overall market.

Figure 3.2: Monthly returns of the banking sector relative to the overall market



Source. Author's calculation.

Figure 4.2 shows three main episodes (circled in dotted lines) of negative excess returns of our bank-share index (R_{banks}) relative to the index of the overall market (R_{cac40}): i) in late September 1931, right after the sterling crisis; ii) in August 1936, right before the devaluation of the franc and iii) in September 1939, France's entry into WWII. Those events had indeed a destabilizing effect on banks. But this first result should be mitigated by banks' excess returns relative to the market. In Turner (2014), the only crisis considered systemic is the recent one of 2007-8. According to the author's calculation, bank stocks fell by almost 80% when the overall market fell by "only" 30%. In our case, the gap between the two figures reaches its maximum in 1931: bank stocks fell by 14% when the market fell by 9%.

This result leads is contrary to the idea of a systemic crisis. To provide a more in-depth analysis, we estimate the risk of the banking sector relative to the overall market by using the portfolio theory. Using the CAPM model, we can get the estimated beta of the banking sector, β_{banks} .

$$\beta_{banks} = \frac{cov(ER_{cac40}, ER_{banks})}{var(ER_{cac40})}$$

With ER_i the difference between the return of stock or index i and the return of the risk free asset. This calculation consists in running regressions of the bank's stock return on a risk factor, using the Ordinary Least Squares (OLS) estimation procedure:

$$ER_{banks} = \alpha + \beta ER_{cac40} + u_t \quad (3.2)$$

The risk is then assessed using the following criteria:

- ◇ If $\beta > 1$: the banking sector is more volatile (i.e. riskier) than the overall market.
- ◇ If $\beta < 1$: the banking sector is less volatile than the overall market.

We rely on a CAPM framework mainly due to data frequency. Indeed, bimonthly intervals does not allow to measure Value-at-risk (VaR) with the usual 10 days horizon. In fact, according to Alexander (2009), it is not appropriate to base historical VaR models on weekly or monthly data. The issue is similar for example for Stressed VaR (SVaR), which should be relevant in a financial stressed period as the 1930s. However, it has to be calculated on a minimum basis of one week.

We estimate Equation (3.2) for (i) the full period as well as for (ii) the 1920s (overall expansion) and (iii) the 1930s (overall recession). Table 3.1 summarizes the results for the estimated betas.

Table 3.1: estimated β by periods

	Full period	1919-1929	1929-1939
β	0,77 (40,32)	0,75 (28,57)	0,77 (28,44)

Notes. The t-statistics (t-stat) are in parentheses. If t-stat > |1,96|, the coefficient is significant at a 5% threshold.

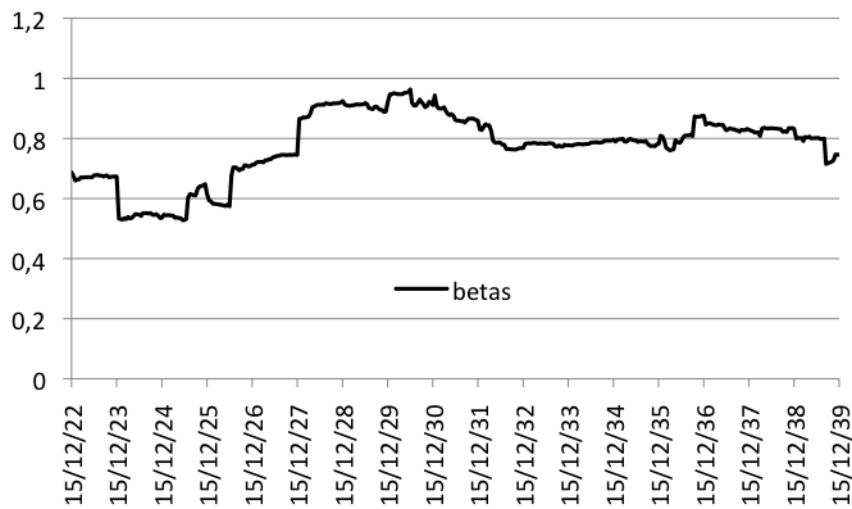
The first striking observation is that regardless the considered period, the estimated coefficient β is lower than 1, suggesting that bank stocks are on average less risky than the overall market. Surprisingly, the beta remains stable in the two sub-periods, while we would expect a riskier investment environment driven by the Great Depression during the period 1929-1939.

However, beta estimates are known to be unstable and time dependant (Groenewold and Fraser, 1999). We then also rely on rolling estimates to capture the dynamics of the risk over the period. To do so, we estimate betas with a four years' window (i.e. 96 observations). Therefore we are able to observe the time-varying beta for the whole banking sector from late 1922 up to the end of 1939. Figure 3 reports our estimation results.

Thanks to this time-varying approach, we confirm that the banking sector as a whole is always less risky than the overall market. Nevertheless, given the high heterogeneity among banks of our sample, data analysis can produce misleading results. Then, these first results need further clarification.

3.4.2 Bank's risk exposure: do banking activities matter?

Here we use the sub-indices mentioned in Section 3.2.3 and run a risk analysis for each type of banks.

Figure 3.3: Rolling betas for the whole sector, 1919-1939

Source. Author's calculation.

Table 3.2 reports the estimated betas for the five sub-indices.

Table 3.2: Estimated β according to banking activities

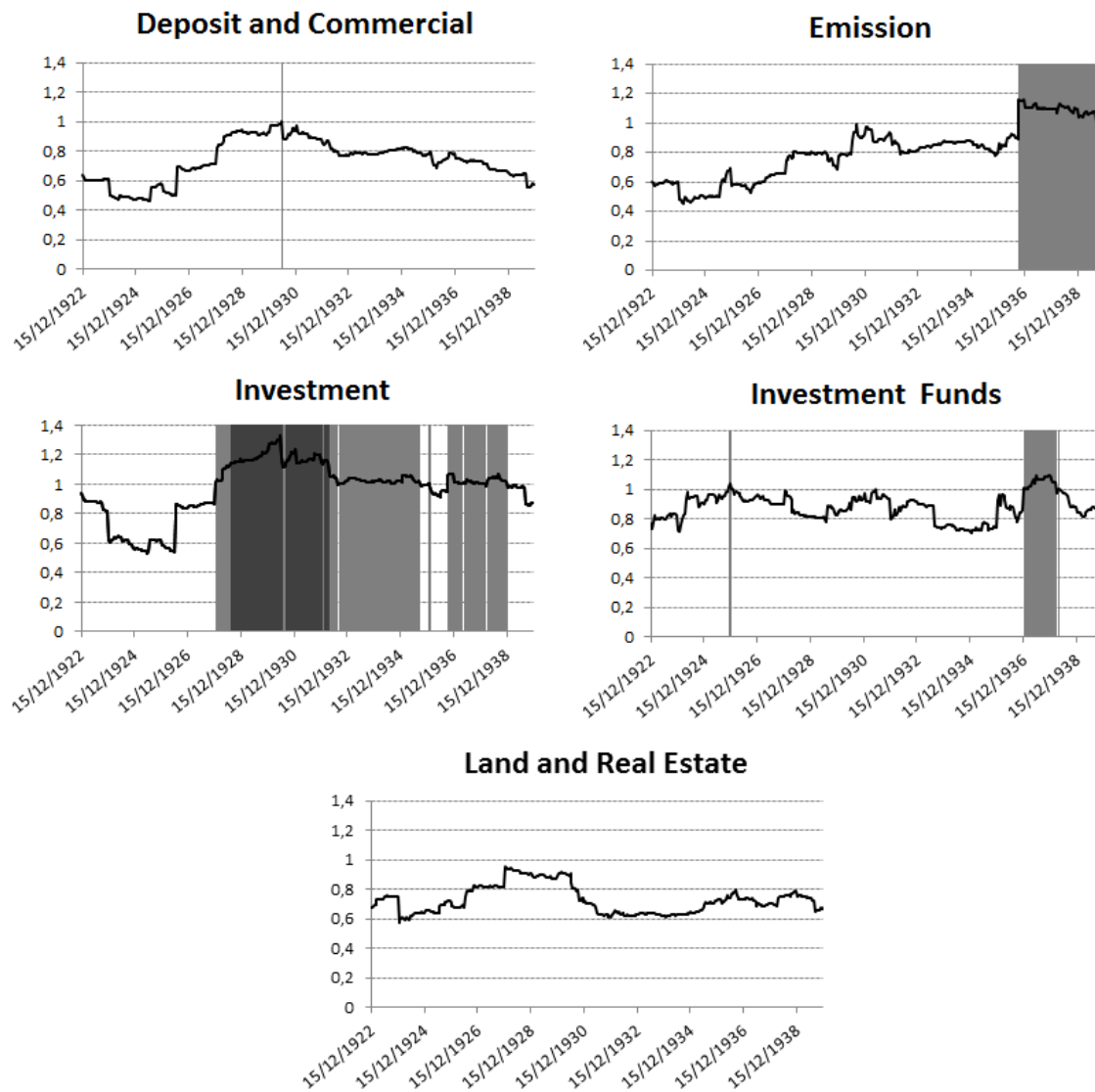
Banking activities	Full period	1919-1929	1929-1939
DEPOSITS AND COMMERCIAL	0,72 (28,7)	0,73 (19,83)	0,69 (21,15)
EMISSION	0,78 (21,58)	0,67 (12,7)	0,94 (19,74)
INVESTMENT	0,95 (24,5)	0,94 (17,37)	0,95 (17,13)
INVESTMENT FUNDS	0,87 (13,65)	0,9 (8,68)	0,82 (12,55)
LAND AND REAL ESTATE	0,73 (27,23)	0,78 (20,84)	0,66 (17,37)
TOTAL	0,75 (40,32)	0,75 (28,57)	0,77 (28,44)

Notes. The t-statistics (t-stat) are in parentheses. If t-stat > |1,96|, the coefficient is significant at a 5% confidence level.

As for the whole banking sector, the estimations results don't evidence a clear difference between the boom phase of 1919-1929 and the depression phase of 1929-1939. For the same reasons above-mentioned, we rely on rolling estimates to perform a time-varying analysis.

Figure 3.4 displays the results for the five sub-indices.

Figure 3.4: Rolling-correlations of β according to specialization



Notes. Rolling-correlations estimations with 96 observations in each rolling window. Light shaded areas depict observations for which the estimated beta ($\hat{\beta}$) exceeds 1 (i.e. the security's price is theoretically more volatile than the market). Dark shaded areas corresponds to observations for which we rejected the null hypothesis of the following unilateral Student test: $H_0: \beta = 1$ versus $H_1: \beta > 1$. The Student statistic, calculated as $\frac{\hat{\beta} - 1}{\sigma_{\hat{\beta}}} \sim t_{(95)}$ (with $\sigma_{\hat{\beta}}$ the standard error of $\hat{\beta}$), is compared to the critical value 1,66 at the 5% confidence level. Hence, it corresponds to observations for which the corresponding actors were significantly riskier than the overall market. **Source.** Author's calculation.

As can be seen, only the investment banks' betas are, at some point, significantly above one. This means that these banks were the only ones that had assets that were perceived by investors riskier than the overall market. Indeed, we observe dark shaded areas only for

investment banks between roughly mid-1928 up to mid-1932.³⁷ Banks in this category are also found to be as risky as the overall market (i.e. betas are fluctuating around 1 without being significantly different from 1). We note that this also holds true for the note-issuing banks, from September 1936 during the devaluation of the Franc up to the end of the period. This result could be explained by changes in the statutes of the *Banque de France* that occurred the same year, undertaken by the lefty coalition and which can be seen as a first step towards nationalization completed in 1945. We note however that even during this period, note-issuing banks are not significantly riskier than the market, but only as risky as the market. On the contrary, deposit and commercial banks are always less risky than the overall market,³⁸ while the *Banque Nationale de Cr dit (BNC)* failed during the banking crisis. This analysis corroborates the hypothesis that the specialization of the banking sector could have acted as a buffer to exogenous financial shocks. Indeed, despite the *BNC* only business banks needed intervention of either authorities or bank syndicates in order not to fail. To make comparisons with other banking systems, the work of Richard Tilly (1998) is very insightful. As the author writes: "Neither bank-oriented nor market-oriented financial systems escaped the crisis; and it is not easy to say which system proved the more resilient". The German case is quite interesting. Although German banks suffered a lot from the Government's debt and policy and the weakness of the Reichsmark, Tilly (1998) notes that the competition among universal banks in the 1920s reduced their margin and encouraged them to invest in riskier businesses. As for other countries like Austria, Italy or Belgium, where universal banking was widespread, the crisis of the early 1930s caused Government interventions. For Italy and Austria, the State's ownership continued after the war, whereas Belgium took steps to separate commercial and investment activities, as in the US. Only the German universal banking system survived, but thanks to massive nationalizations. For the US case, the Glass-Steagall act response to the large banking crisis of 1929-1933 could also be seen as a confirmation of our hypothesis. However, the study of Kroszner and Rajan (1994) tempers this view by showing that the comparison between performances of securities underwritten by commercial and investment banks prior to the Act shows no evidence of the need to separate those activities. In our analysis, the French case seems to differ from the American experience.

³⁷Dark shaded areas corresponds to periods in which the rolling-correlation coefficient is significantly higher than one.

³⁸Even though there is one point for which the beta is equal to 1, it is not significantly above 1.

3.4.3 Robustness checks

As a robustness check, we run the same regressions with individual bank series. Tables 3.C.1, 3.C.2, 3.C.3 (see in the Appendix) report the estimated betas for each of our 106 banks.

Results on individual series are more difficult to interpret. In fact, many coefficients are not significant. Nevertheless, some particularities emerge. For example, the *BNC* case seems rather well captured by our estimations: the beta goes from 0.66 in the 1920s to 1.346 in the early 1930s.³⁹ Also, the *BUP* case seems relevant, the beta strongly increases from 1.06 to 1.47 between the two sub-periods. We would have expected the same pattern for the *Banque de Paris et des Pays Bas (BPPB)*, however the beta slightly decreases. In this case, rolling estimates may be a relevant alternative but the lack of statistical significance prevents us from running systematic rolling estimates for all series, in addition to the difficulty of displaying the results for such a wide range of observations.

3.5 Conclusion

Using a new set of stock price data, we have estimated in this chapter investors risk perceptions on the French banking sector. Our results show that this estimated risk differs among banking activities. They then add new insights on the French banking crisis of the 1930s by relying on a different framework than the usual analysis based on banks' failures. Moreover, our findings go against the argument that a system based on universal banks provides a more stable and diversified financial system. This paper provides an example of a specialized banking system resilient in times of economic and financial crisis. Indeed, during the stressful episode of the early 1930s in France, the specialized structure of the French banking system did help deposit banks to avoid panics and bank runs.

However, this study merits further research. In order to go further, we could use balance sheets data to investigate which items explain the best stock returns. For example, the level of deposits or participations in other firms would probably help to understand the difference in the risk of bank stocks according to their activity, i.e. to their balance sheets. Balance sheets data on the banks' debt structure would also allow us to estimate a market-based measure of risk such as the distance-to-default. As we already have stock prices, it would

³⁹Data for this bank stops in 1932: the stock is delisted right after the failure in 1932.

only require to assess the "default-point" by using short-term and long-term debt data. It should be particularly interesting to see how such measures behave across two very different macroeconomic regimes (i.e. the 1920s and the 1930s). Also, bank level data would allow us to calculate capital and liquidity ratios in order to evaluate investors' interest in the management policy of the banks as well as their market discipline.

