The development of the Paris Bourse in the interwar period
What old and new stock indices tell us[a]

Preliminary version, comments welcome

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Abstract

In this paper, we discuss the conditions for stock market indices to be useful instruments both of long term growth measure and of international comparisons. We base our discussion on the case of French indices during the interwar period. We first present indices that were built then for macroeconomic studies. Second, we build a new blue chip index, which we aim is more comparable to foreign and contemporary ones, and helps understanding the limitations of previous indices. That new index is based on a new database on the French Bourse during the interwar period, which includes for every listed share monthly prices, earnings, splits and other capital operations, issues, and, most importantly, a measure of liquidity. The comparison with the Dow Jones index suggests that differences between the two markets are much smaller than previously thought.

JEL : G1, N20

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Introduction

Stock market indices are vital to macroeconomists, to financial economists as well as to actors in the financial world. Indices consistently built on the long term are essential to assess those regularities that help understanding the actual behaviour of financial actors and the evolution of the economy. The same is true for international comparisons. Nevertheless, little discussion of the methodology of indices is conduced today in economics classes and handbooks, and data series are used, with little caution, for purposes sometimes quite different from the ones they were constructed for. The recent revival in the study of long term financial market development, long term returns of investments and international comparison between the performances of historical markets seems to us to have been based on sometimes quite shaky bases (e.g. Goetzmann Jorion 1999, Jorion Goetzmann 1999, Rajan Zingales 2001).

After their invention by successful journalists at the end of the 19th century, stock market indices became the focus of the interest of very different groups of people, and their construction became a more complex and specialized task. Those studying the indices had different objectives and interests. A surprising fact from today's perspective is that the study of indices because of the stock market's importance in finance (for firms financing, for savers' portfolio choices or for investment banks' decisions), was a late-comer. Most of the initial interest came from economists that looked at the stock market only as a measure or an index of the macroeconomic situation. In the US, the "N.B.E.R." came before the "Cowles commission". This article insists that comparable indices built for common purposes on common methodologies are a necessary first step in the study and comparison of financial markets, and lists the risks that are otherwise incurred, using the French case as an example.

Various indices of stock prices were built during the interwar by the French government statistical office (the Statistique générale de la France or SGF). We analyze in detail their motivations and their consequences on the technical characteristics of the index : sample size, weights, statistical measures used, publication periodicity. We highlight two major breaks in the series : the first one in July, 1927, when the index is profoundly modified in composition and calculation ; second in January 1931, with the creation of a narrow index weighted by transaction volumes.

In order to measure the effects of the methods and of the samples used in the interwar indices, we construct a blue chip index on the basis of standard indices of today such as the CAC-40. Our index, that we call Paris-30, is based on a portfolio of 30 French listed manufacturing firms and utilities that we select from size and liquidity criteria. The index is weighted by market capitalizations and adjusted for all capital operations, entries and exits.

To build this new blue-chip index from the list of the most liquid stocks during the period, we use the data of a new exhaustive monthly database for all stocks listed on the Paris Bourse during the interwar period, the most advanced step in an ongoing collective effort of reconstruction of historical French databases consistent with the available contemporary French and foreign series [1]. That database includes end of month equity prices and dividends for all companies listed on the Paris Bourse (some 236 974 observations), all operations (initial public offerings, etc) for all these firms (some 3500 over the period), and a proxy for liquidity that compensate for the lack of available information on transaction volumes.

Part one motivates the creation of a new stock index by discussing previously existing indices in the context of the theories and methodologies with which interwar stock market indices were built. Part II presents the information in the new database that is required in order to build a new blue chip index. Part III describes the methodology used for the construction of that index. Part IV compares the resulting new index to the interwar ones and to the Dow Jones. This allows us to make some remarks on the specificities of the 1920s stock prices growth and on the 1929 turning point in Paris.

I. Stock market indices in the inter-war period

Historically, the first indices were constructed and published by financial newspapers as day-to-day summaries of the days stocks fluctuations. As such, they had to be easy to calculate and to understand. The two first (to our knowledge) such indices were published almost simultaneously in 1884 in *Banker's magazine* (UK) and by Dow Jones and Co's *Customer's Afternoon letter* (the precursor of the *Wall Street Journal*). The American one was the first stock-prices index since the British one included the prices of several bonds (Stillman, 1986). There was no equivalent in France, where businessmen focused on the variations of the price of government debt (the *rentes*) and some important stocks[2], and the most notorious financial advisers such as *Le Rentier's*, Neymarck (1913) suggested most categories of savers to abstain from buying stocks, except for a small proportion of important portfolios[3].

[1] In the same line, see on the 19th century Arbulu (1998) for the Parisian stock market, Vaslin (1999) for the government bonds market; for the interwar period Petit (2000) on the regional Lille market, Hautcoeur (1994) on new issues on the Paris market, and Ureche (2003) on the government bonds market. Contemporary databases for Paris start only in 1977 (Jacquillat Hamon, 1992). Similar research, prolonging contemporary databases back into history, is under way for the New-York Stock Exchange before the CRSP database (Goetzman & al. 2001), for London (Grossman 2002), Brussels (F. Buelens) and Milan (S. Curioni 2000).

[2] The first French index (to our knowledge) was published in the *Situation économique et financière* by P. Dromel from November 1912 to July 1914. It consisted in 5 *monthly calculated* indices for 1/ government bonds, 2/ bank stocks, 3/ railroads and transportation stocks, 4/ metallurgy stocks, 5/ mining stocks.

[3] Even for rich investors, the maximum 30% share of shares they recommended was far away from the 80-90% that similar advisers suggest today.

The development of the stock-market during the 1920s (Hautcoeur, 1994, 1999) might have increased the demand for indices, but apparently the only supply came from a government institution, the Statistique Générale de la France (SGF), which indices were constructed for macroeconomic purposes and did not become a standard instrument in financial periodicals[4].

Macroeconomic indices : At the end of the 19th century, economic crises and the resulting social unrest were among the main reasons for the development both of government statistical offices and academic interest in price, wage and later production indices. For example, the 1907 crisis led in France to the creation of a commission which strongly recommended a development of the production of economic statistics.

Financial variables, which were not included in these early statistics (except for public finances), were added when the academic study of business cycles emphasized, first theoretically, then empirically, the role of financial speculation among the determinants of fluctuations.

This explains why some important scholars in this field became involved in the construction of stock-market indices. After the initial development of "black-box" barometers aiming at anticipating crises (Babson, 1913 ; Brookmire, 1913; Armatte, 1992), academic economists wanting to test business cycles theories had to reconstruct long term indices, which led to different methodologies from the ones used in the day-to-day indices of the business press. In the U.S., precursors of such an approach were J. Commons and N. Stone (1900), W. Mitchell (1910, 1916) and W. Persons (1916, 1919). Persons chose to select strictly the stocks he introduced in his index, eliminating all whose fluctuations "diverged" from the "'normal" one (among 19 railroad stocks available to him for the 1898-1909 period, he eliminated 8 for such reasons). Mitchell (1916) clarified best the methodological choices required by the construction of stock indices. In the logic of the business cycles research program, he suggested developing large indices, modifying their structure every 10 or more years in order to follow the industry-distribution of the market. Magee (1913) introduced stock prices among the prices which relationships with the stock of money he examined. In France, a similar orientation was pursued by Ch. Rist (1913) for the period since 1871[5].