The systemic risk of the banking system could also be captured by the degree of connectivity of market participant. The Social Network Analysis should be investigated through the lengths of interlocking-directorates. Such a study is possible because the Desfossés Yearbooks report the names and functions of all board members for every listed company at the Paris' Bourse. Recent studies, such as Billio et al. (2012) use both monthly data on stock returns and different measures of connectedness under the Principal Component Analysis framework, in order to assess the role of different financial institutions (banks, hedge funds, insurances...) in the transmission of shocks.

Appendix

3.A Sample

Table 3.A.1: DEPOSITS AND COMMERCIAL BANKS

	Average Volatility 1919-1939	Average Market Capitalization (in millions Francs)
Crédit Lyonnais	25,83%	1297,43
Société Générale	16,31%	1140,64
Comptoir National d'Escompte de Paris	21,12%	739,39
Banque Nationale de Crédit	29,17%	541,93
Compagnie Algérienne	24,53%	295,31
Crédit Commercial de France	27,61%	268,57
Sté Générale Alsacienne de Banque	12,56%	152,14
Société Marseillaise de Crédit Industriel	31,3%	117,91
Banque Nationale pour le Commerce et l'Industrie	9,31%	114,75
CIC	15,18%	106,37
Banque de Mulhouse	22,92%	104,63
Comptoir d'escompte Mulhouse	43,69%	98,78
Banque Privée Lyon-Marseille	22,86%	91,11
Banque Française et Italienne pour l'Amérique du Sud	21,4%	78,46
Banque Transatlantique	22,76%	72723107,14
Banque Française pour le Commerce et l'Industrie	20,01%	63,53
Banque Industrielle de l'Afrique du Nord	24,83%	47,27
Banque des Pays du Nord	19,67%	45904331,98
Société Française de Banque et de Dépôts	25,04%	43,75
Etablissement Marret, Bonnin, Lebel et Guieu	60,08%	42,17
Banque Française de l'Afrique Equatoriale	24%	38,84
Banque Franco-Polonaise	10,57%	35159000
Société Française de Reports de dépôts	19,85%	34,77
Comptoir d'escompte de Reims	29,67%	31,82
Crédit Industriel de l'Ouest	17,62%	30,63
Caisse Générale de l'Industrie et du Bâtiment	72,9%	24,13
Société Bordelaise de Crédit Industriel et Commercial et de Dépôts	16,02%	19,42
Caisse Lecuyer	28,8%	17,15
Lehideux et Cie	26,01%	16,30
Compagnie de l'Océan Indien	88,07%	13,86
Banque Commerciale Africaine	76,99%	11,15
Banque Commerciale du Maroc	39,35%	7,31
Banque Franco-Asiatique	50,15%	7,25

Table 3.A.2: EMISSION BANKS

	Average Volatility 1919-1939	Average Market Capitalization (in million Francs)
Banque de France	26,8%	2002,82
Banque de l'Indochine	32,79%	772,74
Banque de l'Algérie	25,46%	395,77
Banque de l'Afrique Occidentale	38,41%	58,87
Banque de la Réunion	26,02%	36,59
Banque de Madagascar	34,93%	32,19
Banque Nationale de la République d'Haïti	15,22%	20,91
Banque de la Martinique	30,11%	12,36

Table 3.A.3: INVESTMENT BANKS

	Average Volatility 1919-1939	Average Market Capitalization (in million Francs)
BPPB	33,68%	819,85
Comptoir Lyon-Alemand	59,44%	344,03
Banque de l'Union Parisienne	54,22%	308,93
Crédit du Nord	10,93%	199,90
Banque Générale du Nord	17,65%	137,18
Crédit Mobilier Français	20,45%	117,40
Société Nancéienne de Crédit Industriel et de Dépôt	20,56%	94,84
Comptoir Lyon-Alemand Louyot et Cie	27,12%	91,99
L'Union des Mines	44,81%	77,42
Banque Europe Centrale (des Pays de l')	29,57%	69,69
Banque Industrielle de la Chine	53,52%	62,72
Caisse de Liquidation des affaires en marchandises à Paris	30,35%	48,20
Banque Nationale Française du Commerce Extérieure	25,34%	35,46
Crédit Algérien	19,86%	31,57
Société Parisienne de Banque	16,53%	31,14
Union Industrielle de Crédit pour la Réconstitution	48,44%	23,68
Banque Franco-Japonaise	17,66%	20,38
Crédit Français	59,39%	18,06
Banque Spéciale de Crédit pour Fournisseurs de Services Publics	40,75%	14,84
Banque Internationale de Commerce	16,24%	12,91
Naud et Cie	32,84%	6,67

Table 3.A.4: INVESTMENT FUNDS

	Average Volatility 1919-1939	Average Market Capitalization (in million Francs)
Société Financière Française et Coloniale	61,1%	104,72
Société Financière d'Exploitations Industrielles	17,67%	43,40
Société Financière de l'Est	54,14%	41,433
Cuivre et Pyrites	24,62%	27,32
Union Trust	55,75%	25,19
Omnium Colonial	37,64%	19,56
Association Financière pour le commerce et l'industrie	38,61%	4,25

Table 3.A.5: LAND AND REAL ESTATE BANKS

	Average Volatility 1919-1939	Average Market Capitalization (in millions Francs)
Crédit Foncier de France	25,79%	1889,41
Crédit Foncier Franco-Canadien	33,07%	460,09
Banque Hypothécaire Franco-Argentine	32,87%	277,62
Crédit Foncier Colonial	39,58%	267,92
Crédit Foncier d'Algérie et de Tunisie	16,32%	167,57
Immobilière Marseillaise	21,96%	132,48
Rente Foncière	33,2%	121,19
Foncière Lyonnaise	27,92%	114,68
Crédit Foncier de l'Indochine	57,96%	113,83
Crédit Foncier du Brésil et de l'Amérique du Sud	48,39%	110,93
Société Générale Foncière	48,79%	98,597103,09
Société Foncière du Nord de la France	81,77%	53,707
Foncière de France	45,61%	47,45
Sous-comptoir des Entrepreneurs	32,49%	46,64
Foncière de l'Etoile	39,92%	38,08
Immobilia "Banque de crédit à long et moyen terme"	37,35%	28,78
Caisse Hypothécaire Canadienne	42,17%	24,78
Crédit Foncier d'Orient	37,26%	23,78
Crédit Foncier Argentin	54,33%	23,34
Foncière Parisienne	15,79%	21,74
Garantie La Foncière	35,04%	19,67
Immobilière des Voitures à Paris	59,9%	18,25
Banque Française du Maroc	62,43%	18,00
Immeubles de France	33,72%	17,55
Caisse Hypothécaire Argentine	28,82%	15,42
Pharos	43,31%	14,49
Fourmi Immobilière (La)	29,17%	14,05
Caisse Générale de Prêts Fonciers et Industriels	39,88%	13,23
Industrielle Foncière (L')	60,81%	10,97
Crédit Franco-Egyptie	19,16%	10,41
Crédit Foncier de Madagascar	36,79%	9,32
Trust Immobilier de France	3,88%	9,30
Foncière et Immobilière de la Ville d'Alger (Sté)	28,53%	6,96
L'immeuble Parisien	42,42%	6,73
Société Immobilière du Comptoir Central de Crédit	29,91%	6,40
Société Foncière de l'Argentine	50,24%	4,37
Immobilière et Industrielle du Bâtiment	27,21%	3,06

3.B Data

3.C Econometrics

Table 3.B.1: Securities' portfolio ratio

Banks	Securities' portfolio ratio
Comptoir Lyon-Alemand Louyot et Cie ^a	53,96
Crédit du nord ^b	49,18
Banque Internationale de Commerce	31,32
Union industrielle de Crédit pour la Réconstitution ^c	30,85
Comptoir Lyon-Alemand	26,31
Crédit Mobilier français	23,83
Banque Générale du Nord	20,76
Caisse de Liquidation des affaires en marchandises à Paris ^d	19,64
Société Parisienne de Banque	17,50
Banque Nationale Française du Commerce Extérieure	16,49
BUP	16,30
Union des mines	15,29
Naud et Cie	15,10
Banque Franco-Japonaise	14,35
Crédit Algérien	14,04
Société Nancéienne de Crédit Industriel et de Dépôt	12,22
Banque Europe Centrale (des Pays de l')	11,58
BPPB	10,95
Banque Industrielle de la Chine	10,78
Banque Spéciale de Crédit pour Fournisseurs de Services Publics	9,80
CIC	8,32
Transatlantique	7,21
Etablissement Marret, Bonnin, Lebel et Guieu	6,73
Lehideux et Cie	4,19
Banque Française de l'Afrique Equatoriale	4,09
Banque Franco-Asiatique	3,66
Banque des Pays du Nord	3,46
Sté Générale Alsacienne de Banque	2,26
Comptoir d'escompte Mulhouse ^e	2,17
Caisse générale de l'industrie et du bâtiment	1,56
Banque Française et Italienne pour l'Amérique du Sud	1,16
Crédit industriel de l'ouest	1,16
Société Française de Banque et de Dépôts	1,12
Banque commerciale africaine	1,11
Crédit commercial de France	1,03
Banque privée Lyon-Marseille	1,02
Banque de Mulhouse ^f	0,95
Compagnie de l'Océan Indien	0,93
Comptoir d'escompte de Reims	0,82
Banque Franco-Polonaise	0,63
Banque Nationale de Crédit	0,62
Banque Commerciale du Maroc	0,49
Compagnie Algérienne	0,46
Société Bordelaise de Crédit Industriel et Commercial et de dépôts	0,45
Société Marseillaise de Crédit Industriel	0,44
Société Générale	0,44
Banque industrielle de l'Afrique du Nord	0,39
BNCI ^g	0,27
Comptoir national d'Escompte de Paris	0,07
Crédit Lyonnais	0,03
Caisse Lecuyer	0,00
Société Française de Reports de dépôts	0,00
Average	9,55
Median	3,87

Notes. ^a: balance sheet as per 30/06/31.

^b: balance sheet as per 31/12/34.

^c: see the 5th Dec. 1926. This company was involved in many borrowings in the industrial sector.

^d: Listed in 1934. Balance sheet as per 30/09/34.

^e: balance sheet as per 31/12/27.

^f: balance sheet as per 31/12/27.

^g: balance sheet as per 31/12/33.

Table 3.C.1: Estimated β by periods

	Full	1919-1929	1929-1939		Full	1919-1929	1929-1939
<i>Association Financière pour le commerce et l'industrie</i>	0,229 (2,056)	0,24 (1,55)	0,212 (1,292)	<i>Banque Générale du nord</i>	0,35 (3,68)	0,29 (3,56)	0,399 (1,75)
<i>Banque Industrielle de la Chine</i>	0,411 (2,45)	0,38 (2,23)	0,459 (1,13)	<i>Banque Hypothécaire Franco-Argentine</i>	0,638 (8,2)	0,63 (7,81)	0,643 (4,56)
<i>Banque de l'Afrique Occidentale</i>	-0,094 (-0,94)	-0,54 (-4,1)	0,466 (3,17)	<i>Banque Industrielle de l'Afrique du Nord</i>	0,324 (5,55)	0,299 (3,17)	0,346 (4,873)
<i>Banque Commerciale Africaine</i>	0,258 (0,91)	0,38 (2,33)	0,236 (0,706)	<i>Banque Internationale de Commerce</i>	0,38 (7,13)	0,42 (6,57)	0,354 (4,538)
<i>Banque Commerciale du Maroc</i>	0,11 (0,87)	0,17 (0,66)	0,103 (0,746)	<i>Banque Nationale de Crédit</i>	0,98 (6,62)	0,66 (7,72)	1,343 (2,597)
<i>Banque de l'Algérie</i>	0,54 (10,045)	0,39 (4,93)	0,736 (10,514)	<i>BNCI</i>	0,208 (3,34)	- (-)	0,208 (3,341)
<i>Banque de France</i>	0,584 (11,18)	0,52 (6,48)	0,657 (10,95)	<i>Banque Nationale Française du Commerce Extérieure</i>	0,32 (3,77)	0,28 (2,75)	0,369 (2,748)
<i>Banque de l'Indochine</i>	0,723 (11,18)	0,57 (7,05)	0,914 (8,873)	<i>Banque Nationale de la République d'Haïti</i>	0,39 (2,39)	0,4 (2,39)	- (-)
<i>Banque de Madagascar</i>	0,209 (1,6)	0,31 (1,18)	0,194 (1,375)	<i>Etablissement Marret, Bonnin, Lebel et Guieu</i>	0,43 (2,14)	0,37 (1,37)	0,443 (1,908)
<i>Banque de la Martinique</i>	0,247 (3,489)	0,31 (2,79)	0,168 (1,931)	<i>Banque des Pays du Nord</i>	0,22 (3,45)	0,26 (2,87)	0,165 (1,81)
<i>Banque de Mulhouse</i>	0,36 (1,66)	0,37 (3,44)	-0,83 (-0,29)	<i>BPPB</i>	1,005 (14,8)	1,03 (9,94)	0,961 (11,566)
<i>Banque de la Réunion</i>	0,374 (4,464)	0,61 (3,59)	0,183 22,875	<i>Banque Spéciale de Crédit pour Fournisseurs de Services Publics</i>	0,208 (1,05)	0,408 (1,98)	-0,039 (-0,11)
<i>Banque Europe Centrale (des Pays de l')</i>	0,329 (2,81)	0,34 (1,34)	0,312 (4,16)	<i>Banque Transatlantique</i>	0,58 (12,06)	0,51 (8,33)	0,66 (8,34)
<i>Banque Franco-Asiatique</i>	0,107 (0,54)	-0,25 (-1,17)	0,146 (0,6606)	<i>BUP</i>	1,24 (7,47)	1,06 (9,47)	1,47 (4,32)
<i>Banque Française de l'Afrique Equatoriale</i>	0,316 (1,99)	0,36 (4,66)	-0,307 (-0,319)	<i>Compagnie Algérienne</i>	0,641 (12,93)	0,57 (8,15)	0,73 (10,49)
<i>Banque Française pour le Commerce et l'Industrie</i>	0,55 (1,54)	0,55 (1,54)	- (-)	<i>Crédit commercial de France</i>	0,728 (12,08)	0,7 (7,23)	0,75 (11,75)
<i>Banque Française et Italienne pour l'Amérique du Sud</i>	0,43 (8,5)	0,55 (8,49)	0,261 (3,389)	<i>Comptoire d'escompte Mulhouse</i>	0,534 (3,04)	0,49 (3,82)	0,74 (1,06)
<i>Banque Franco-Japonaise</i>	0,345 (7,11)	0,48 (7,12)	0,199 (2,926)	<i>Comptoire d'escompte de Reims</i>	0,454 (2,38)	0,19 (1,56)	1,16 (1,66)
<i>Banque Française du Maroc</i>	0,634 (4,77)	0,28 (1,96)	1,09 (4,698)	<i>Crédit Foncier Argentin</i>	0,384 (2,52)	0,38 (2,97)	0,39 (1,28)
<i>Banque Franco-Polonaise</i>	0,0647 (1,03)	-0,13 (-0,53)	0,09 (1,551)	<i>Crédit Foncier d'Algérie et de Tunisie</i>	0,46 (10,6)	0,52 (7,49)	0,37 (8,35)

Notes. Figures in parenthesis are t-stats. If t-stat $> |1,96|$, the coefficient is significant at a 5% threshold.

Table 3.C.2: Estimated β by periods

	Full	1919-1929	1929-1939		Full	1919-1929	1929-1939
<i>Crédit Foncier du Brésil et de l'Amérique du Sud</i>	0,25 (1,55)	0,49 (5,14)	-0,66 (-0,96)	<i>Crédit Algérien</i>	0,46 (10,1)	0,49 (7,07)	0,43 (7,3)
<i>Crédit Foncier Colonial</i>	0,35 (3,59)	0,26 (1,54)	-0,45 (6,71)	<i>Crédit français</i>	0,49 (2,04)	0,49 (2,04)	-
<i>Crédit Franco-Egyptien</i>	0,327 (0,57)	0,33 (0,57)	-	<i>Crédit du Nord</i>	0,17 (1,87)	-	0,17 (1,87)
<i>CFF</i>	0,49 (9,86)	0,5 (6,88)	0,47 (7,1)	<i>Cuivre et Pyrites</i>	0,5 (9,86)	0,49 (7,44)	0,52 (6,45)
<i>Crédit Foncier Franco-Canadien</i>	0,89 (11,57)	0,98 (9,18)	0,78 (6,97)	<i>Foncière de l'Etoile</i>	0,212 (0,63)	0,4 (0,79)	0,12 (0,28)
<i>Crédit foncier de l'Indochine</i>	1,278 (10,17)	1,06 (5,28)	1,43 (8,9)	<i>Foncière et Immobilière de la Ville d'Alger (Sté)</i>	0,446 (6,21)	0,63 (5,34)	0,19 (2,93)
<i>Crédit Foncier de Madagascar</i>	0,37 (3,25)	0,57 (3,85)	0,2 (1,22)	<i>Foncière de France</i>	0,46 (4,31)	0,48 (2,78)	0,42 (3,68)
<i>Crédit Foncier d'Orient</i>	0,68 (8,25)	0,49 (5,7)	0,91 (6,2)	<i>Foncière Lyonnaise</i>	0,61 (9,87)	0,62 (6,99)	0,59 (6,91)
<i>Caisse générale de l'industrie et du bâtiment</i>	0,65 (2,07)	0,0067 (0,03)	0,79 (2,025)	<i>Foncière Parisienne</i>	0,127 (1,9)	-	0,13 (1,91)
<i>Caisse générale de Prêts Fonciers et Industriels</i>	0,45 (4,71)	0,37 (5,18)	0,57 (2,99)	<i>Fourmi Immobilière (La)</i>	0,292 (3,92)	0,37 (2,88)	0,21 (2,56)
<i>Caisse Hypothécaire Argentine</i>	0,358 (2,62)	0,21 (2,24)	2,93 (1,64)	<i>Garantie La Foncière</i>	-0,028 (-0,11)	0,57 (0,68)	-0,035 (-0,136)
<i>Caisse Hypothécaire Canadienne</i>	-0,41 (-0,252)	-0,41 (-0,25)	-	<i>Immeubles de France</i>	0,476 (6,18)	0,55 (5,01)	0,36 (3,42)
<i>CIC</i>	0,37 (9,1)	0,46 (1,47)	0,25 (4,18)	<i>Immobilière et Industrielle du Bâtiment</i>	0,286 (4,18)	0,44 (4,24)	0,09 (1,06)
<i>Crédit industriel de l'ouest</i>	0,26 (5,25)	0,33 (4,08)	0,18 (3,19)	<i>Immobilière marseillaise</i>	0,44 (9,18)	0,367 (5,17)	0,54 (8,43)
<i>Crédit Lyonnais</i>	0,8 (14,52)	0,85 (9,54)	0,73 (12,78)	<i>L'immeuble Parisien</i>	0,22 (0,975)	-0,12 (-0,46)	0,25 (1,01)
<i>Comptoir Lyon-Alemand</i>	0,54 (2,91)	0,62 (7,24)	0,31 (0,56)	<i>Immobilia "Banque de crédit à long et moyen terme"</i>	0,3 (3,25)	0,32 (2,43)	0,283 (2,25)
<i>Caisse de Liquidation des affaires en marchandises à Paris</i>	-0,16 (-0,95)	-	-0,17 (-0,95)	<i>Industrielle Foncière (L')</i>	0,32 (2,15)	0,37 (4,15)	0,25 (0,82)
<i>Crédit Mobilier Français</i>	0,57 (5,79)	0,48 (8,37)	0,76 (1,88)	<i>Immobilière des Voitures à Paris</i>	-0,4 (-1,32)	0,46 (2,65)	-0,79 (-1,67)
<i>Comptoir national d'Escompte de Paris</i>	0,59 (12,39)	0,52 (7,36)	0,67 (10,98)	<i>Caisse Lecuyer</i>	-0,102 (-0,98)	0,24 (2,92)	-0,57 (-2,74)
<i>Compagnie de l'Océan Indien</i>	0,26 (0,92)	0,07 (0,19)	0,45 (0,98)	<i>Lehideux et Cie</i>	0,397 (4,318)	0,03 (0,29)	0,43 (4,27)

Notes. Figures in parenthesis are t-stats. If t-stat > |1,96|, the coefficient is significant at a 5% threshold.

Table 3.C.3: Estimated β by periods

	Full	1919-1929	1929-1939		Full	1919-1929	1929-1939
<i>Comptoir Lyon-Alemand Louyot et Cie</i>	0,37 (1,64)	- -	0,37 (1,65)	<i>Société Foncière du Nord de la France</i>	0,57 (1,55)	0,11 (0,43)	0,69 (3,4)
<i>Naud et Cie</i>	0,46 (6,49)	0,41 (4,28)	0,52 (4,92)	<i>Société Française de Reports de dépôts</i>	0,16 (2,8)	0,28 (3,63)	-0,009 (-0,11)
<i>Omnium Colonial</i>	0,133 (0,25)	0,37 (1,06)	-0,15 (-0,15)	<i>Société Générale</i>	0,397 (7,037)	0,41 (4,29)	0,37 (7,73)
<i>Pharos</i>	0,375 (1,8)	0,42 (2,9)	0,34 (0,87)	<i>Sté Générale Alsacienne de Banque</i>	0,33 (7,23)	0,51 (8,13)	0,11 (1,67)
<i>Banque Privée Lyon-Marseille</i>	0,48 (3,72)	0,38 (4,03)	1,12 (1,21)	<i>Société Générale Foncière</i>	0,75 (6,09)	0,26 (1,47)	1,22 (7,42)
<i>Rente Foncière</i>	0,68 (9,72)	0,59 (5,18)	0,78 (11,27)	<i>Société Immobilière du Comptoir Central de Crédit</i>	0,26 (2,99)	0,45 (3,37)	0,14 (1,25)
<i>Société Bordelaise de Crédit Industriel et Commercial et de dépôts</i>	0,28 (5,29)	0,45 (5,8)	0,097 (1,39)	<i>Société Marseillaise de Crédit Industriel</i>	0,36 (2,01)	0,41 (6,67)	0,29 (0,76)
<i>Sous-comptoir des entrepreneurs</i>	0,43 (4,98)	0,46 (4,74)	0,387 (2,55)	<i>Société Nancéienne de Crédit Industriel et de Dépôt</i>	0,25 (4,03)	0,29 (3,61)	0,18 (1,92)
<i>Société Foncière de l'Argentine</i>	0,47 (3,16)	0,58 (3,71)	0,33 (1,2)	<i>Société Parisienne de Banque</i>	0,13 (1,32)	0,16 (1,17)	0,13 (1,18)
<i>Société Française de Banque et de Dépôts</i>	0,22 (2,86)	0,31 (2,21)	0,12 (2,22)	<i>Trust Immobilier de France</i>	-0,44 (-0,45)	-0,036 (-0,098)	-0,31 (-0,21)
<i>Société Financière de l'Est</i>	1,06 (6,49)	-0,0046 (-0,075)	1,06 (6,38)	<i>Union industrielle de Crédit pour la Réconstitution</i>	-0,02 (-0,12)	-0,57 (-0,92)	0,15 (0,93)
<i>Société Financière d'Exploitations Industrielles</i>	0,18 (2,27)	- -	0,18 (2,27)	<i>L'Union des Mines</i>	0,58 (4,64)	0,48 (0,86)	0,6 (4,67)
<i>Société Financière Française et Coloniale</i>	1,34 (9,13)	0,92 (4,95)	1,78 (8)	<i>Union Trust</i>	-0,86 (-1,82)	0,06 (0,23)	-0,97 (-1,76)

Notes. Figures in parenthesis are t-stats. If t-stat $> |1,96|$, the coefficient is significant at a 5% threshold.

Chapter 4

Financial market integration during the interwar period: on the effects of Gold Standard adoption on stock markets*

Abstract

This chapter assesses the effect of monetary integration on stock market correlations between Belgium, France and the US during the interwar period (1919-1939). Our comparative analysis relies on an original dataset including high quality value-weighted stock price indices on a monthly basis. Contrary to the common wisdom, we find that cross-correlations increased before the beginning of the international financial crisis of the 1930s. Financial linkages between stock markets tightened during the Gold Exchange Standard period, showing that monetary integration has strongly affected the co-movement of stock returns especially between the Belgian-US and the French-US stock markets.

JEL Classification: E63, G15, N22, N24

Keywords: Exchange rate regime, Financial market integration, Interwar period, Stock market correlations

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4.1 Introduction

Since the global financial crisis of 2007-2008 and the subsequent Euro area sovereign debt crisis of 2010-2011, there have been raising concerns about the potential exit of a member from the currency union. After Greece's dramatic monetary fate and the subsequent "Grexit" fear, attention has now shifted to a much larger economy, namely Italy. Political uncertainty surrounding the Prime Minister Renzi's referendum about a large constitutional reform, added to poor economic performances have raised fears about the country's ability to remain in the Eurozone. These concerns have materialized in increasing capital flight since 2015.¹

The most prominent episode of a fixed exchange rate regime collapse caused by a financial crisis occurred in the 1930s. Indeed, the largest economies at that time used to devalue their currency in order to boost their domestic output and employment. As the recession spread internationally, these domestic policies worsened the recession in other countries. The main difference with the recent crisis is that the principal concern of economic authorities at that time was ensuring price stability through an international monetary system based on gold parity: the Gold Standard or the Gold Exchange Standard (GES hereafter).² The issue with this setting was the lack of fiscal room it implied when a country wished to boost its demand. The only way for countries to depreciate their currency was then to get out of the system and abandon their gold parity even if there were still concerns about inflation. This is what happened after the beginning of the Great Depression in the early 1930s: the UK went off gold in 1931, the US in 1933, France and most of the remaining countries in 1936. According to Eichengreen (1992), and his famous "Golden Fetters" hypothesis, countries that stayed the longest on gold were the ones for which the recovery was the slowest. Obstfeld and Taylor (2003) point out that the evolution of the global capital market is closely related to the existing international monetary system. They analyze the development of international lending under the framework of the inconsistent trinity, i.e. the impossibility for an open economy to get more than two elements out of the three following policy goals: full cross-border capital mobility; a stable exchange rate and an independent monetary policy reaching domestic objectives. According to the authors,

¹See Carmen Reinhart (2016) *Fleeing from Italy*, Project Syndicate, November. <https://www.project-syndicate.org/commentary/capital-flight-from-italy-by-carmen-reinhart-2016-11>.

²The Gold Standard refers to the monetary system in place until 1914. For a matter of simplification, we will use GES as a standard term for the interwar gold standard since the latter had many different denominations according to slight differences in the countries it was set up (for example Gold-bullion standard, Gold-coin standard, Qualified gold standard etc).

the world capital market's evolution reflects how governments have been dealing with their objectives with respect to the trilemma. Wolf (2008) investigates the timing of going off the gold standard in the 1930s using monthly data for European countries.³ He finds that deflationary pressure was a key factor in the decision-making process to exit the interwar gold standard, along with the occurrence of a banking crisis, the ability to defend the gold parity and the trade ties. The author stresses the importance of complementing his analysis by taking into account bilateral economic relationships as "*new evidence of the pattern of bilateral financial relations would be of considerable value*". This is what we do in this paper. Indeed, the aim of this chapter is to investigate bilateral relationship between two members of the gold block with the US, in order to explore, in the light of high quality data, the consequences of monetary instabilities on stock exchanges.

More specifically, we analyze the relationships between three stock markets: New-York, Paris and Brussels. As it will be discussed further, New-York and Paris, in addition to London, were at the heart of international finance during the interwar period. In fact, while the US kept its gold parity during World War I (WWI hereafter) and until 1933, France, Belgium and most of the belligerent countries abandoned gold in order to finance the war.⁴ But, during the early 1920s, those countries managed to stabilize their currency and restore their gold convertibility. France and Belgium are particularly interesting as the timing of their monetary decisions was very similar. In addition, these two continental European countries had close commercial and financial links⁵ and they were both members of the "Gold Block", a group of countries that were still committed to the GES after the US' exit in 1933. We are particularly interested in this feature since the currency war at that time caused large capital movements with asset allocation driven most strongly by stable monetary environment prospects. The use of Belgian data allows for robustness checks of the phenomena observed between France and the US. Moreover, as stated by Bussière (1992), Brussels becomes a much more international financial place starting in 1927 as Europe receives large capital inflows.

Our intuition here is that the switch from a floating to a fixed exchange rate regime for

³The author tests multiple hypotheses stemming from the modern theoretical literature on currency crises (from the 1st to the 3rd generation) in order to predict the timing of European countries' departure from gold.

⁴Actually, US gold exports were restricted by the Fed from September 1917 to June 1919, but gold kept on circulating domestically (Friedman and Schwartz, 1963).

⁵See Bussière (1992) for a detailed study of the Belgian-French relationship during the interwar.

most of the advanced countries tightened up stock market linkages. Therefore, the movements of stock prices became more interconnected and they should have responded to a change in the monetary policy elsewhere. In a context of a worldwide depression, the closer links between financial places might have also worsened the global decrease in stock prices. To check our conjecture(s), we rely on both statistical and econometrical analyses. More specifically, the econometrical analysis is conducted over different sub-periods as well as on rolling windows. Our approach—inspired partly by that of Chow et al. (2011) but primarily motivated by the data—focuses on correlations between national stock market returns thus allowing pairwise contemporaneous relationships between the stock markets (i.e. the co-movements). An increase in correlation coefficients can then be interpreted as evidence of greater stock market co-movements and hence, as a deeper financial integration. Our methodology also provides a dynamic analysis of financial integration during the interwar on a monthly basis, which allows us to examine the response of stock market co-movements to changes in exchange rate regimes.

Our findings confirm the tightening of financial links when the countries returned on gold. Interestingly, the integration process decreases dramatically only after the collapse of the Gold Bloc in 1936. While Obstfeld and Taylor (1997) claim that the Great Depression is the main explanation for the decline in international capital mobility during the 20th century, we believe that the question is more complex than it first appears. Indeed, according to our results, financial integration was low following WWI, but returned to high levels in the mid/late-1920s when countries came back under the same fixed exchange rate regime. The level of integration in bilateral relationships between the US and gold bloc members such as France and Belgium remained high until both countries departed from gold. Implications are twofold. First, this finding shows that capital mobility between the mid-1920s and the mid-1930s was higher than what we usually read in the literature on the Great Depression.⁶ It supports the idea that France was more resistant to the Depression than some comparable economies thanks to its ability to attract gold and capital in the early 1930s. Second, our findings also shed lights on the outcome of a departure from the Euro area for a country such as Italy, or any large northern economy in terms of capital markets integration. The experience of gold bloc countries during the interwar shows that a country that abandons the currency union will find its capital market isolated.

⁶A detailed picture can be found in Section 2.

The remainder of the chapter proceeds as follows. Section 2 gives an outlook of the interwar monetary history, detailing the course of events for the studied countries and how we divide the 1919-1939 period into three distinct sub-periods based on the exchange rate regime. Section 3 introduces the data, discusses the choice of the series and shows the evolution of cross linkages through a correlation analysis. Section 4 presents the methodology used to analyze the bilateral co-movements between our three markets and depicts our results. Finally, Section 5 concludes.