[4] A few publications were directed to the general public by former SGF statisticians (L. March published *Indices du mouvement général des affaires* from 1923, and Dessirier followed a few years later with his *Conjoncture économique et financière*), but none became a standard reading for *financiers*. Comments on the Parisian stock market were not based on indices even during the great depression : a systematic look at all articles on the stock market in *Le Rentier* and *L'économiste français* from 1929 to 1932 shows that comments on the New-York crash, based on *The Economist*, used indices (e.g. Viallate, 1929), but no article used the SGF indices to discuss the French situation.

[5] An index restricted to "9 iron and steel stocks" was the first published regularly by the SGF,from April, 1914, and during 10 years. No details on its construction was given, but it benefited from a place in the first page of the *Bulletin* (although not of a graphical representation). It may have followed the Rist (1913) iron and steel index.

World War One, its managed economy, and the 1920's economic fluctuations reinforced the need for statistics and business cycle theory. New institutions emerged such as the NBER. The SGF, still a small institution in comparison with its foreign equivalent, was reinforced (Sauvy, 1984). International institutions such as the International Labor Organization co-ordinated these developments.

All this led to a more systematic and comparative research on business cycles. The first issue of the *Review of Economic Statistics* in January 1919 was entirely dedicated to "indices of economic condition" (among which some stock-market indices) under the direction of W. Persons. It became famous as the "Harvard barometer". Frickey (1919) in the US, Persons, Silberling and Berridge (1922) and Bowley (1922) in the UK[6], M. Lenoir (1919, 1920) in France, constructed stock indices in the same macroeconomic perspective. [7]

The state of index numbers theory[8] and the business cycle purpose of all these stock-market indices explains their characteristics : they included all shares for which prices were regularly available, without concern for their actual importance on the market ; they included little (if any) correction for capital operations; they didn't weight prices either by market value or transactions[9]; they didn't modify their portfolios during long periods, conducing to biases relative to the stock-market.

These characteristics made these indices quite inadequate for the growing needs of professional financiers, at a moment when, partly because of inflation (especially in France), the stock markets developed rapidly almost everywhere. This explains why a second generation of stock-indices emerged in the 1920s, aiming at measuring the performances of various portfolio investments (Fisher, 1925; Jackson, 1928), ending in the famous Cowles commission (Cowles, 1933).

French indices : As mentioned above, French scholars participated the international movement of business cycles measure and theory. Nevertheless, one French peculiarity was the division between "ingénieurs économistes" and academic economists, which were quite

[6] All business cycles specialists did not have the same interest in stock market indices. For example, J. Kitchin, who had an important role in the development of the London and Cambridge Economic Services, didn't mention them in his famous paper on cycles (Kitchin, 1923).

[7] This tradition would continue under the auspices of the NBER in the US : see Cole and Frickey (1928), and the synthesis by Mitchell (1938), when, after the Great Depression and the rise of keynesian macroeconomics, the stock market became the locus of irrational behaviour and an inconsequential element for economists. A few scholars kept searching for a theory linking statistics, macroeconomics and financial markets (e.g. in France, Guillaume (1932), at the crossing of the walrasian and SGF traditions).

[8] A debated topic at the turn of the century, it was mostly settled by I. Fisher (1922). As Armatte (2003) shows, the theory was mostly dedicated to the construction of price indices.

[9] Weighting problems were discarded as secondary by Edgeworth (1896), but concerning price indices. Still, some weighted price indices were constructed (SGF, 1928)

hostile to the entry of statistics and mathematics in their field[10] (Zylberberg, 1990). Efforts to bridge the gap led to the creation of the Institut de Statistique de l'Université de Paris by E. Borel, F. Faure and L. March in 1922, but it did never resulted in scientific publications similar to the *Review of Economic Statistics*. Statistical theory and practice[11] remained *de facto* the exclusive domain of those engineers who developed the government statistical offices : SGF and later INSEE. For example, the SGF's head from 1899 to 1920 was Lucien March, educated as an engineer and an excellent statistician (Jovanovic & Le Gall, 2002). March participated the business cycles debate (March, 1913). When stock-market indices were constructed, it was then within that perspective, giving way to a broad index which precise methodology we describe below. A few smaller indices were constructed during brief periods.

The broad index. The SGF stock index (*indice des valeurs à revenu variable*) is the only available for the entire interwar period. It was first presented in a paper by M. Lenoir (1919), published from April, 1922 in the SGF monthly bulletin, which also gives details on the methodology and its modifications (SGF, 1926, 1927, 1932a, 1932b). The SGF also published yearly companion indices on capitalization ratios and net earnings for the stocks included in that index.

Since it was constructed on a *a priori* basis, the index does not suffer from survivor bias (except in the retrospective study for 1856 to 1918 presented in Lenoir's 1919 paper[12]). It was a broad composite index, including 186 in 1919, 194 in 1926, 288 in 1927 and 300 from 1929 to the war. It covered mostly the official Parisian stock-exchange, with occasional prices taken from the unofficial *Coulisse* or from provincial stock-exchanges[13]. Most but not all the shares were ordinary ones, which makes the index quite homogeneous[14]. The index was a monthly one from 1919 to 1929 (end of month prices[15]) and weekly from 1930.

[10] Among other things, indices were relatively understudied ; for example an academic handbook of statistics didn't discuss them in 1905 and dismissed them as late as 1933 (Liesse, 1905-1933). The same problem limited the development of financial theory, which explains partly why Bachelier's famous 1900 doctoral thesis didn't originate a French tradition in financial theory and was almost forgotten until its rediscovery by Savage, Samuelson and Markovitz (Bernstein, 1992)

[11] See L. March (1921, 1930), F. Divisia (1926) or R. Roy (1935).

[12] The retrospective reconstruction started in 1856, and included 54 stocks as soon as 1876. It was calculated on a yearly basis with prices until 1916 were taken from the yearly *Annuaire des valeurs cotées à la Bourse de Paris*, a publication by the Compagnie des agents de change that gave only minimum and maximum prices over the course of the year.

[13] The market is not mentioned in Lenoir (1919), but SGF (1927) mentions one share listed in Lyon, one in Lille, nine in the Coulisse (including 2 foreign firms). SGF (1932b) mentions six listed in the Coulisse and none outside Paris.

[14] SGF (1927) mentions 14 *actions de jouissance* (among which 5 from the great railroads) and 2 priority shares (respectively 7 and 1 in 1932 : SGF (1932b)).

[15] Prices were taken from the daily *Cours Quotidiens* published by the official *Compagnie des agents de change*.

When defining the index for each share's price, Lenoir (1919) explicitly mentioned adjustment for new issues. SGF (1927) explains how account was taken of the impact of share dividends, reserve distributions, late payments (*liberation*) of existing shares, and how coefficients of adjustment were calculated for every operation in a fairly modern manner. Nevertheless, it is not clear whether calculations before that date took into account all these operations or only new issues.

Industry groups' indices were constructed from 1919 on as the arithmetic mean of the group's securities prices. There were 25 industry groups in 1919, including from 1 to 26 different shares (median : 5). The general index was the arithmetic mean of the group indices.[16]

A change in presentation was decided in 1926, a new synthetic index being calculated for the 23 groups of "French firms", excluding the group of foreign railroads and that constituted by the Suez Canal alone (SGF, 1926). The reason given for this separation was the fact that the inflation differential between France and many other countries in the preceding years had created a discrepancy between the evolution of the prices for these two groups of firms, and then a bias in the index[17]. Unfortunately, the index was not recalculated retrospectively, so that there exists no index of "French firms" before that date. More profoundly, many French firms having most of their activity abroad or in the French empire remained within the "French firms" index, so that the 1926 reform was only a partial move toward a more geographically-based index.

A more profound reform of the index occurred in 1927, allegedly because of the recognition that an "artificial weighting" (SGF, 1927: 391; 1932a : 48) resulted from the very heterogeneous evolutions of individual shares' prices (and industry group indices) since the pre-war basis [18]. The number of shares augmented to 288, the number of group decreased to 20 (respectively 300 and 22 in a small change in 1932), with a more even number of shares per group (median : 13). Many aspects of this reform create a strong discontinuity in the index. First, around 100 firms are substituted for others and 100 new firms enter the index, without the reasons nor the impact being discussed. Second, the general index changed from the average of group indices [19] to the average of individual stocks indices, which suggests a

[16] Little reasons were given for the group's construction. Lenoir (1919) actually suggests an economic an not a financial perspective, since he discusses the differences in the chronologies of fluctuations among groups in terms of their market power and fixed-price contracts in the face of global price level fluctuations.

[17] Ironically, the stabilization of the franc occurred within a few months after that change, making it almost useless.

[18] From then on, re-weighting giving again an equal share to all firms occured regularly, at least during the following years : August 1928, July 1929, September 1930 and January 1932 are known (SGF, 1932b).

[19] Some group indices were recalculated back to 1919, although incompletely : 12 industry groups' indices, whose compositions didn't change much, were not recalculated. Two entirely new groups were not calculated backward. For two groups that resulted from the fusion of various old ones, pre-1926 indices were calculated as the average of previous groups' indices. Only 4 groups had their indices entirely calculated backward to 1919 with the same methodology as for the post-1926 period (see annex 1).

move toward an interpretation in terms of macroeconomic cost of capital. Third, the creation of a separate index for "foreign firms" and separate groups for "colonial firms" and "French firms with activity abroad" achieved the "nationalization" of the index, quite consistent with the inter-war's general trend toward a de-globalisation of the international economy and the increasing relative importance for the French economy and the French savers of the colonial Empire. [20]

Narrow indices. Two narrower indices were calculated for some years by the SGF. In both cases, the observation of the activity and volatility of the stock market was the main purpose, in contrast with the general index's motivations. In 1926, the SGF published a retrospective index for ten stocks[21] listed on the forward market (*la cote du terme*), arguing that, first, "speculation (…) is a forward market phenomenon", and that "if one takes into account the width and velocity of price fluctuations, one may desire to know not only end of month prices but also average values and extreme points, which requires following the quotes day after day. This cannot be done for an index of 200 quotes, but the new indices, calculated for a limited number of securities, have been calculated, since two years, for every stock-market session" (BSGF 1926, p.186). Unfortunately, little detail is given on the construction of the index, and its publication is not continued.

New narrow indices were published by the SGF from October, 1932 for around 25 shares[22] and 10 bonds which transactions volumes it obtained from the *Chambre syndicale des agents de change* (*BSGF*, July 1932, p.565). [23] All were quite sophisticated : the price index was the geometric mean of a Paasche and a Laspeyres indices of prices weighted by transaction volumes. The transaction index was symmetric and an index of the value of transactions was the product of the two previous ones (SGF, 1934). Most importantly, the index included a number of foreign shares (around half the total in 1934). All this suggests this index had a clear financial objective, which is confirmed by the comments in the BSGF, concerned with explaining the day-to-day volatility of the stock market (e.g. SGF, 1934, p. 447).

[20] It is not clear whether the new series given in 1927 recalculate backward the general index excluding those foreign firms in order to be homogeneous with the post-1927 series.

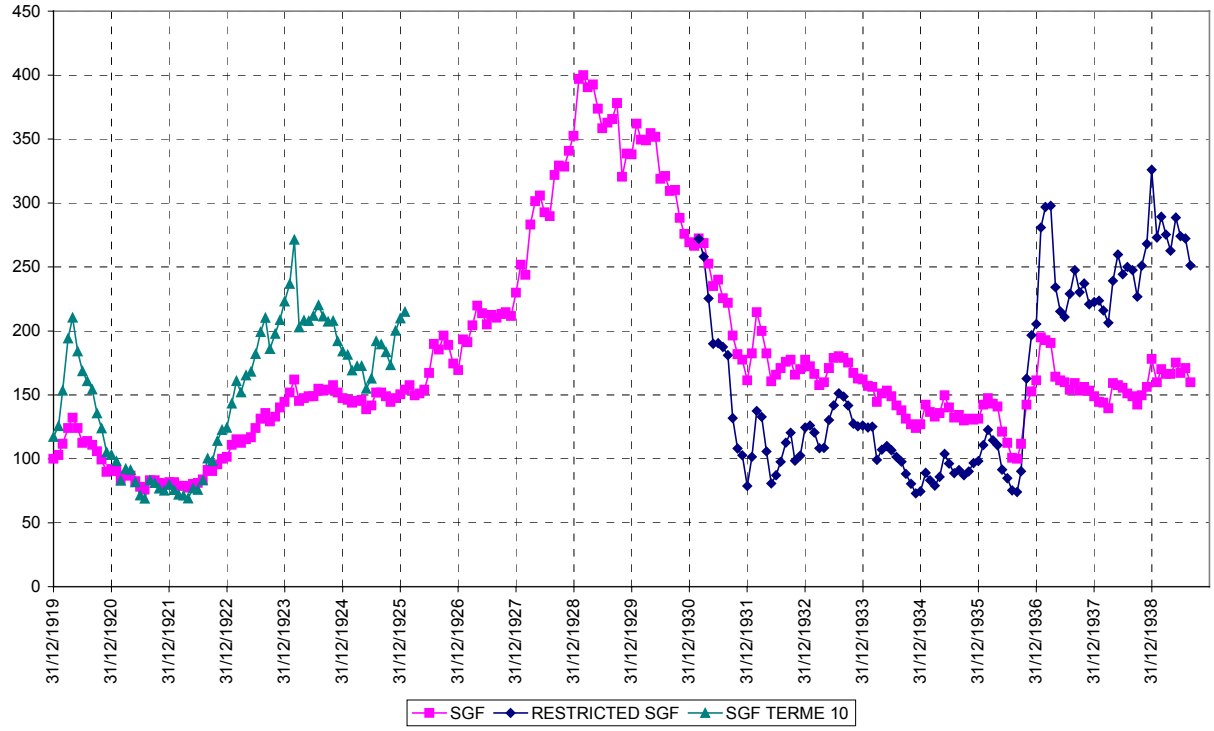
[21] Banque de Paris, Chemin de fer d'Orléans, Compagnie générale d'électricité, Forges et aciéries du Nord et de l'Est, Tréfileries du Havre, Mines de Lens, Phosphates de Gafsa, Chargeurs réunis, Voitures à Paris, Raffinerie Say). Another index was constructed for 5 "foreign" (firms whose operations are mostly outside France) stocks, also listed on the forward market : Canal de Suez, Crédit Foncier Egyptien, Nitrate railways, Rio Tinto, Norvégienne de l'Azote.

[22] It rose from 22 initially to 23 in October 1923 to 26 in April 1935, 24 in July 1935, 26 in January 1936, 29 in July 1936 and 31 from July 1938 until the war.

[23] Weekly values appeared from October 1932 and June 1933 (respectively for volume and price indices), and even obtained the honorific position of appearing in the front page "Mouvement économique general" of the *BSGF* from July, 1933 to January, 1934.