4.2 Financial integration during the interwar: background and related literature

Financial integration may be defined as the situation in which market participants face the same set of rules, have equal access and are treated equally (Baele, 2004). Financial integration is a complex phenomenon which is defined and measured in different ways in the literature depending on the topic that is tackled.

Chinn and Ito (2006, 2008) computed a *de jure* measure of financial openness which is frequently used in the literature. More precisely, their capital account openness index (KAOPEN) is calculated as the first component of four International Monetary Fund (IMF) binary variables reported in the Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) that translate restrictions on cross-border financial transactions. The idea here is to compare regulatory restrictions on capital account transactions among countries.⁷ Due to data unavailability, we cannot replicate this methodology for our period of interest.

The other way to assess financial integration consists in using *de facto* measures. In the literature, we can find *de facto* indicators that are either price-based or quantity-based.

⁷For a survey, see Kose et al. (2006) who offer a nice outlook of the methods used in the literature.

The European Central Bank (ECB hereafter) outlines the complexity of the financial integration phenomenon⁸ on the basis that many markets are involved, ie. money, banking, debt and equity markets. ECB's FINTECs (Financial Integration Composite) indices are *de facto* measures based on the aggregation of four indicators, one for each market segment above-mentioned.⁹ With regards to quantity-based measures, Edison and Warnock (2003) constructed a measure of capital controls based on restrictions on foreign ownership of equities. Such a measure requires data on Initial Public Offerings (IPOs) for several countries which are difficult to gather for the interwar period, especially on a monthly basis, as it is done by the authors. Obstfeld and Taylor (2003) proposed an alternative method which consists in using gross stock of foreign capital divided by the size of the world economy, the level of output in current prices and in a common currency unit. It is also difficult to gather these data for the late nineteenth and the first half of the twentieth century. In any cases, the French national statistic institution (INSEE) did not collect such data.

When adopting price-based measures to assess the extent of market integration, one has in mind that capital market integration should be reflected in the prices of similar financial assets across national frontiers (Kose et al., 2006). This approach is limited when it comes to comparing a large number of heterogeneous countries because price differentials could potentially reflect, for example, the lack of liquidity in an emerging market with respect to advanced economies. However, this limitation does not arise for our group of countries since none of them suffered from liquidity concerns during the interwar. In their study on the long-term evolution of international capital mobility, Obstfeld and Taylor (2003) offered three price-based indicators to assess the development of financial integration. First, the authors focus on long-term real interest rates using monthly series of seven-year or more government bonds yields. They state that these long-term rates are "*closely linked to the cost of long-lived capital, because the slow mean reversion in real exchange rates makes it difficult to discern expected exchange rate changes in short-term data, and because risk premia can be reduced over long horizons if long-run purchasing power parity holds*". The purpose of their study is to test if real interest rates for developed countries diverge over the long term. Stationary and cointegration tests outline the presence of a long-run relationship

⁸The ECB defines financial integration as "*a situation whereby there are no frictions that discriminate between economic agents in their access to -and their investment of capital, particularly on the basis of their location*", hence when market access is equal for all. Speech of Benoît Coeuré, member of the executive board of the ECB, in Madrid (12/03/13).

⁹ECB (2015). *Financial Integration in Europe*. European Central Bank report, April. Price-based measures aim at capturing discrepancies in asset prices across different national markets while quantity-based measures aim at quantifying the change in demand for and supply of securities with respect to market frictions (Baltzer et al., 2008).

among real interest rates, meaning that although there might be short-run deviations, they converge towards the same level in the long-run. Their results support the idea that bond markets are integrated.

Anyways, the computation of the indicators discussed above is not easily feasible for earlier periods, mainly because of data unavailability.¹⁰

The second price-based indicator proposed by Obstfeld and Taylor (2003) is based on the covered nominal interest rate parity theory. The idea is the following: if there is free capital mobility between Paris and New York's financial places, an investor in Paris should be able to alternatively buy a loan issued in francs, or invest the same amount in New York while simultaneously covering the exchange risk by forward selling of dollars. If the covered interest parity holds, the investor's net gain from borrowing in Paris and investing in New-York is zero. In other words, if there are no gains for investors to arbitrate between the two markets, one can assume that the two countries are financially integrated. Obstfeld and Taylor (2003) do the exercise for London, New York and Berlin. According to their results over the very long-run (1870-2000), differentials in interest rates were small and stable before 1914 during the Gold Standard era. They became quite large in the early 1920s but decreased around the end of the decade (once currencies were stabilized) before expanding during the 1930s and the Depression. According to their results, it seems that the exchange rate regime played a significant role in interest rates differentials. Once again, such analysis requires scarce data for our period of interest. Indeed, it requires in the first place finding the same type of bonds with identical yield and maturity in each market. It is fairly straightforward for large financial places such as New York, Paris or Brussels. Nonetheless, one investor has to cover itself thanks to forward contracts on the foreign exchange market. Yet, during the interwar, forward rate of exchange are quoted in Paris for the Sterling pound and the US dollar for 1, 2 and 3 months' maturity. As one cannot hedge any investment for more than a three-month time span, it is then impossible to run tests on covered nominal interest parity for any loan with a longer maturity. Usually, the test will consist in using treasury bonds since they are both short-term securities and rather liquid. Yet, such bonds are not listed in Paris after 1926, corresponding to the foundation of a special fund, the *Caisse Autonome*

¹⁰For example, the money market price-based indicator used by the ECB is the cross-country standard deviation of average unsecured interbank rates (at three different maturities: overnight, one month and twelve month), while the quantity-based indicator for this market relies on trading volumes. To the best of our knowledge, neither interbank rates nor trading volumes are available for Belgium, France and the US during the interwar.

d'Amortissement, which deals with the government debt.¹¹ The purpose of those operations was to prevent a massive demand of reimbursement from the public on short-term bonds, especially after the crisis of the franc during the 1924-26 period. Consequently, it is not easy to find a listed short-term bond in Paris during the interwar after 1926, which makes it difficult to run tests on covered nominal interest parity.

Finally, financial integration may also be reflected in the interactions between equity markets across national borders. Nowadays, it is quite clear that when a crash occurs in one large financial center, most of the other ones will be affected. But does this phenomenon hold when it comes to earlier periods? The third *de facto* indicator proposed by Obstfeld and Taylor (2003) serves to check whether global capital market integration follows a U-shape over the long-run. To this end, they gather a sample of up to twenty-two country stock price indices on a yearly basis since 1880.¹² The question addressed concerns the extent to which stock returns' correlations changed over time. Rolling correlations on a ten-years' window show that capital markets were highly active from 1900 to 1914 and after the 1960s, but also during most of the interwar period. This result contrasts with the authors' hypothesis of a U-shape financial integration between 1880 and 2000. According to the authors, the rationale for the high correlations observed during the interwar period stems from the high volatility of stock prices, especially in the US, and the common shocks associated with large economies going on and off gold. We can also mention other studies that aimed at comparing the performances and correlations between international stock markets. Goetzmann and Jorion (1999) draw a picture of the long term history of capital markets starting in the 1920s. Using data on a set of 39 countries, they compare the performances of different stock markets over time and conclude that apart from the US, real capital appreciation returns were low because of either financial crises, wars or political turbulences. The authors outline that their estimates are subject to survivorship bias, which is not the case for a shorter period such as the interwar period. They also note that monthly data create more precise estimates and allow performing event studies. Goetzmann et al. (2005) address the issue of diversification and study the correlation structure of the world equity markets over a 150-years time span. Their exercise shows that periods of poor market performance are mostly associated with high correlations rather than low correlations, notably during the Great Depression. According to the authors, the Great

¹¹This institution, created when Raymond Poincaré came back as the prime minister in 1926, aimed at resolving the floating debt, especially by lengthening maturities of short-term government bonds. The *Caisse Autonome d'Amortissement* also dealt with the payment of the *Bons de la Défense Nationale*, issued between 1915 and 1918 in order to finance the war.

¹²However the number of countries included in their sample decreases to a dozen during the interwar.

Crash of 1929 represents a turning point in the volatility of the world stock markets and in average international correlations. The latter reached a peak in the 1930s that had not been equaled until the modern era. This result confirms the U-shape hypothesis of Obstfeld and Taylor (2003). Nonetheless, the previous studies mentioned rely on average correlations among many different countries in terms of size and all of those financial places were not equally internationalized.

4.3 Stylized facts

4.3.1 Data

A key issue when dealing with historical data for comparative research concerns the lack of consistency and comparability across time and space, due to changing meanings, various interpretations of the same historical situations or processes, changing classifications, etc. Sources and computation of indices vary widely across studies that examine the long-run evolution of stock prices. In this section, we describe our data choice as well as the reason why we restrict our analysis to the US, French and Belgian stock markets.

Indeed, stock market data for other countries would have been interesting in order to compare them, especially the UK, but also gold bloc members such as Switzerland, Netherlands or Italy. Although such data exist,¹³ we do not think it is appropriate to use stock indices of these countries since they are computed in very different ways.

Although London was the main international financial center up to WWII, data on stock prices suffer from a major caveat for our period of interest. The whole 19th century is covered with high quality indices,¹⁴ while the London Share Price Database contains all the available data for the period after 1955. However, the qualitative gap is massive if we focus on the interwar period. To the best of our knowledge, the only available composite share price index for the interwar is the one stemming from the *Banker's Magazine*.¹⁵ The latter came out very early, at the end of the 1880s, but was revised several times in its sectoral composition. While the composition remained stable from 1921 to 1957, it is not clear how

¹³Series for each of those countries are available on Global Financial Data (GFD).

¹⁴See Acheson et al. (2009) for the period 1825-1870 and Grossman (2002) for the period 1870-1913.

¹⁵The Financial Time also published a share price index: the FT-30, but the first observation is in 1935.

it was computed: the original series were calculated using market capitalization, but the continuous series have been converted into indices by scaling capitalization by the par value in order to get comparable numbers between series with different sectorial compositions.

We could also look for the dynamics of stock prices in other members of the gold block such as Italy, Switzerland or the Netherlands. In the case of Italy, the only index that is available on a monthly basis during the interwar consists in the combination of two indices: one spanning from 1905 to 1930 including 173 stocks, and the other from 1931 to 1939 including 74 stocks.¹⁶ Moreover, data from 1922 to 1924 are yearly, which generates noise in the series. Finally, the methodology used to calculate these indices is not reported. The same applies to Switzerland. The Swiss National Bank calculated an index using 21 stocks from 1910 to 1925 when a broader sample of stocks was introduced, however the methodology used is not detailed. Finally, data for Amsterdam consist in an arithmetic average of weighted indices for 50 stocks representing all sectors. It was calculated by the Central Bureau of Statistics.¹⁷ The selection criteria for the included stocks are not reported, so it is difficult to assess the representativeness of the index since there are no mentions of market capitalizations.

This is why our analysis is conducted considering only the Belgian, French and US stock market returns as the series for these three countries have been collected recently with a high degree of transparency with respect to the primary sources and computation methodologies.¹⁸ Therefore, these data computed by using high quality value-weighted stock price indices ensure a better consistency of our results.

For the US stock market, we use the S&P 500 index, which is a market capitalization-weighted index. During our sample period, series are retrieved from the Cowles/Standard and Poors' composite index, which includes on average 90 stocks.¹⁹ Data are monthly and correspond to end-of-the-month prices. The French stock index, the "Indice Général CAC", comes from Le Bris and Hautcoeur (2010). It is also a market value-weighted index, which includes the 40 top capitalizations listed at the Paris Bourse at the beginning of each year. Finally, Belgian data stem from the SCOB database, which gathers stock prices for all

¹⁶Source: GFD.

¹⁷Source: GFD.

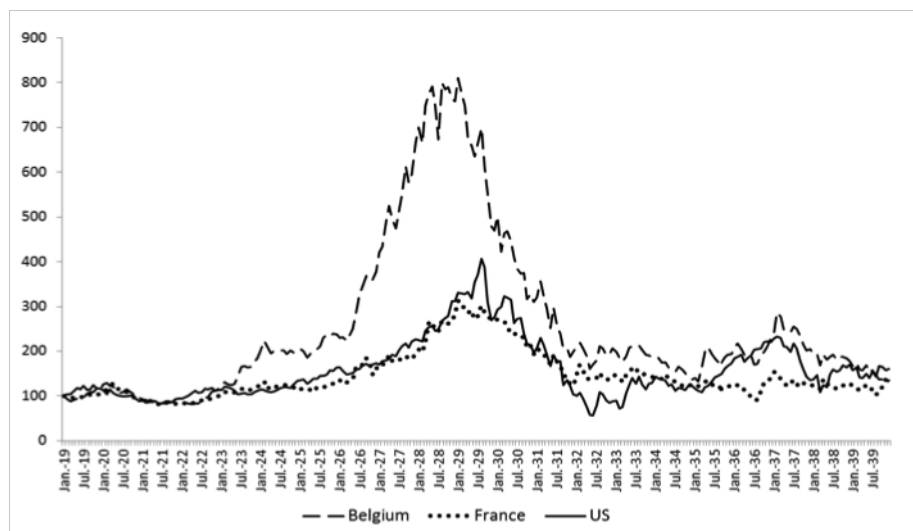
¹⁸It is not true for the S&P, but the Cowles' commission documented their work and it is available for researchers.

¹⁹This index is available through the Global Financial Database (GFD).

stocks listed at the Brussels' stock exchange.²⁰ Here, the Belgium index has been recomputed especially for this study in order to include only companies whose main activities were both national and international, thus allowing us to account for international difficulties. It includes the top 40 stocks by their market capitalizations at the beginning of each year.

These three indices measure common stocks and do not include dividends, so that the rate of return of stocks only corresponds to capital gains. As indices for Paris and New-York correspond to raw data,²¹ the rate of return over the period t-1 to t is the percentage change in the raw index: $R_{it} = \frac{I_{t-1} - I_t}{I_{t-1}}$ with I the raw index. For the Brussels' index, data already correspond to capital gains. The following figure shows the evolution of the three indexes from 1919 to 1939.²²

Figure 4.1: Indices in nominal terms (1919=100)



Source. Author's calculation.

Figure 4.1 shows rather clearly the different cycles of stock prices during the interwar. The common upward trend in the three series during the 1920s corresponds to the economic boom from 1926 to 1929. It is interesting to note here that for both France and Belgium,

²⁰They also have data for both Antwerp and Liège stock exchanges, but here we only focus on stocks listed in Brussels. A precise description of the data is given in Annaert et al. (2015).

²¹Expressed in domestic currencies and nominal terms.

²²We also transformed our nominal series in real terms by using the associated consumer price index for each series. Figure 4.B.1 (reported in Appendix B) plots the real series. Differences are visible among nominal and real terms especially for France and Belgium who suffered from inflation during the 1920s while the US remained on gold up to 1933, except for a short period between late 1917 and mid-1919.

this upward trend starts when their currency was stabilized *de facto* (in mid-1925 for Belgium and late 1926 for France). The three indices reached their peak in 1929, yet earlier for France and Belgium. The NYSE was then the center of international speculation and prices kept rising until the crash of October. Also, the depression is clearly identified in the series with a dramatic drop for all markets (particularly for the US). For each series, prices continued to decrease until governments departed from gold: early 1933 for the US, mid-1935 for Belgium and late 1936 for France.