We reproduced in figure I-1 the SGF general index together with the two narrow indices, which, paradoxically, miss the 1929 crash. At first sight, the narrow indices show greater volatility. Differences in levels after 1932 are likely to result from the weight of foreign shares in the narrow index, since the franc was overvalued from 1931 to its devaluation in 1936, and undervalued thereafter.

Figure I-1 Stock-market indices calculated by the SGF



II - The official listing, 1919-1939.

Sources and data collection process : In this paper, we use information from our new database on all shares listed on the official Paris market [24]. End of month prices and detailed characteristics of the shares of all French firms listed on the Paris official stock-exchange from December 1919 to December 1939 have been hand-collected from the *Cours officiels et authentiques*. The resulting database includes 236,974 prices for 240 monthly observations. Five variables characterize every security : name of the issuer, industry, market of quotation, number of securities listed, nature of the security (ordinary or other). Three secondary market variables are included : spot prices of the day and the day before, number of transactions realized after the fixing.

All operations concerning these shares have also been collected in the *Annuaires des valeurs admises à la cote officielle de la Bourse de Paris* and in the *Décisions et avis*, all official publications of the Chambre syndicale des agents de change. Our database includes 2300 such operations, with six variables : nature of the operation (new issue, split,….), dates of the

[24] For details on missing data and database organization, see Petit (2003).

General shareholder's meeting authorizing it, dates at which the newly issued shares were listed and later assimilated to the older ones, number of the new shares and their issuing price.

Number of firms and quotation market : The number of firms listed on the Paris Bourse increased from 406 in 1919 to 862 in 1930, by an average 40 firms a year. From 1931 on, that growth stopped and the number stabilized around 800, in small decrease from the 1931 peak (figure II-1). The total number of firms in the database exceeds 1100 since some of them were short-lived. Firms might be listed on two official markets, either on the "*comptant*" where transactions were paid cash or on the "*terme*" where all operations were long purchases and short sales. The *terme* market never included more than 90 firms, and a sharp restructuring in 1925 reduced that number from 90 to 49. In figure II-1, the number of firms on the *comptant* market is the difference between the total and the number of firms on the *terme* market.

Market capitalization : We first calculated a market capitalization for every listed ordinary share, as the end-of-month price multiplied by the number of securities. Total market capitalization, the sum of individual capitalization, increased almost continuously from 24 billion francs at the end of 1919 up to a peak of 177 billion at the end of September, 1929, with a first break in February, 1929 at a 173 billion value, Figure II-2. After a two-years rapid decline, it reached a low at 76 billion in December, 1931, and, except for a temporary fall in 1936, did not change much until the war.

The figure II-2 shows the distribution of the market capitalization between firms listed on the *marché à terme* and the *comptant*. The small number of firms listed *à terme* (on average 50 firms) represent an important proportion of the total market capitalization : from almost 60% in the early 1920s, that proportion decreases to around 40% in the late 1920s, and increases to a maximum superior to 60% in the mid and late 1930s.

Figure II –1 Number of listed French firms and number of quotation lines for their shares

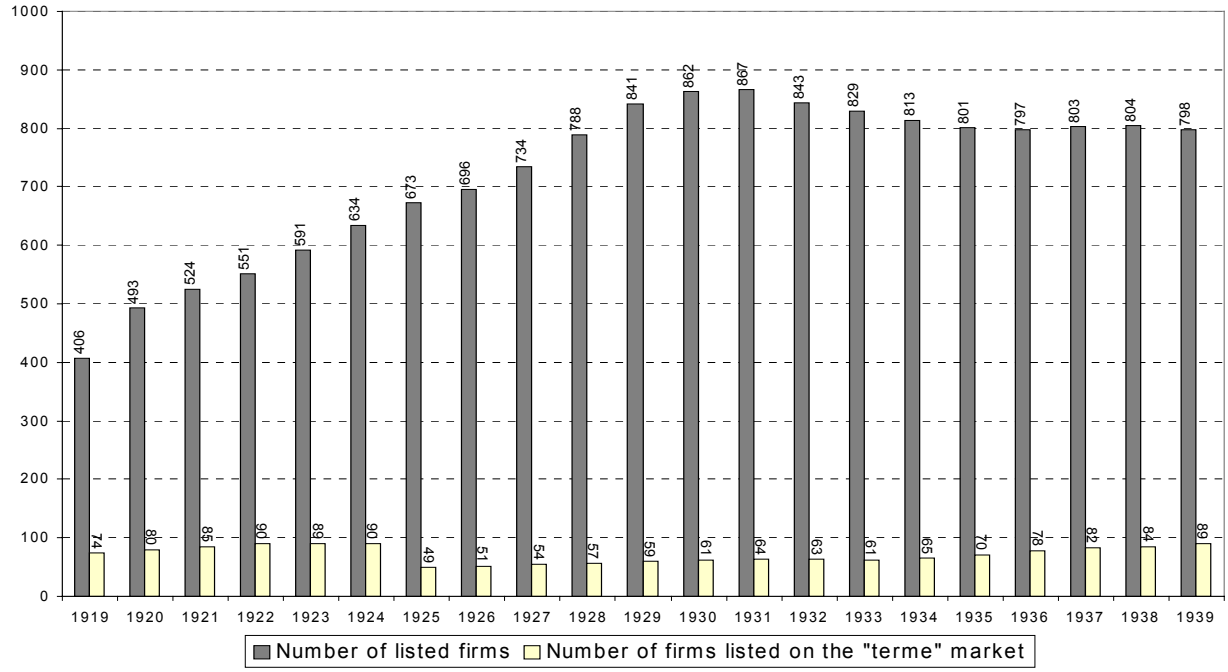
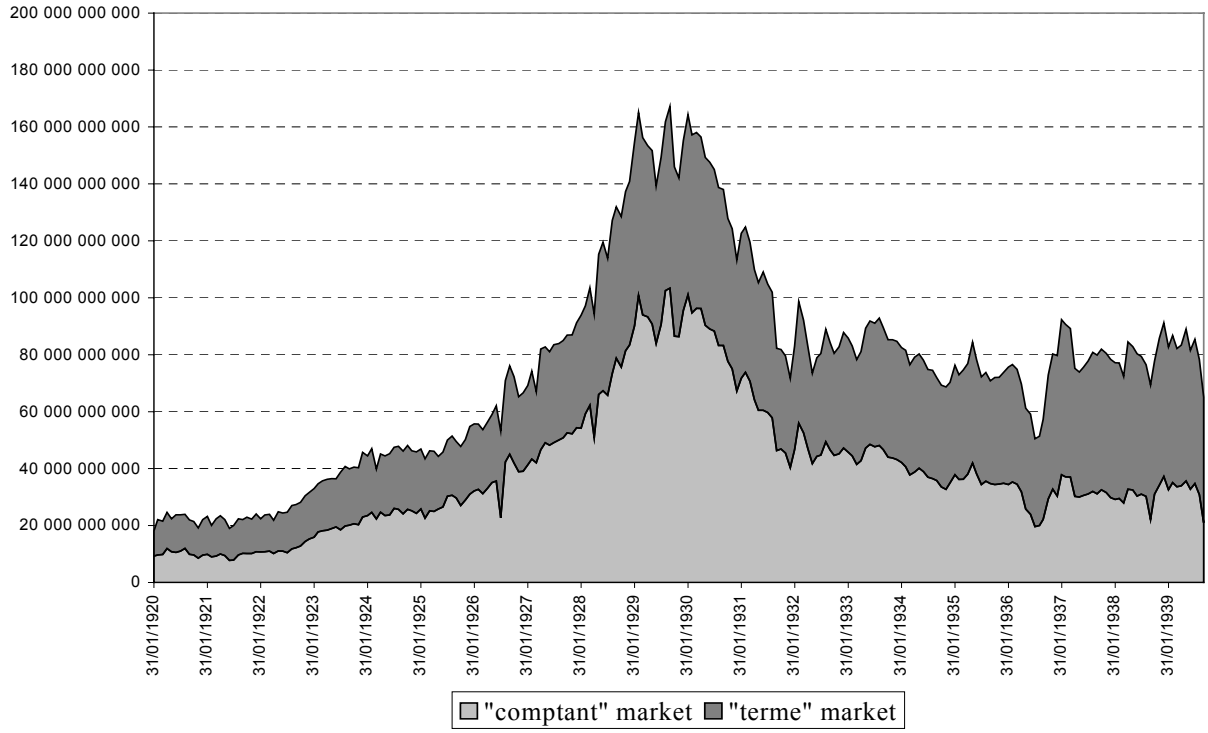


Figure II-2 Stock-market capitalization by markets

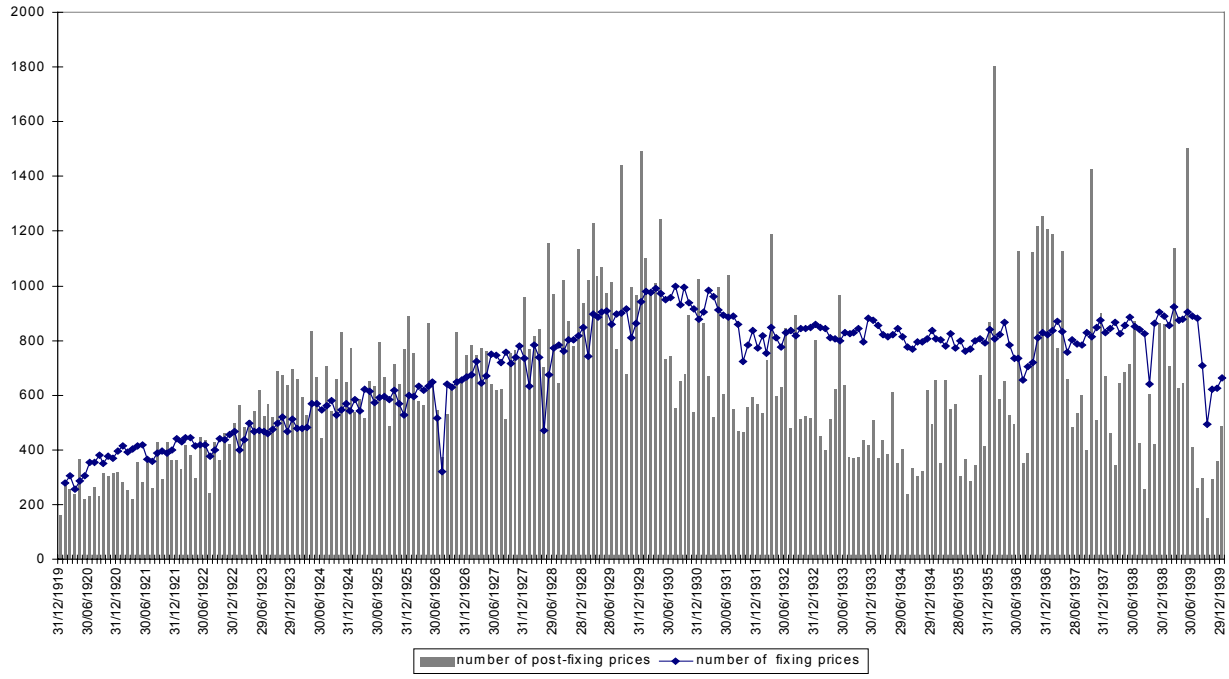


A measure of liquidity

Up to recently, no data on the volumes of transactions on the Paris *Bourse* was published. No complete data on transactions is available in the archives either. Contemporaries such as Leroy-Beaulieu (1912) considered that this lack of information impeded discriminating correctly between firms as was already common practice in New-York. This lack of information also proves a major problem for our study since it makes it difficult to construct

homogeneous categories of firms according to liquidity. We propose to solve this problem by building a proxy for liquidity : the number of prices that were quoted on the same day for the same security. Although the Paris Bourse had a centralized quotation system with the agents de change as official walrasian-type auctioneers (*commissaires-priseurs)*, price-making was not limited to a unique fixing. Actually, when selling and buying orders were transmitted to the *agents de change* after the fixing, they could realize one or various successive transactions, and the Chambre syndicale des agents de change had to publish all their prices in order to inform the public (François-Marsal, 1929). Following in a systematic way the methodology of Hautcoeur (1994, pp. 290ss), we count the number of prices quoted after the fixing, which we consider as the best available measure of liquidity.

Figure II-3
Number of fixing and number of post-fixing prices for every date.



During the 1920s, such post-fixing prices existed for around 25% of the quotation lines (table II-1), a proportion similar to that observed on the Paris Bourse during the 1977-1989 period (Hamon-Jacquillat, 1991). During the 1930s, that proportion decreased something, but remained around 20%. The number of post-fixing prices could be as high as 22, with a mean of 3.69 and median of 3. If one adds the numbers of post-fixing prices for all shares at every date for the market as a whole, one finds that, up to 1929, the post-fixing activity produced as high a number of prices as fixing activity (Figure II-3). The post-fixing activity decreased significantly after 1929, producing only around half as many prices as the sole fixings, with a much higher volatility.

Table II-1 Distribution of the quotation lines between those only with a fixing and those with multiples prices.

	ONLY FIXING		MULTIPLE PRICES	
PERIODS	Number of lines	%	number of lines	%
1920-1924	19592	0,75	6469	0,25
1925-1929	31224	0,74	11039	0,26
1930-1934	42008	0,82	9476	0,18
1935-1939	38522	0,80	9562	0,20
1920-1939	131346	0,78	36546	0,22

Table II-2 Distribution by market and by firm size of the quotation lines with only fixing and of those with multiple prices

	ONLY FIXING		MULTIPLES PRICES	
	Number of prices	%	Number of prices	%
TERME	7107	0,42	9931	0,58
COMPTANT	101837	0,79	26651	0,21
quantile 95	3032	0,56	2357	0,44
quantile 90	6573	0,61	4129	0,39
quantile 75	20109	0,68	9329	0,32
quantile 50	45471	0,74	16281	0,26

Post-fixing price formation was much more important on the *marché à terme* than on the *comptant* one. Table II-2 shows that for firms listed on the *comptant*, most quotations were limited to fixing prices (79%), when on the *terme*, 58% had multiple prices. Nevertheless, if one considers the biggest firms listed on the *comptant*, the difference is not that important : 42% of the 5% biggest firms quotation lines had some post-fixing activity.

Capital operations.