4.3.2 Cross-correlations between stock market

In order to get first glimpses on the relationship between the Belgian, French and US stocks markets —and so to adopt an empirical approach consistent with the observations, we proceed to some preliminary analyses. More specifically, we compute pairwise correlations between the Belgian, French, and US stock market returns over three succeeding sub-periods defined according to the countries' exchange rate regime. The sub-periods examined are defined as follows: i) period I: from January 1919 to October 1926, during which the two European currencies floated not only towards the US dollar but also against each other; ii) Period II: covering the gold exchange standard until US and Belgium's departure from gold respectively in June 1933 and March 1935; and iii) Period III from the end of period II to December 1939 when all countries devalued their currencies and adopted a regime of managed floats.

The results of the correlations are set out in Table 4.1.

Table 4.1: Correlations between the stock market returns (in nominal terms)

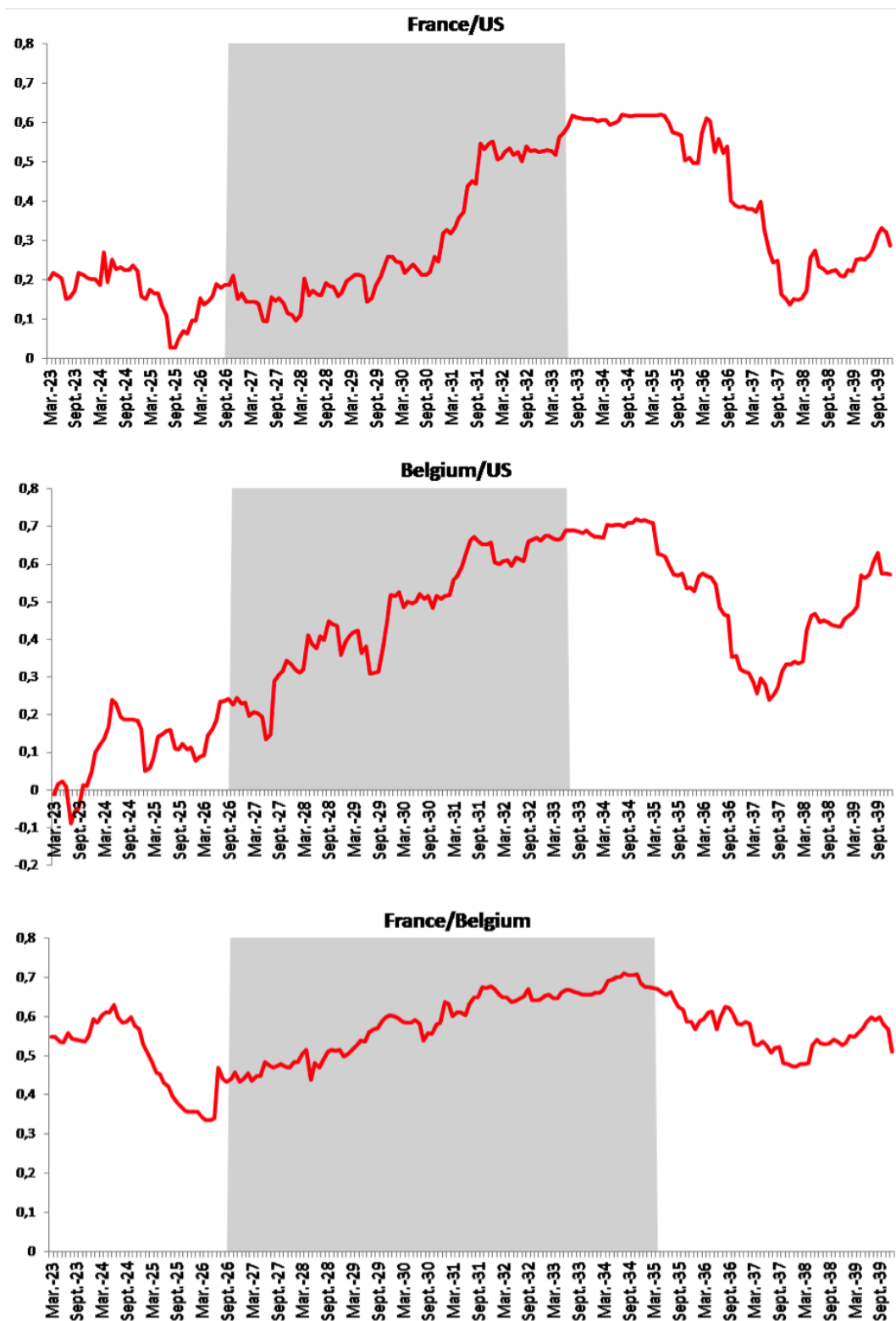
	Period I			Period II			Period III		
	BEL	FR	US	BEL	FR	US	BEL	FR	US
BEL	1			1			1		
FR	0.486	1		0.631	1		0.498	1	
US	0.096	0.196	1	0.626	0.482	1	0.453	0.299	1

Notes. The period I corresponds to observations before October 1926. Period II corresponds to observations between October 1926 and June 1933 for the correlation between the US and France and the US and Belgium; for the correlation between France and Belgium, period II corresponds to observations between October 1926 and march 1935. Period III corresponds to the rest of the observations.

A first look at the stock market nominal returns indicates that the correlations between the three stock markets are higher in period II compared to the other two periods. Indeed, focusing on the French and Belgian stock markets, the correlation is equal to 0.486 in period I, then rises to 0.63 in period II, before falling to 0.498 in period III. Looking at the US-Belgian and US-French stock market return correlations, we note an even more pronounced rise in the correlations in period II. The most striking rise is that of the correlation between the US and Belgium: in period I the correlation is around 0.1 then increases up to 0.626 in period II. The correlation in period III is also important (0.453) although weaker than that in period II. These first results, showing that correlations are higher in average when countries' exchange rates regimes are pegged on gold, fit well with our intuition. At first glance, it seems therefore that there has been a tightening of the links between the three stock market returns during period II, i.e. the GES period. To provide an indepth analysis and especially to identify trends in the markets integration process, Figure 4.2 displays pairwise rolling correlations (50 months basis) between the different stock markets.

Figure 4.2 not only confirms our previous observations but also brings new evidence on the relationship between the three stock markets. Indeed, from the end of 1926, a clear upward trend can be observed in the correlation between the US and France, and between the US and Belgium. The upward correlation is more pronounced between the US and Belgium than between the US and France. In the latter case, the increase in the correlation is quite small from the end of 1926 to mid-1930 before increasing dramatically hereafter. For the correlation between France and Belgium, the picture is similar while variations in the correlations seem weaker. This confirms our previous results based on correlations computed over the three sub-periods. Another interesting outcome stemming from this time-varying analysis is that correlations between Belgium and the US, and France and the US remain high after June 1933. Indeed the coefficients only start to decrease when all the countries left the monetary arrangement (March 1935 for Belgium and US, and September 1936 for France and US) and when the US consequently adopted a managed float exchange rate regime through the Exchange Stability Fund. Moreover, even after the US went off the gold exchange standard, many transactions occurred between New York and Paris precisely because the economic environment continued to be stable for the members of the gold block, while the US stock market begun to show signs of recovery after 1933. However, after late 1936, correlations decrease in every pair, confirming a global reallocation process towards domestic markets.

Figure 4.2: Pairwise rolling correlations (50 months' basis) on returns (in nominal terms)



Notes. The shaded area corresponds to the period in which both countries operated under the GES.

4.4 The dynamics of stock markets integration

4.4.1 Methodology

As we are interested in pairwise contemporaneous relationship between the stock markets (co-movements), we consider the following equation which links the domestic market returns with the foreign market returns — and augmented with lags:²³

$$r_t = \alpha + \sum_{i=1}^n \gamma_j r_{t-j}^* - \delta USrec. + \epsilon_t \sim N(0, \sigma_\epsilon^2) \quad (4.1)$$

Where r_t (resp. r_t^*) is the domestic (resp. foreign) market return. To control for unobserved global shocks we include a dummy variable *USrec.* scoring 1 if the US are in recession (0 otherwise).²⁴ n corresponds to the number of lags selected; α is a constant and ϵ is the error term.

Our econometric model, although simple, meshes perfectly with our goal. Indeed, in Equation (4.1), the coefficient associated with current foreign market returns (γ_j) captures the level of influence the foreign market has on the domestic market, and more specifically the interest of domestic investors in the foreign market. The estimated parameter therefore reflects, somehow, the nature of the domestic market agents' expectations. To get an idea on the interaction between the domestic and foreign markets, we simply run the regressions in both directions, i.e. considering alternatively the domestic and foreign markets as the dependent variable. Finally, the inclusion of lags in the specification meets the need to

²³Vector Auto Regression (VAR)/ Vector Error Correction (VECM) models are often used to address issues similar to ours. However, as we are interested in co-movements which imply a contemporaneous relationship between the variables —we consequently exclude VAR models. If VECM models offer this possibility, their estimation is however conditioned by the existence of a long-run relationship between the variables. As part of our preliminary analyses, we investigated the existence of a long-run relationship between the variables using the Engle-Granger and Johansen (both Trace and Maximum Eigenvalue) cointegration tests. Results —not reported but available upon request— indicate that the variables are not cointegrated therefore making irrelevant the use of VECM models. The absence of cointegration between the variables may come from the fact that monthly intervals are too long and consequently miss the covariation in the prices of stocks traded in the markets. The frequency of the data also makes irrelevant the use of GARCH models.

²⁴We use the US economic cycle as a summary statistic for the state of the global economic cycle, as the US dollar becomes the dominant international currency from the mid 1920s (Eichengreen and Flandreau, 2009). *USrec.* is computed using information on the US Business Cycle Expansions and Contractions provided by the NBER (National Bureau of Economic Research).

account/control for delayed effects between the markets. Hence, our econometric model is in line with that of Chow et al. (2011).

Moreover, as there have been significant changes —over time— in the relationships between the Belgian, French, and US stock markets, the conventional practices of measuring the correlation of stock returns by means of a single coefficient slope in a linear model can lead to biased results since it limits the analysis to a monotonic correlation. Consequently, the ideal approach to analyze the ties between the three markets is one that allows the coefficients to vary over time. Accordingly, we begin by estimating Equation (4.1) on the different sub-periods considered before. Then, in a second stage, we rely on time-varying regressions and more specifically on rolling window regressions. Indeed, the main advantage of this approach is that it allows us to refine the analysis by showing trends (i.e. the dynamics of the coefficients) and breaks in the relationships among markets.²⁵

4.4.2 Results

For clarity and didactic purposes, we begin by examining the estimations based on the sub-periods before presenting the rolling window ones. Regarding rolling window regressions, we opted for a rolling window of 50 months to ensure a sufficient number of degrees of freedom and thus statistical robustness of the coefficients. Furthermore, all our estimations include 4 lags —for each variable— as recommended by the Akaike Information Criterion (AIC).

4.4.2.1 Sub-periods analysis

Table 2 reports the estimation results over the full sample as well as over the different sub-periods, and for each bilateral relationship between the market returns. For example, estimation results of the relationship between French and US stock markets are reported using alternatively the US and the French returns as the dependent variable. To save space, we only report coefficients indicating the contemporaneous relationship between the stock

²⁵Furthermore, the rolling window approach does not require extra assumptions regarding the coefficients or the data generating process. As a result, this approach is relatively simple and intuitive hereby facilitating the comprehension and the coefficients' interpretation.

Table 4.1: Co-movements between the stock market returns (in nominal terms)

Dep. Var	US					France			
	Full Sample	Period I	Period II	Period III		Full Sample	Period I	Period II	Period III
r_t^*	0.489*** (4.77)	0.119 (1.38)	0.621*** (3.06)	0.325*** (2.56)	r_t^*	0.256*** 6.03	0.145 (1.37)	0.246*** (3.98)	0.173*** (2.33)
R^2	0.23	0.21	0.38	0.21	R^2	0.18	0.11	0.31	0.30
Obs.	247	88	80	79	Obs.	247	88	80	79

Dep. Var	US					Belgium			
	Full Sample	Period I	Period II	Period III		Full Sample	Period I	Period II	Period III
r_t^*	0.543*** (6.91)	0.048 (0.54)	0.726*** (6.39)	0.522*** (2.97)	r_t^*	0.409*** (7.69)	0.096 (0.54)	0.443*** (6.34)	0.385*** (5.44)
R^2	0.34	0.29	0.53	0.32	R^2	0.28	0.16	0.46	0.30
Obs.	247	88	80	70	Obs.	247	88	80	79

Dep. Var	France					Belgium			
	Full Sample	Period I	Period II	Period III		Full Sample	Period I	Period II	Period III
r_t^*	0.452*** (9.83)	0.405*** (3.53)	0.483*** (8.91)	0.452 (4.24)	r_t^*	0.659 (8.85)	0.575*** (4.99)	0.725*** (5.75)	0.615*** (4.18)
R^2	0.35	0.31	0.45	0.43	R^2	0.34	0.37	0.44	0.38
Obs.	247	88	101	58	Obs.	247	88	101	58

Notes. ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively. T-statistics are reported in parentheses. Period I corresponds to observations before October 1926. Period II corresponds to observations between October 1926 and June 1933 for the correlation between the US and France and the US and Belgium; for the correlation between France and Belgium, period II corresponds to observations between October 1926 and march 1935. Period III corresponds to the rest of the observations. In all the regressions we consider 4 lags as suggested by the AIC.

markets or in other words, the influence of the foreign market on the domestic one. These coefficients are reported next to r_t^* .

As indicated by the results displayed by sub-periods, the co-movements between stock returns have not been constant over time. Indeed, the effect of the French market on the American one in period I is very small (0.119) and above all not significant. The coefficient then dramatically increases in period II, reaching 0.621 before falling in period III to 0.325. A similar pattern emerges when considering the effect of the US returns on the French returns, although of weaker magnitude. The US effect appears significant and stronger during period II before decreasing in the following period. Overall, in both cases (from France to US and from US to France), coefficients increase in period II thereby illustrating a tightening of the links between the two markets under the GES period. The same conclusion is reached for the Belgian-US pair: coefficients are always higher in period II. However, during this period, the influence of the US stock market on the two European countries

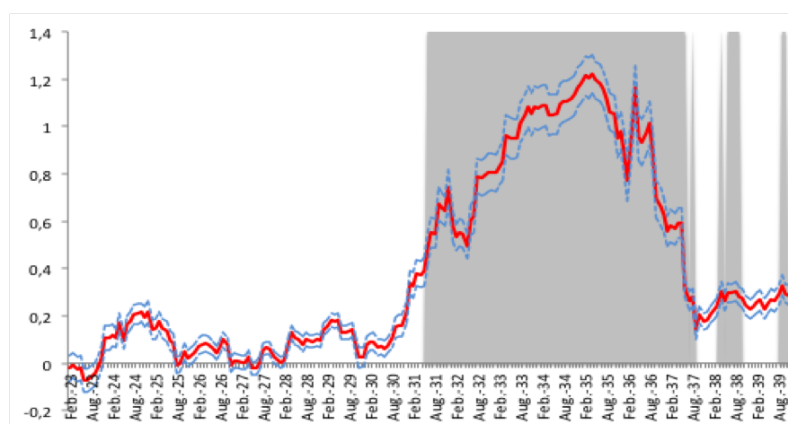
is lower than the mutual influence between the two European stocks markets,²⁶ suggesting the importance of geographical and cultural proximity in the financial integration process.

Finally, while the relationship between the Belgium and the French stock returns also shows higher coefficients during period II compared to the other periods, the associated changes in these coefficients are however weaker and the estimated coefficients—and their significance—indicate a relatively high degree of integration between the Belgian and French markets over the full period. An interesting—and noteworthy—point to make is the greater influence of the French market on the Belgian one. Indeed, regardless the considered sub-periods, the coefficient reflecting the effect of the French market on the Belgian one is always higher than the coefficient capturing the effect of the Belgian market on the French one, reflecting the dominant position of Paris vis-à-vis Brussels as an international financial center.