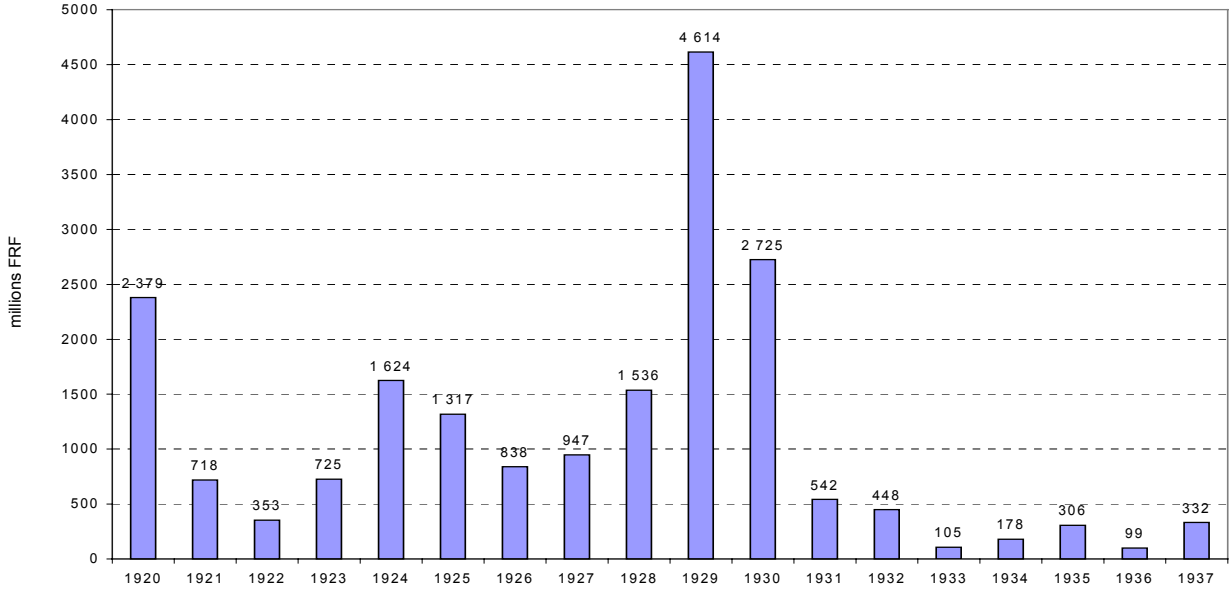
Hautcoeur (1994) collected on a yearly basis all capital operations of French firms listed on the Paris Bourse from 1890 to 1936, from the *Annuaires des valeurs.* Our database improves on this work by a detailed identification of every operation and more precision in the dates (day and month) of the General meetings that authorized every operation, and the dates at which new shares were assimilated to older ones (in the case of new issues). This allows adjusting the market capitalization for each firm in the database, a necessary step when constructing the index.

Table II-3 Inventory of capital operations realized during the interwar period.

	Number of cases	Number of shares created	Mean price	Median price	Min. price	Max. price	Amount
Operations increasing the number of shares							
New issues	1 045	62 181 193	446	350	20	5 000	21 847 772 345
Assimilation of multiple vote shares	106	2 722 038	363	200	50	1 000	1 240 455 918
Split or dividend	64	6 983 250	x	x	x	x	x
Bonus shares	87	5 666 965	x	x	x	x	x
Operations diminishing the number of shares							
repurchase	33	-562 168	302	250	57	1 167	-122 175 568
Capital reductions	50	-3 814 149	x	x	x	x	x
Reverse splits	8	-1 876 100	x	x	x	x	x
Reimbursements (transforming shares in *actions de jouissances*)	369	-13 346 469	x	x	x	x	x

Table II-3 summarizes the operations realized by all listed firms during the interwar period : new issues, bonus-shares, splits, reverse splits, repurchases, reimbursements, assimilations of multiple voting shares.[25] New issues represented the overwhelming majority of all operations, with a total amount of around a fourth of the average market capitalization of the period. Figure II-4 shows the evolution of the new issues (including shares issued against contributions in kind) both in nominal and real value. They reach an exceptional level in the years 1929 and, more surprisingly, 1930, something we will deal with in a later study.

Figure II-4 Initial public offerings and other issues



[25] Such shares were created in an increasing number of firms during the (late) 1920s, and were forbidden by a 1933 law, which imposed assimilating them to ordinary shares (see Hautcoeur, 1999).

III. The Blue-chip Paris-30 index - methodology :

The purpose of this section is to construct a French equivalent to the Dow Jones index, i.e. an index for a restricted number of prestigious firms from non-financial industries. We call it Paris-30 (the Dow Jones had between 20 and 30 shares during the period). We present first the methodology for the index' calculation and for the selection of the firms in the portfolio

Calculation of index : Although we aim at a comparison with the Dow Jones, we did not follow its calculation method, in which firms are weighted in the index by the price of their shares, something which may bias severely the index when share prices vary among firms and in time. We chose to weight individual share prices by their market capitalization, something more consistent with a modern portfolio approach. Our index is then equal to the market capitalization of the portfolio of elected firms divided by the initial year market capitalization adjusted by a coefficient taking into account the capital operations that affect the index (new issues, repurchases, capital reductions) and the entries and exits from the portfolio.

$$It = 100 \times \frac{\sum_{i=1}^{30} (Qit \times Pit)}{Kt \times MCo}$$

t = date if calculation ; Qit = number of shares i at date t. ; Pit = price of share i at date t.
MCo = market capitalization of the initial portfolio on December 31, 1919.
Kt = product of all the adjustment coefficients applicable to MCo and reflecting all capital operations between December 31, 1919 and date t that have an impact on market capitalization.

Selection of firms entering the Paris-30

Eligibility. Two criteria are commonly used for such a selection : size and liquidity. An institutional criteria likely to give similar results would be to choose the firms listed on the *marché à terme*, but their number varies and some firms listed on the *comptant* market have a similar size and liquidity. We then chose a selection process in two steps, eligibility and election, similar to that used nowadays by Euronext [26]. The first step is the construction of a yearly pool of firms among which the firms entering the index could be selected in a second step : for each year, we order all ordinary shares first by size (market capitalization at the end of the year), second by liquidity (number of post-fixing prices for the year). The mean of the

[26] See Davydoff (1998) and http://www.bourse-de-paris.fr/centredoc/pdf/methGB.pdf

two ranks gives us a rank for every firm every year. After some trial and error, we defined as eligible each year those firms which have a rank inferior to 60 during at least 4 years (of which at least 3 consecutive ones [27]).

Election. The second step is to select 30 elected firms which will compose the Paris-30 index every year. The selection was done yearly from 1920 to 1939 with two principles : to elect all firms with the highest ranks but without taking out those firms which exit the eligibility pool for only one year.

IV - Results :

Portfolio composition : Applying that method, we select among the entire period 73 eligible firms and 64 elected firms (30 every year) which enter the Paris-30 index. The complete list of elected firms is given in table III-1, with their names in column and for every year their rank. The years for which a firm pertain the index are highlighted. Framed cells signal firms maintained in the index in spite of a rank superior to 60, because of the absence of any other firm in a position to replace it and because the low rank is transitory.

The turn over in the index is quite high : 47 firms enter and exit the index during the interwar period, most of them (33) during the 1920s. The mean time span of the firms in the index is 9 years, and the median 8 years, which suggest an overall stability of the portfolio.

Table III-2 provides for each year the repartition of the elected firms among markets, and the share of each firm pertaining the index in the total market capitalization of the Paris-30 portfolio. Highlighted cells correspond to firms listed on the *marché à terme* (all others are listed on the *comptant* market). A high and increasing proportion (from 65% in 1920 to more than 90% in the late 1930s) of the portfolio's firms are listed on the *marché à terme*, which suggests that an index for that market alone would be a decent approximation of our index. Nevertheless, among the 64 firms which pertain at least once to the index, 24 are continuously listed on the *marché à terme*, 20 never, 18 move from the *comptant* to the *terme*, and only 2 do the reverse movement.