4.4.2.2 Rolling window regressions analysis

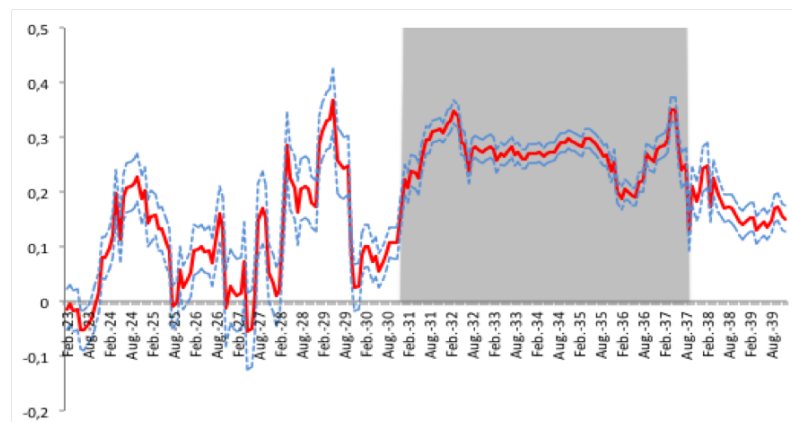
To take a closer look at the relationship between the stock markets, Figures 3 to 8 display the evolution of the estimated coefficients capturing the influence of one market on the other (γ_j in Equation (4.1)). Overall, the results tend to confirm our previous findings.

Figure 4.1: Influence of the French market on the US market (nominal returns)



Notes. The bold line shows the evolution of the coefficient over time. The dashed lines delimit the confidence interval. The shaded area indicates significance of the coefficient at 5%.

²⁶For example, during period II, the coefficient of the US return relative to the French (Belgian) one is around 0.246 (0.443) while the coefficient of the Belgian (French) return relative to the French (Belgian) one is around 0.483 (0.725).

Figure 4.2: Influence of the US market on the French market (nominal returns)

Notes. See Figure 4.1.

The France-US case

Looking first at the US-France case (Figures 4.1 and 4.2), we note that in both ways, the relationship between the returns only become statistically significant around 1931. One can easily observe the upward trend for both coefficients starting in the early 1930s. Indeed, the influence of the French returns on the US market is very low and not statistically significant before late 1930. For the opposite relationship (i.e. the influence of New York on Paris), the evolution of the coefficient is very volatile and not significant —at a 5% threshold— neither. Several reasons can explain this result. The first reason is that the French economy had a limited exposure to international fluctuations up to mid-1930-1931. Indeed, the great crash in Wall Street in late October 1929 had almost no impact on the Paris' Bourse in the short-term (see Hekimian and Le Bris, 2016). Nevertheless, both coefficients become statistically significant in late 1930-early 1931. The influence of Paris on New-York follows a bell curve, increasing up to mid-1935 and then decreasing until mid-1937.²⁷ It reaches two peaks: first in March 1935, and then in mid-1936 which correspond respectively to the devaluation of the Belgian and the French franc.

James (1992) provides interesting insights regarding the growing influence of the French stock market at the beginning of the 1930s. First, after the Credit-Ansault's failure during the spring of 1931 and the subsequent financial crisis in central and oriental Europe, France

²⁷We note however two important perturbations. The first —on the upward trend— coincides with the UK's gold exchange standard exit (September-October 1931 on the graph) and is associated with a drop in the estimated coefficient of around 20 percentage points. The second perturbation occurs in late 1935, early 1936. According to Dessirier (1936), stock prices were decreasing in early 1936 in Paris while prices were increasing in every other stock exchange of large economies. The author evokes the rising political instability before the election of April. This could explain the decreasing interest of foreign investors for the French market.

became a "*major center for funds moving out of central Europe*" (page 600). To justify the fact that the French market was then considered as a safe haven, the author suggests to look at the rise in private deposits at the *Banque de France*. Indeed, if one looks at the recently available data from the *Banque de France*,²⁸ the total amount of private deposits more than doubled between March and December 1931, going approximately from 10 to 24 billion francs. Second, it seems that the sterling crisis indirectly reinforced the capital inflows to France. Indeed, after the UK went off gold, the US became the only international short-term debtor left on the Gold Standard and hence, faced risks of withdrawals. In fact, large outflows occurred in the US in late September and October 1931: around \$ 250 million in gold were shipped to France (James, 1992). Again in 1933, when the fear of US abandoning gold started to grow, a new round of gold outflows took place from February onwards: the Federal Reserve Bank of New-York lost three-fifth of its gold reserve and it caused several bank runs and even a bank holiday in March. According to James (1992), it resulted in a "*pronounced outflow of capital, a substantial proportion of which went to France*" (page 605).

Moreover, the years 1929 and 1930 witnessed efforts from the Paris stock exchange's effort towards enhancing its short-term international financing (Brown, 1940; Myers, 1936). Even if this was not done, Myers (1936) outlines that the stock exchange of Paris was more an investment market than an acceptance market. Efforts were made to facilitate the exchange of foreign securities, for instance through a tax cut on their dividends. The minutes of the French stockbroker company reports many quotes showing the need to modernize the foreign exchange. There were however several improvements made that led to an expanded foreign exchange service.²⁹ The laws of 1916 and 1918 placed severe restrictions: under the law of May the 31st 1916, admission to official listing of new foreign securities required the permission of the minister, while the law of April the 3rd 1918 prohibited sales of securities to nonresidents.³⁰ But in the 1930s, many stockbrokers were in fact willing to list new foreign securities, especially from early 1931 onwards.³¹

Besides, other quotes from the French stockbrokers suggest that Paris renewed its importance from an international perspective, especially after UK went off gold. On September

²⁸See *Situation hebdomadaire* of 03/05/1931 and 12/17/1931.

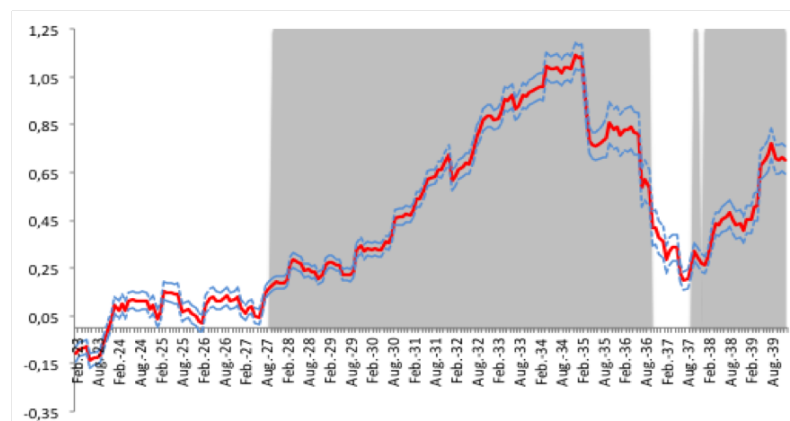
²⁹For example, phones were installed in 1924-25 in order to ease currency trades.

³⁰However, Quennouëlle-Corre (2015) explains how difficult the 1918 law was to apply. This still lasted until 1928.

³¹See, among others, minutes of the Stockbrokers guild from 02/06/1931; 04/30/1931: 11/12/ 1931; 01/28/1932; 03/04/1932: 07/28/1932.

the 15th, a few days before UK's exit, we can read: "*The current situation (persistent decrease in stock prices) comes mostly from foreign investors' sales that are done in Paris precisely because of the healthy position of our market*". We also note that relations with the New-York financial place were increasing in 1932: on September the 20th: "*A French stockbroker would like to open a special account to ease trading with New-York*"; on November the 10th: "*While the Paris market only deals with a small number of foreign securities, many brokers from New-York opened offices in Paris to get buying orders from French clients on American securities, without paying French taxes.*"³² In order to support this new feature of Paris as an international financial center, an extra session was established on the afternoon, when Wall Street opened. The purpose of this session was to benefit from potential arbitrages among stock exchanges which implied more foreign securities listed.

Figure 4.3: Influence of the Belgian market on the US market (nominal returns)

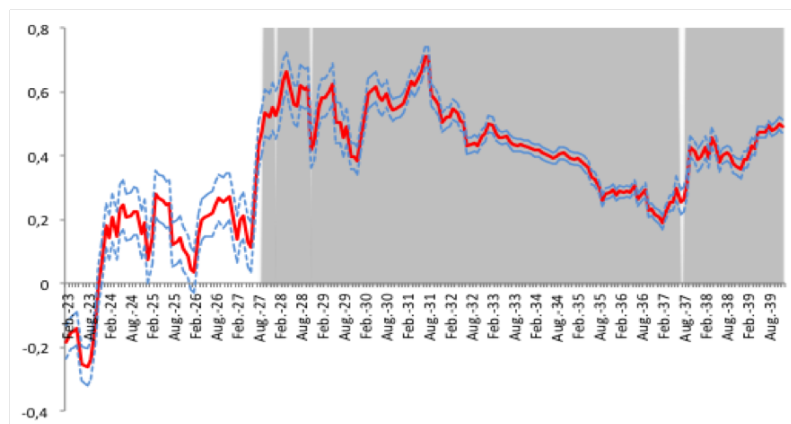


Notes. The bold line shows the evolution of the coefficient over time. The dashed lines delimit the confidence interval. The shaded area indicates significance of the coefficient at 5%.

The Belgium - US case

Looking now at the Belgium-US relationship, one can observe that the estimated coefficients display a similar pattern compared to the France-US case. Indeed, the influence of the Belgian market returns on the US market returns also displays a bell-shaped evolution over time. As in the France-US case, the effect of Brussels on New York is not significant during the first period (before October 1926). Periods II and III are the most instructive regarding the relationship. In fact, both periods witnessed a succession of —marked— upward and downward trends. Among these trends, the most noticeable is undoubtedly the upward one observed between the first half of 1927 and March 1935 (see Figure 4.3). This

³²The next week, the Minister of Finance said that he was in favor of the listings of four large American companies: American British Tobacco, General Electric, AT&T, United States Steel Corp.

Figure 4.4: Influence of the US market on the Belgian market (nominal returns)

Notes. See Figure 4.3.

feature is consistent with the growing internationalization of the Belgian market starting in 1927 (Bussière, 1992). If the reversal of this trend corresponds with the Belgium exit of GES (March 1935), it is interesting to note that the US exit which occurred earlier (April 1933) did not really modify the dynamics of the Belgian stock market returns' coefficient as the UK exit in September 1931 did.³³ As we stated above, the creation of the Exchange Equalisation Account in Britain and the Exchange Stability Fund in the US were most likely to be the main reasons explaining the tightness of the links after 1933.

Belgium's exit from the GES in 1935 seems to have had a deleterious effect on the relationship between the Belgian and the US markets. Indeed, the coefficient associated with the effect of Brussels on New York fell by 26% between March 1935 and April 1935, followed by a slight increase and a short stability. Then from the second half of 1936 up to July 1937, the coefficient again fell sharply, before once again taking off on an upward trend associated with "important" perturbations occurring in September 1937, October 1938, and June 1939.

The influence of the US market on the Belgian market (Figure 4.4) is neither statistically significant during period I. But the coefficient dramatically increases in mid-1927 and becomes significant simultaneously. Despite some fluctuations, it remains relatively high until mid-1931. Then, there is a clear downward trend between 1931 and 1937 and a smooth resumption thereafter. The relationship remained statistically significant until the end of the period.

For the US-Belgian case, the shaded area in which the relationship between the two markets

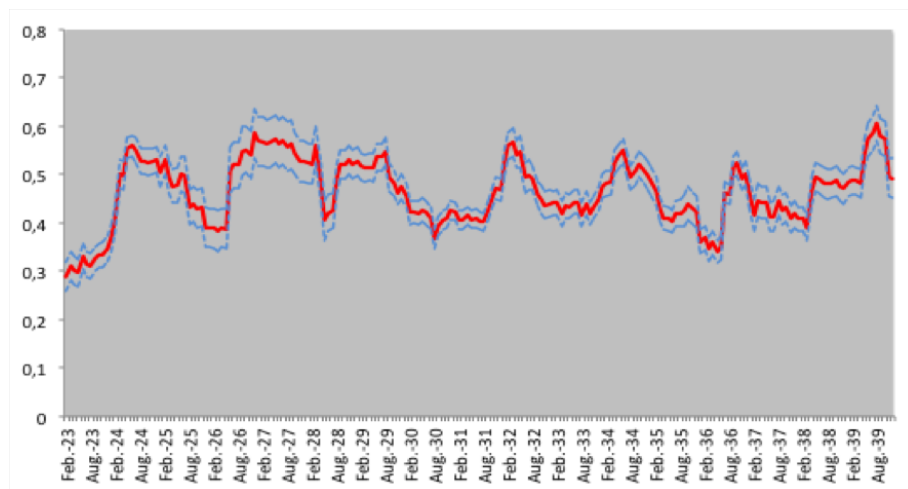
³³This observation also noted in the France-US case supports and complements the abovementioned importance of the British stock market at that time.

is significant starts earlier: from late 1927 up to 1939. As for the previous case, but even more surprising, the influence of Belgian returns over the US ones seems to be higher at some point. The difference lies in the date of the reversal: the coefficient for the Belgian returns gets higher in September-October 1931, so right after the sterling crisis.

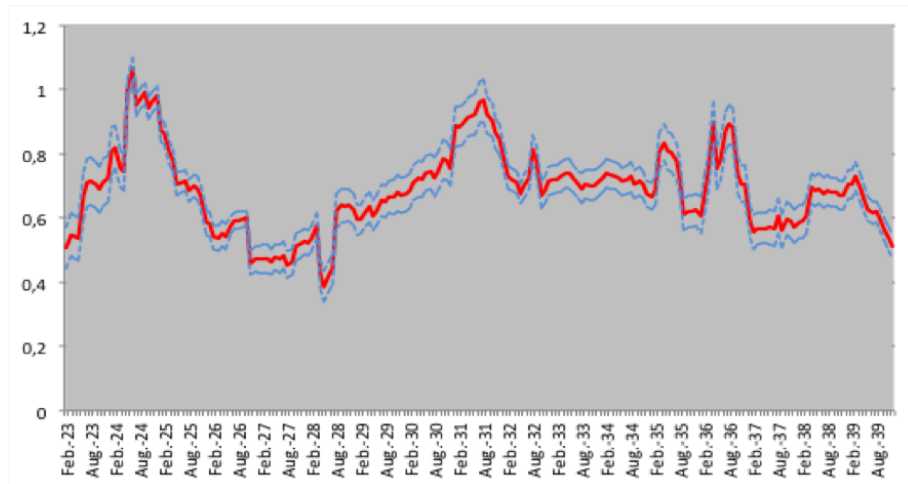
The France - Belgium case

The relationship between the returns of Paris and Brussels is statistically significant in either direction during the inter-war period. Even though there were some disturbances on both markets in the early 1920s, especially with the crisis of the French franc during 1924-26, it seems that the two markets stayed closely tied. Whereas the influence of Brussels over Paris (Figure 4.5) remains in the same fluctuation band (between 0.3 and 0.6), the influence of Paris over Brussels (Figure 4.6) after having increased in 1923-24 decreases until late 1927. There is then an upward trend until mid-1931. This trend denotes the increasing role of Paris as an international financial center. Buisnière (1992) states that in 1927-28 a capital shortage occurred on the Belgian capital markets while there was an expansion of capital flows directed to the Paris' stock exchange. After 1931, the coefficient falls back and remains quite stable until the devaluations of 1935 in Belgium and 1936 in France.