Except at the beginning of the period, few firms represent more than 5% of the total market capitalization, which decreases the risk that the index is biased by a single share price variations. One must note the special situation of the Suez Canal : its capitalization represents during all the period at least 20% of the index, rising to more than 30% from 1932 to 1937. Reallocation of the portfolios of French capitalists during the 1930s in favour of Suez shares was important.

[27] Because a firm's rank is the average of two ranks, the number of firms with rank inferior to 60 is necessarily inferior to 60. The condition of rank repetition further decreases the number of eligible firms.

Table IV-1 Rank (mean of market capitalization and liquidity ranks) of firms elected in the Paris30

FIRMS	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	DV
AFRIQUE OCCIDENTALE	46	28	40	34	39	73	40	53									47		37	42	8
AIR LIQUIDE	37	39	31	34	42	29	36	47	9	6	11	14	9	11	12	6	4	3	5	5	20
BOR MINES DE					26								44	30		32	55	14	8	12	3
BRASSERIE ARGENTINE QUILMES		10	7	4	5	3	2	8	56				30	54	23	9	12	24	23	30	14
CAOUTCHOUC DE L INDO CHINE						15	19	42									58	42	60	43	2
LEBON ET CIE				29	25	25			35												3
CHARBONNAGES DU TONKIN	20	16	25	56	57	23	12	37	40		47	55	40	43		36	35	38	23	16	9
CHARGEURS REUNIS	11	22	43				30	57													5
CIE DU BOLEO		34	20	44	37					60											3
CIE GENERALE D ELECTRICITE		52	49	49	35	75	35	28	20	19	27	16	19	33	25	26	32	58	31	25	18
CIE GENERALE DES TABACS	40	49																			2
CIE PARIS. DE DISTRIB. ELECTRICITE		49	18	15	75	26	36	22	43	14	13	11	9	19	31	7	6	11	15	10	19
CITROEN STE ANDRE									8	18	25	23	21	32							6
COMPAGNIE DE BETHUNE	47	72	44	47			57			27	35	34	33	37	42	26	38	38	35	49	13
COMPAGNIE FRANCAISE DES PETROLES																42	41	19	26	28	4
COMPT. ET MAT. D USINES A GAZ					40				47	48	59	46	29	21	30	21	15	25	39	25	12
DISTILLERIE DE L INDOCHINE						39	30	49									47	57	36	44	3
DISTILLERIE E CUSENIER FILS AINE ET CIE			38	37	33	32															3
DISTRIBUTION D ENERGIE ELECTRIQUE				38	44			33	50	15	13	20	34	19	18	39	28		24	30	8
DOLFUS MIEG ET CIE					32	27	47	32	49				26	51		53	42	45	43		5
ELECTRICITE OUEST PARISIEN										45	33	27	52	38	45	48					6
ELECTRICITE DE PARIS					46					33	29	25	27	31	43	47	59	28	29	62	10
ELECTRICITE ET GAZ DU NORD	58	52	32	27	54				27	34	32		60		41	50	42	54			5
UGINE									51					40		30	26	15	13	13	4
EN. ELECTRIQUE DU LIT. MEDITERRANEEN	45	42							22	28	19	14	20	39	30	37	29	54		42	12
ENERGIE INDUSTRIELLE									40	38	27	27	42	50	45	60				35	8
EST	47	53		47		56	57	18	30	55		52			26		46				7
HUTA BANKOWA			37	49	22	57															4
FORGES DU NORD ET DE L EST	54	33	55	46					49	19	33	44	35	38	42	34	23	21	32	30	15
HAVRAISE D ENERGIE ELECTRIQUE												39		31	24	51	37	51	46	63	7
KALI SAINTE THERESE MINES DE										26	5	7	3	6	12	10	4	5	7	10	11
KUHLMANN	10	15	38	19	27	62	14	27	17	15	17	34	17	11	13	8	9	11	14	22	20
LYON	57	29	38				41	19	18	27	31			41	10	33	51			57	8
METROPOLITAIN DE PARIS	46	45							57	45	42	27	23		24	46	53		54		2
MINES D ANZIN			19	24			42	53		23	60	43	53			45	58				2
MINES DE COURRIERES	9	40	10	14	15	23	15	13	6	5	15	21	11	18	17	28	20	50	35	45	20
MINES DE LENS	6	10	16	4	19	9	15	10	3	2	3	6	6	7	13	14	14	34	17	20	20
MINES DE MARLES		34	57		44	36		24	34	31	30	34	29	34	26	25	25		52	33	9
MINES DE VICOIGNE			16	19	74	47			21	19	28	42	33	62	40	37	48			49	13
MOKTA EL HADID	46					55								51		47	34	48	43	46	3
NICKEL																57	20	12	9	4	3
NORD	26	15	31	54	121	32	29	6	18	31	24	41	30	28	16	23	49	41	60	39	20
PARIS FRANCE			50			39	59	55		51		37									3
PARIS MAROC	53	57																			2
PATHE CINEMA		39	15		53	39	39	31													6
PENARROYA	5	7	12	11	8	5	8	13	20	41	67	44	26	34	48	36	24	27	26	18	20
PEUGEOT AUTOMOBILES ET CYCLES														50	44	33	36	59			5
GAFSA	9	10	11	9	20	18	33	22		56				46	42	45	23	30	29	26	15
POLIET ET CHAUSSON									58	41	41	40	53								5
ALAIS FROGES ET CAMARGUE	52	82	19	37	15	39	14	16	14	11	11	11	14	17	16	9	7	7	6	6	20
RAFFINERIE ET SUCRERIE SAY	15	9	6	8	18	10	15	14	21	35	36	37	17	22	10	12	19	13	20	30	20
RHONE POULENC USINES CHIMIQUES	41	40	54	40				21	7	10	16	21	15	5	10	5	5	10	3	9	15
SAINT GOBAIN	26	11	6	14	2	3	13	4	6	4	3	5	8	9	13	4	5	5	7	9	20
SANTA FE	30				58	26	32	49	39		51	58	56								6
SCHNEIDER ET CIE CREUSOT ETC					35				45			57	58	50		43	36	44	37	67	3
SENELLE MAUBEUGE	48	41					56		43	46	60										2
LYONNAISE DES EAUX			45		15	29	42	34		19	21	11	14	12	20	14	6	8	9	8	16
SUEZ	11	6	6	7	1	1	2	1	2	3	17	4	3	2	2	6	7	5	2	1	20
TERRES ROUGES																39	22	24	20	36	2
THOMSON HOUSTON	5	7	13	35	54	34	41	54	28	24	26	45	37							58	13
TRAMWAYS ELECTRIQUES DE SANGHAI					30	37	26	28	43	39	44	57	28	31	64	48	31	42	34	42	16
TRANSATLANTIQUE	13	22	56				45	10	25	33	53										8
TREFILERIES ET LAMINOIRS DU HAVRE	30	36	46	49	56			47	36	37	26	58	57			39	30	40	50	35	10
UEIF				43	21	40	44	47									53		53		5
NUMBER OF ENTERS AND EXITS	0	2	6	3	4	3	4	0	7	4	1	2	0	3	1	0	2	3	2	0	

Table IV-2

Share of each firm in total market capitalization of the Paris-30 portfolio.