Figure 4.5: Influence of the Belgian market on the French market (nominal returns)



Notes. The bold line shows the evolution of the coefficient over time. The dashed lines delimit the confidence interval. The shaded area indicates significance of the coefficient at 5%.

Figure 4.6: Influence of the French market on the Belgian market (nominal returns)

Notes. See Figure 4.5.

4.5 Conclusion

The aim of this chapter was to investigate the effect of monetary integration on stock market correlations during the interwar period, with a particular interest on the interactions between the members of the Gold Bloc and the US. For data quality purposes, we focused on the Belgian and the French stock markets. The main contribution of the chapter lies in the attention put on bilateral financial links in a time-varying framework. First, the rolling correlation exercise shows the precise timing of the stock markets' tightening which argues in favor of the importance of the exchange rate regime. In previous analyses of stock market correlations over the long run, many authors outlined that the increased average correlation among capital markets in the late 1920s was the result of rising volatility in stock prices due to the Great Crash of October 1929 in New-York and the subsequent depression. Our results show that cross-correlations increased before the beginning of the international financial crisis of the 1930s, with a tightening of the linkages among the three financial places during the GES period. Financial integration between the second half of the 1920s and the first half of the 1930s made investors able to diversify their investments when the major currencies were stabilized. It may also explain how large capital flows were possible even though legal restrictions and capital controls were supposed to be effective after WWI, as it was the case in France. Finally, this paper provides a relevant case study to illustrate the potential consequences of a departure from a fixed exchange regime on capital

markets integration. We can easily imagine the consequences on financial integration if a large economy departed from a currency union such as the Eurozone.

Appendix

4.A Data

Table 4.A.1: The Data

VARIABLES	DEFINITIONS	SOURCES
Stock market index		
Belgium — SCOB40	40 stocks, weighted by market capitalization, monthly	SCOB database
France — CAC40	40 stocks, weighted by market capitalization, monthly	Le Bris and Hautcoeur (2010)
US — S&P500	Average 90 stocks, weighed by market capitalization, monthly	GFD
Stock market returns		
Deflators		
Belgium	Purchase Power of the Belgian franc on yearly basis (= 1/CPI)	Van de Velde (1943)
France	Consumer Price Index / yearly basis	WTID
US	Consumer Price Index / monthly basis	NBER
US recessions		NBER

Notes: NBER : National Bureau of Economic Research; WTID: World Trade and Income Database; Van de Velde (1943): "Le rendement des placements 1865-1939".

4.B Results based on real returns

4.B.1 Descriptive and preliminary analyses

Figure 4.B.1: Returns in real terms (1919=100)

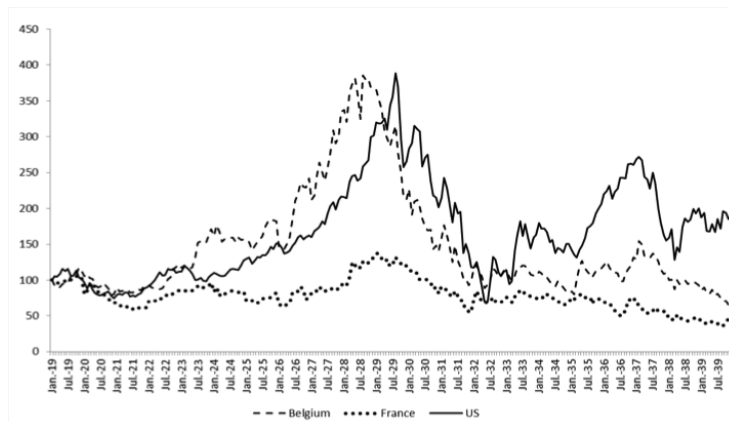
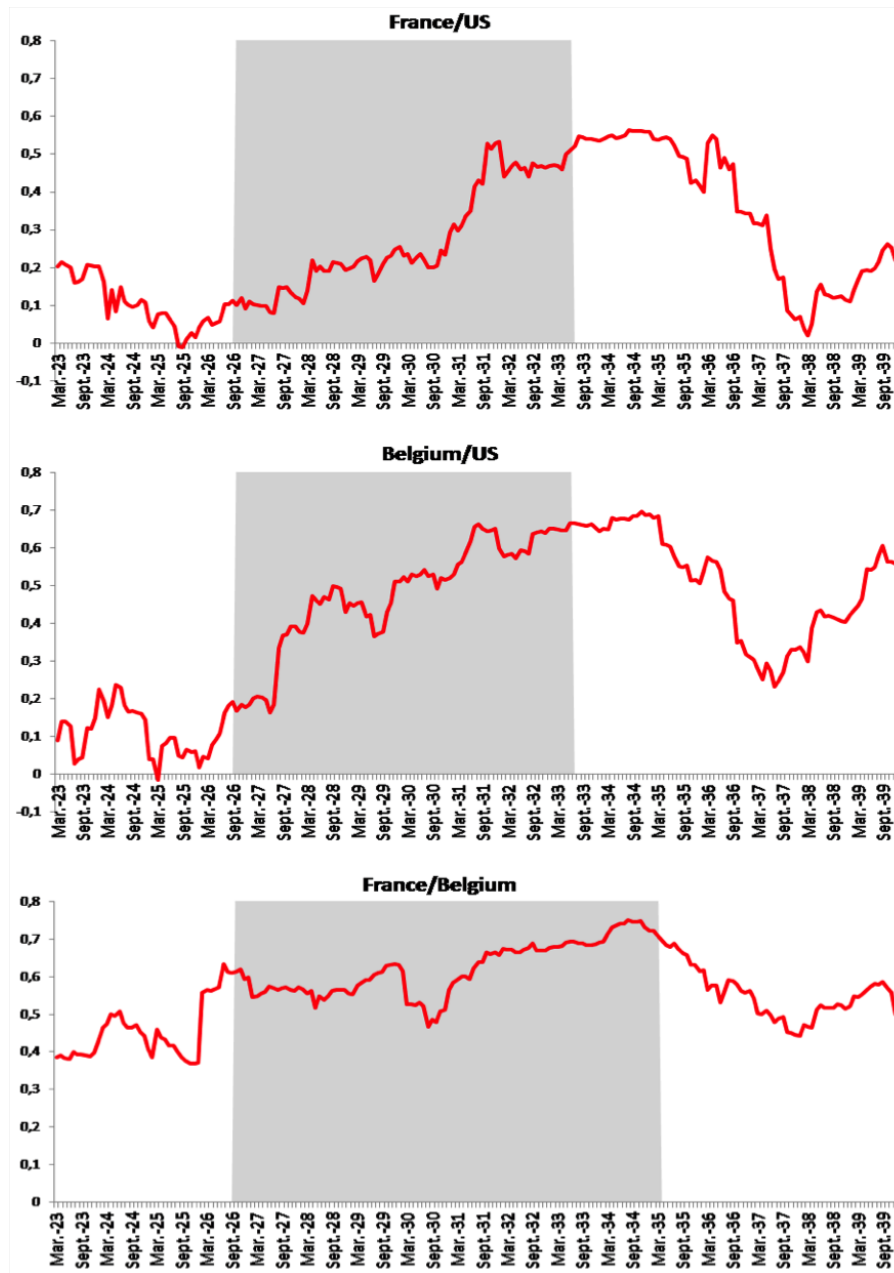


Table 4.B.1: Correlations between the stock market returns (in real terms)

	Period I			Period II			Period III		
	BEL	FR	US	BEL	FR	US	BEL	FR	US
BEL	1			1			1		
FR	0.519	1		0.628	1		0.496	1	
US	0.123	0.155	1	0.616	0.451	1	0.445	0.241	1

Notes. The period I corresponds to observations before October 1926. Period II corresponds to observations between October 1926 and June 1933 for the correlation between the US and France and the US and Belgium; for the correlation between France and Belgium, period II corresponds to observations between October 1926 and March 1935. Period III corresponds to the rest of the observations.

Figure 4.B.2: Pairwise rolling correlations (50 months' basis) on returns (in real terms)



Notes. The shaded area corresponds to the period of when both country are on gold.

4.B.2 Econometric analyses

Table 4.B.2: Co-movements between the stock market returns (in real terms)

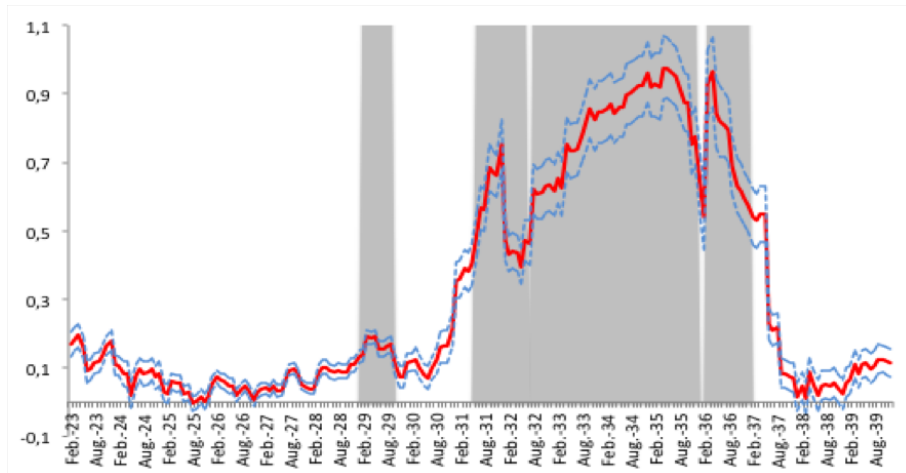
Dep. Var	US				France				
	Full Sample	Period I	Period II	Period III	Full Sample	Period I	Period II	Period III	
r_t	0.343*** (4.01)	0.102* (1.73)	0.534*** (2.81)	0.163 (1.25)	r_t^*	0.239*** 5.58	0.212 (1.45)	0.258*** (3.79)	0.115 (1.19)
R^2	0.18	0.13	0.37	0.24	R^2	0.14	0.12	0.26	0.29
Obs.	247	88	80	79	Obs.	247	88	80	79

Dep. Var	US				Belgium				
	Full Sample	Period I	Period II	Period III	Full Sample	Period I	Period II	Period III	
r_t	0.512*** (6.69)	0.092 (1.18)	0.679*** (5.90)	0.495*** (2.98)	r_t^*	0.411*** (7.97)	0.174 (1.13)	0.465*** (6.19)	0.373*** (5.31)
R^2	0.31	0.20	0.51	0.30	R^2	0.25	0.14	0.41	0.28
Obs.	247	88	80	70	Obs.	247	88	80	79

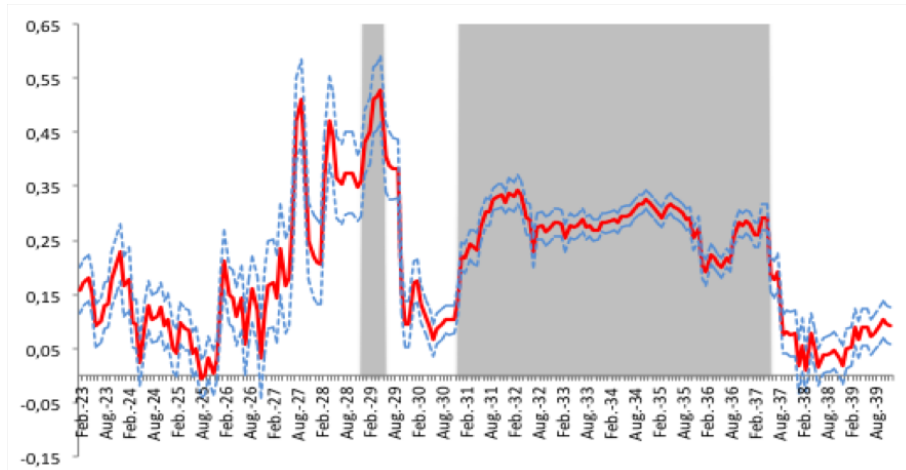
Dep. Var	France				Belgium				
	Full Sample	Period I	Period II	Period III	Full Sample	Period I	Period II	Period III	
r_t	0.513*** (8.77)	0.562*** (4.71)	0.503*** (6.71)	0.587*** (4.78)	r_t^*	0.592*** (9.25)	0.515*** (3.89)	0.713*** (6.44)	0.582*** (4.46)
R^2	0.36	0.38	0.46	0.49	R^2	0.33	0.34	0.43	0.48
Obs.	247	88	101	58	Obs.	247	88	101	58

Notes. ***, **, * indicates statistical significance at 1%, 5%, and 10%. t-statistics are reported in parentheses. The period I corresponds to observations before October 1926. Period II corresponds to observations between October 1926 and June 1933 for the correlation between the US and France and the US and Belgium; for the correlation between France and Belgium, period II corresponds to observations between October 1926 and march 1935. Period III correspond to the rest of the observations. In all the regressions we consider 4 lags as suggested by the AIC.

The France-US case

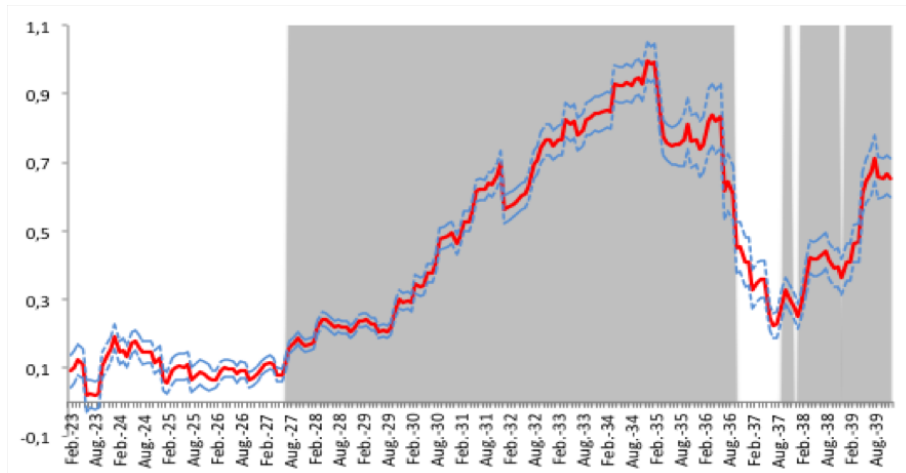
Figure 4.B.3: Influence of the French market on the US market (real returns)

Notes. The bold line shows the evolution of the coefficient over time. The dashed lines delimit the confidence interval. The shaded area indicates significance of the coefficient at 5%.

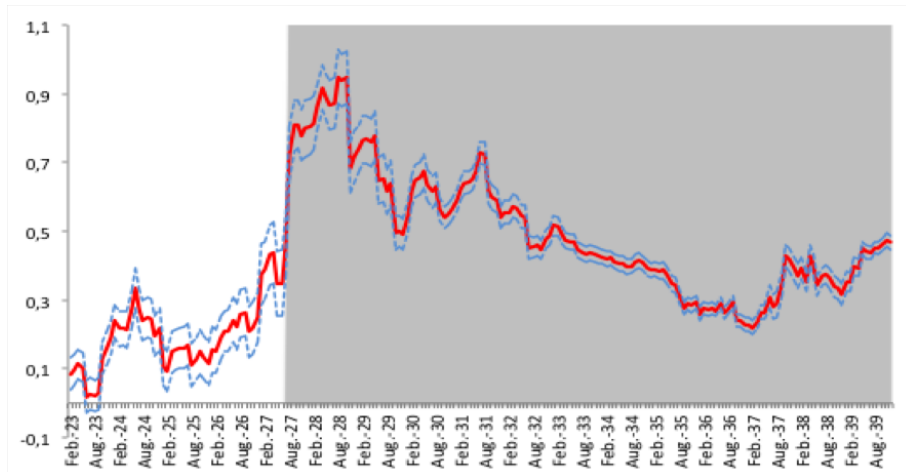
Figure 4.B.4: Influence of the US market on the French market (real returns)

Notes. See Figure 4.B.3.

The Belgium-US case

Figure 4.B.5: Influence of the Belgian market on the US market (real returns)

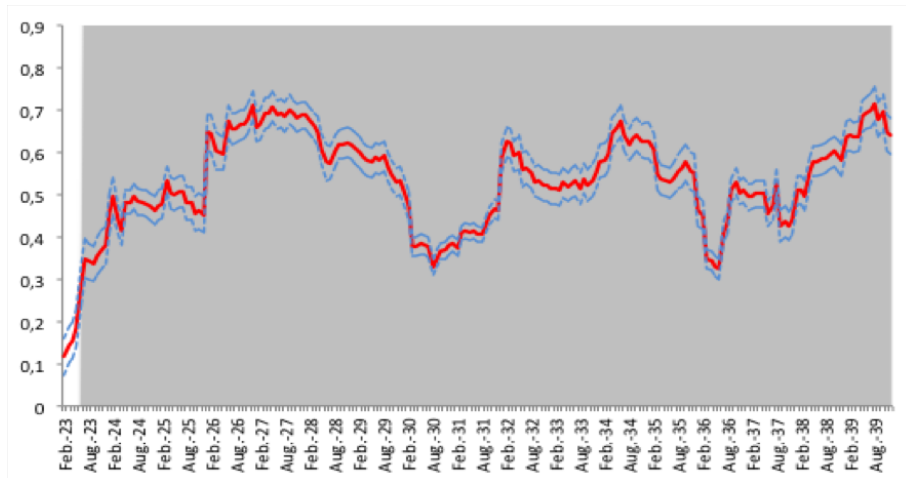
Notes. The bold line shows the evolution of the coefficient over time. The dashed lines delimit the confidence interval. The shaded area indicates significance of the coefficient at 5%.

Figure 4.B.6: Influence of the US market on the Belgian market (real returns)

Notes. See Figure 4.B.5.

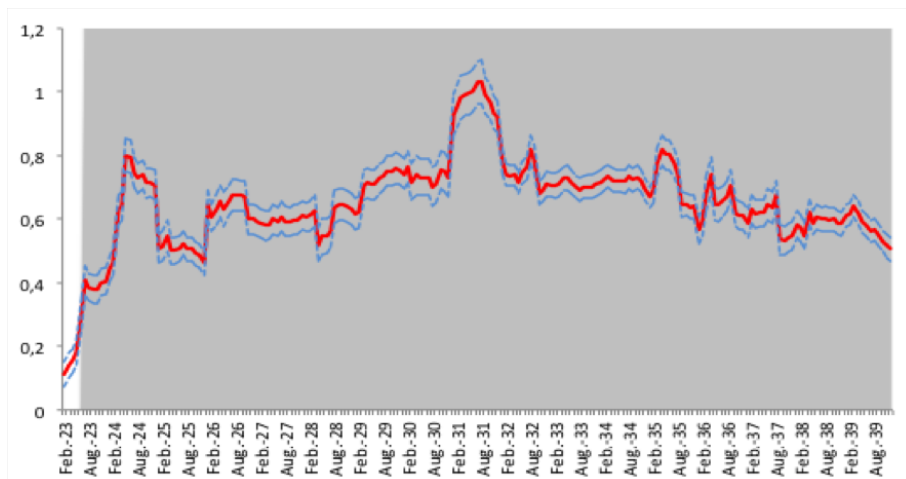
The Belgium-France case

Figure 4.B.7: Influence of the Belgian market on the French market (real returns)



Notes. The bold line shows the evolution of the coefficient over time. The dashed lines delimit the confidence interval. The shaded area indicates significance of the coefficient at 5%.

Figure 4.B.8: Influence of the French market on the Belgian market (real returns)



Notes. See Figure 4.B.7.

Conclusion Générale

Suite au choc de la crise financière de 2007-2008, l'économie mondiale n'a toujours pas renoué avec l'expansion économique qu'elle avait connue pendant les années 2000. Plusieurs années après la chute de *Lehman Brothers* et la crise de la dette souveraine en Europe, les séquelles sont encore nombreuses, comme l'attestent les difficultés rencontrées par un certain nombre d'économies émergentes et la stagnation des économies de la zone euro. De façon similaire, durant les années 1930, notamment en France, l'euphorie des années folles laissa la place à la dépression et il fallut plusieurs années pour retrouver un niveau de croissance similaire à celui qui avait prévalu avant 1929³⁴. Ces deux crises financières, les plus importantes de notre ère, soutiennent ainsi la comparaison notamment du point de vue de leur ampleur et de leur caractère global.

Le phénomène de propagation de la crise constitue le point de départ de cette thèse. En particulier, pour analyser les différents canaux de contagion par lesquels la crise des années 30 se propagea à l'économie française, les différents travaux que nous avons menés ont mis l'accent sur trois dimensions du système financier, potentiels vecteurs de la contagion : la bourse, les banques et le régime de change. Pour appréhender chacune de ces dimensions, nous nous sommes appuyés sur des données de marché afin de mieux préciser la manière dont la crise fût perçue, à l'époque, par les investisseurs. L'exploitation des données boursières ainsi que le recours à des économétriques des séries temporelles nous a notamment permis d'étudier la dynamique de la crise sur les marchés. Le champ épistémologique dans lequel s'inscrit cette thèse étant celui de l'histoire économique quantitative, une attention particulière a été portée sur la nature des données utilisées. Dans le cas de la Bourse de Paris, dont les archives sont exceptionnellement riches, le recours à des sources originelles ainsi que leur examen nous a permis d'une part, d'obtenir une plus grande transparence

³⁴Certains indicateurs, comme le PIB ou les cours de bourse, n'ont d'ailleurs retrouvé leur niveau de 1929 qu'à la suite de la deuxième guerre mondiale (cf. Tableau 1, Introduction Générale).

sur l'agrégation des données et d'autre part, d'avoir une connaissance plus fine de la microstructure de marché du point de vue institutionnel.

Dans le premier chapitre nous présentons les sources à partir desquelles les données nécessaires à l'élaboration de la majeure partie de cette thèse ont été collectées. Après avoir rappelé l'intérêt des indices boursiers comme indicateurs macroéconomiques et outils de l'analyse financière, nous décrivons les principales sources nécessaires à la constitution de tels indices pour les actifs cotés à la Bourse de Paris pendant l'entre-deux guerres. Plus précisément, il s'agit du bulletin de la cote officielle, où sont retranscrits tous les prix de transaction pour tous les actifs cotés ; les annuaires de la Bourse, regroupant les informations disponibles sur les émetteurs ; et les Avis et Décisions de la Compagnie des Agents de Change, sur lesquels sont décrites toutes les modalités d'opérations sur le capital des sociétés cotées. Nous construisons ensuite un indice boursier des dix plus grandes capitalisations boursières au sein du secteur bancaire, selon différentes méthodes d'agrégation. Pour ce faire, nous collectons dans un premier temps les séries au niveau individuel, ce qui nous permet de prendre en compte l'ajustement des prix lorsqu'une opération sur titre a lieu. La méthodologie de collecte de données décrite dans ce premier chapitre est celle qui prévaut dans le reste de la thèse lorsque les données n'étaient pas disponibles.

Le Chapitre 2 s'attache à comparer la réaction à court terme de la Bourse de Paris suite à un choc financier, tel qu'il s'est produit lors de deux krachs boursiers survenus à New-York : le krach de 1929 et la chute de *Lehman Brothers* en 2008. Afin de comparer rigoureusement l'impact de ces deux événements sur des données à court terme et de même fréquence, nous construisons un indice boursier journalier pour les quarante plus grandes capitalisations cotées à Paris en 1929, sur une fenêtre d'un an autour d'octobre 1929. Les tests économétriques auxquels nous procédons sur les séries journalières de rendements des actifs aboutissent à des résultats différents quant à l'impact du choc exogène sur les deux périodes. Alors que la chute de *Lehman Brothers* et le krach sous-jacent de la Bourse de New-York a eu un impact immédiat sur l'indice français en 2008, la Bourse de Paris n'est pas déstabilisée par la tourmente de Wall Street en 1929. Nous en concluons que la dépression en France ne s'est pas propagée par la Bourse. Néanmoins, nos résultats montrent que les rendements passés des actifs cotés à New-York ont une influence sur les rendements présents à Paris, et ce sur les deux périodes, suggérant une certaine intégration entre les deux marchés³⁵. L'étude des archives de la Banque de France, de la Compagnie des Agents de Change et de

³⁵Précisons que la présence d'une relation de long-terme (cointégration) entre les séries en 2008 montre que l'intégration des deux marchés sur la période récente est supérieure.

la presse financière de l'époque corrobore l'analyse économétrique précédente.

L'hypothèse d'une transmission de la crise par la Bourse écartée, nous avons alors cherché à explorer une deuxième facette du système financier, souvent au cœur des problématiques de propagation des crises : les banques. Ainsi, dans le troisième chapitre, nous testons l'hypothèse de la propagation de la Grande dépression en France via le système bancaire à travers une analyse du risque perçu par les investisseurs. Nous effectuons cette analyse sur toutes les banques cotées à la Bourse de Paris entre 1919 et 1939. Par ailleurs, les deux décennies qui composent notre période d'étude ont la caractéristique de correspondre à deux régimes macroéconomiques opposés : la croissance des années 1920 et la dépression des années 1930. Cette distinction nous permet d'affiner notre analyse en fonction de l'environnement économique. Le risque, mesuré par l'excès de rendement par rapport au rendement moyen du marché, est estimé à trois niveaux : au niveau agrégé, en sous-échantillon regroupé par activité principale, puis enfin au niveau individuel. Les résultats au niveau agrégé montrent une certaine résilience du secteur bancaire : ainsi, même pendant les années 1930, investir sur l'indice composé des actions bancaires aurait représenté un risque moindre par rapport à l'investissement sur un indice représentatif du marché dans son ensemble. Cependant, lorsque l'on distingue les banques par leur activité, il apparaît que les actions des banques d'investissement se caractérisaient par une prime de risque élevée dans les années 1930 tandis que les actions des banques de dépôt présentaient moins de risque par rapport au marché. Nous en déduisons donc que la structure spécialisée du système bancaire français a favorisé la résilience du secteur dans son ensemble à la crise, puisque les banques de dépôt n'ont jamais eu à faire face à une panique généralisée des déposants. Cela a également permis à la banque centrale de ne se concentrer que sur les banques d'affaires en difficultés, de secourir certaines d'entre-elles sans se mettre en danger. Il apparaît donc que, contrairement aux Etats-Unis par exemple, le système bancaire français n'a pas aggravé la situation de l'économie pendant les années 1930, du moins pas dans les mêmes proportions. Puisque ni le marché boursier, ni le système bancaire ne semblent pouvoir être considérés comme des canaux de contagion, il nous reste à nous tourner vers la sphère monétaire.

Le dernier chapitre de la thèse porte ainsi sur l'impact du régime de change sur l'intégration financière entre deux des principaux pays du bloc-or (la France et la Belgique) et les Etats-Unis. Le système de l'étalon-or (revisité pendant l'entre-deux guerres à partir du milieu des années 1920) offre en théorie une grande stabilité des prix mais est conditionné par une forte mobilité des capitaux à travers les pays membres. Cependant, conformément au

triangle d'incompatibilité de Mundell, l'indépendance de la politique monétaire est altérée dans une telle configuration et il devient notamment difficile de mener une politique expansionniste en cas de faiblesse de la demande intérieure, comme ce fût le cas dans les années 1930. Notre analyse des relations bilatérales entre New-York, Paris et Bruxelles, via une étude de la dynamique des corrélations et des co-mouvements entre les indices boursiers de ces trois places, montre que l'intégration financière entre les trois marchés est fortement conditionnée par le régime de change. En effet, l'intégration a augmenté fortement lorsque les pays sont tous revenus à l'étalon-or à partir de 1926, et a diminué lors de la dislocation du bloc or en 1936. Ce résultat corrobore l'interprétation selon laquelle le point de départ de la crise financière à la fin des années 1920 serait la politique monétaire restrictive de la Fed à partir de 1928, dont la hausse des taux provoqua d'importants mouvements de capitaux vers les Etats-Unis, puis vers la France suite à la stabilisation de sa monnaie. En donnant la priorité à la stabilité des prix, les pays dont la monnaie resta le plus longtemps ancrée sur l'or, sont ceux qui ont le plus tardé à retrouver la croissance, notamment les pays du bloc-or. Le manque de coordination internationale sur la question monétaire, comme en atteste l'échec de la conférence de Londres en 1933, a exacerbé les difficultés des principales économies restées dans l'étalon-or et finalement la plupart des grands pays ont fini par dévaluer leur monnaie, de façon plus ou moins coordonnée mais toujours dans le but d'augmenter leur compétitivité-prix, et ce au détriment de leurs voisins. Il apparaît donc que la propagation de la crise financière en Europe soit imputable au régime de change fixe adopté par les économies du monde entier au milieu des années 1920, en quête de stabilité monétaire.

Ces résultats font écho à la situation actuelle, notamment dans la zone euro mais également dans toutes les économies avancées. D'une part, si dans le cadre actuel du régime de change flottant généralisé, il est difficile de procéder à une dévaluation compétitive comme dans les années 1930, les banques centrales rivalisent entre elles au niveau de la poursuite de l'expansion monétaire à travers les programmes d'assouplissement quantitatif qu'elles ont mis en place. Ceci implique *in fine* le même mécanisme de dépréciation monétaire et de gains de compétitivité, bien que beaucoup moins direct et spontané. Au sein de la zone euro, les craintes liées à la sortie de certains membres font particulièrement écho à la dynamique des années 1930. Si des pays comme la Grèce ou l'Italie font l'objet de doutes quant à leur maintien au sein de la zone euro, les résultats de cette thèse, notamment ceux du Chapitre 4, montrent les conséquences probables en termes d'intégration financière d'une sortie de l'union monétaire de ces deux pays.

A l'issue de cette thèse, plusieurs extensions des travaux entrepris peuvent être proposées.

En premier lieu, il nous semble intéressant d'approfondir l'analyse, en nous appuyant sur à l'aide des données individuelles. Notamment au niveau du Chapitre 3, la prise en compte de données de bilan dans l'analyse permettrait de préciser davantage le risque perçu par les investisseurs en fonction de la structure des bilans des banques, plus tournées vers les dépôts ou les activités d'investissement. Ces données permettraient également de nous éclairer quant aux problèmes de solvabilité rencontrés par les banques dans les années 1930. L'utilisation de données sur les conseils d'administration pourrait être également intéressante à exploiter afin de mettre en évidence des effets de réseaux, souvent importants dans la résolution des crises bancaires.

Le Chapitre 4 pourra également faire l'objet d'améliorations dans le futur, via la prise en compte des séries de taux de change et de taux d'intérêt à court terme. Lorsque ces données seront disponibles³⁶, elles permettront de compléter l'étude de l'intégration financière en testant l'hypothèse de parité des taux d'intérêt. Enfin, nous envisageons également de nous intéresser à la convergence des taux à long terme entre la Belgique et la France via une analyse des prix des obligations cotées simultanément sur les deux marchés.

³⁶Elles sont en cours de collecte via le projet DFIH et seront disponibles au public en 2018.

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