YEAR	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
AFRIQUE OCCIDENTALE	3,1	2,5	1,8	1,5	1,6	1,4	1,6	1,4	1,4												
AIR LIQUIDE	0,8	0,9	0,8	1,1	1,1	1,1	1,1	1,2	1,5	2,0	4,2	2,9	2,2	2,8	2,4	2,4	3,1	3,8	4,3	5,2	4,9
BOR MINES DE																			0,7	0,7	2,2
BRASSERIE ARGENTINE QUILMES			3,6	5,9	6,4	7,2	##	10,9	8,8	5,3						3,6	5,0	7,0	10,2	7,7	12,3
CAOUTCHOUC DE L INDO CHINE								1,1	1,0												
LEBON ET CIE					1,3	1,1	1,0														
CHARBONNAGES DU TONKIN	0,8	2,4	2,8	2,0	4,3	3,6	2,9	3,7	3,4	2,0	3,1										
CHARGEURS REUNIS	2,8	2,8	1,3	1,0				1,0	0,7												
CIE DU BOLEO				1,5	1,2	1,0															
CIE GENERALE D ELECTRICITE				1,2	1,3	1,2	1,3	1,5	1,8	2,0	2,0	2,0	2,5	2,3	2,0	1,5	1,5	1,2	1,0	1,6	1,6
CIE GENERALE DES TABACS	0,3	1,4	0,8																		
CIE PARIS. DE DISTRIB. ELECTRICITE			1,7	2,7	2,6	2,5	2,0	2,3	2,6	2,2	2,9	2,7	4,2	3,6	4,0	2,1	3,6	4,2	3,1	4,4	2,9
CITROEN STE ANDRE										1,8	1,8	1,1	1,5	1,5	1,2						
COMPAGNIE DE BETHUNE	1,6	2,4	2,5	2,3	2,0								2,5	2,0	1,7	1,6	1,8	1,2	1,3	1,7	1,5
COMPAGNIE FRANCAISE DES PETROLES																		1,5	1,9	2,2	2,5
COMPT. ET MAT. D USINES A GAZ										1,4	1,7	2,1	2,5	2,6	2,8	2,5	2,7	0,9	2,0	2,3	2,1
DISTILLERIE DE L INDOCHINE							1,3	1,2	1,1												
DISTILLERIE E CUSENIER FILS AINE ET CIE					1,1	1,1	0,7														
DISTRIBUTION D ENERGIE ELECTRIQUE											3,2	3,2	4,2	4,3	4,2	3,9	2,9	1,9			
DOLFUS MIEG ET CIE						1,4	1,3	1,3	1,8	1,7											
ELECTRICITE OUEST PARISIEN												1,9	1,9	1,4	1,4	1,3	1,1				
ELECTRICITE DE PARIS													2,8	2,5	1,7	1,9	1,6	1,0	1,0	1,4	1,0
ELECTRICITE ET GAZ DU NORD	0,9	0,8	1,1	1,0	1,2	1,1															
UGINE																		1,4	1,0	2,3	3,2
EN. ELECTRIQUE DU LIT. MEDITERRANEEN	1,0	1,4	1,3	1,0						2,0	2,0	2,3	2,9	2,6	2,4	2,0	2,3	1,6	1,3		
ENERGIE INDUSTRIELLE										1,3	1,2	1,7	1,8	1,1	1,1	0,9	0,9				
EST	5,7	5,1	4,9				2,1	2,5	2,2	1,7	1,6										
HUTA BANKOWA				1,4	2,1	1,8	0,9														
FORGES DU NORD ET DE L EST	1,0	1,5	1,9	1,6	1,4						2,2	1,6	1,2	1,2	1,1	0,9	1,1	1,2	1,4	1,6	1,1
HAVRAISE D ENERGIE ELECTRIQUE															1,3	1,6	1,3	1,0	0,8	1,0	0,8
KALI SAINTE THERESE MINES DE												4,0	1,8	2,3	1,2	0,9	0,8	2,4	2,4	2,9	1,6
KUHLMANN	3,1	3,6	2,4	2,1	2,3	2,3	1,8	2,1	2,5	2,6	2,7	2,5	1,9	2,7	3,0	3,0	3,1	2,9	2,6	2,8	3,0
LYON	8,6	8,4	8,9	8,0				4,3	3,9	2,9	3,0	4,1									
METROPOLITAIN DE PARIS	1,6	1,6	1,7																		
MINES D ANZIN					3,9																
MINES DE COURRIERES	5,2	5,1	4,8	5,4	5,5	5,0	4,0	3,9	4,1	3,8	4,6	4,2	2,1	3,5	2,7	2,3	2,2	1,6	1,6	1,8	1,5
MINES DE LENS	5,2	6,2	6,0	5,9	7,1	5,9	4,1	4,3	4,3	5,3	7,2	5,9	4,3	4,3	3,3	2,7	3,0	2,2	1,9	2,3	1,8
MINES DE MARLES										2,9	3,4	3,1	2,9	2,5	2,1	2,0	2,0	1,5			
MINES DE VICOIGNE				3,2	3,3	2,8	1,8			2,0	2,6	2,2	2,1	1,8	1,5	1,5	1,6	1,1			
MOKTA EL HADID	1,9	1,7																		1,2	1,5
NICKEL																			1,9	4,0	5,2
NORD	7,8	6,8	6,5	7,3	5,5	3,8	2,8	3,9	4,0	3,0	3,3	3,7	4,3	3,2	2,7	3,1	2,3	1,3	1,4	1,7	1,3
PARIS FRANCE							0,9	0,7	1,2												
PARIS MAROC	0,3	1,8	1,1																		
PATHE CINEMA				2,1	1,4	0,4	0,3	0,4	0,5												
PENARROYA	6,0	4,7	3,7	3,3	2,9	3,9	4,2	3,7	2,6	1,9	1,6	1,7	1,3	1,6	1,2	0,8	1,1	1,4	1,4	1,3	1,7
PEUGEOT AUTOMOBILES ET CYCLES															0,7	0,8	1,0	0,9	0,7		
GAFSA	3,7	2,2	3,1	3,2	2,9	2,2	2,1	1,6	1,6						0,8	0,8	0,9	1,1	1,0	1,0	1,5
POLIET ET CHAUSSON										0,9	1,1	1,4	1,1	0,7							
ALAIS FROGES ET CAMARGUE	1,9	1,7	2,1	2,4	2,6	2,0	2,2	3,0	3,5	4,3	3,6	3,2	2,9	2,3	2,2	2,0	2,7	3,3	3,2	3,2	3,6
RAFFINERIE ET SUCRERIE SAY	1,0	1,1	1,7	3,3	3,2	1,8	2,3	2,2	1,5	2,3	1,9	2,2	3,2	3,1	3,3	3,9	3,6	2,7	2,4	2,6	2,6
RHONE POULENC USINES CHIMIQUES	0,4	0,4	0,9	0,7	1,1						3,0	2,1	2,0	2,5	3,6	2,9	4,2	3,8	3,4	5,6	5,4
SAINT GOBAIN	4,1	3,5	6,6	7,1	8,1	8,8	6,6	6,8	6,7	8,7	6,9	6,3	5,2	3,2	3,0	2,6	4,2	3,4	3,7	4,2	3,9
SANTA FE	1,3	1,4				1,4	1,7	1,5	2,1	1,6											
SCHNEIDER ET CIE CREUSOT ETC																			0,8	1,1	1,2
SENELLE MAUBEUGE	0,5	0,7	0,9																		
LYONNAISE DES EAUX						2,6	0,9	0,9	1,3	1,5	2,5	2,3	2,9	3,8	4,3	3,9	3,6	1,8	2,9	3,8	2,3
SUEZ	22,4	19,5	18,1	16,5	17,3	##	##	##	##	##	##	##	##	##	##	##	##	##	##	##	22,4
TERRES ROUGES																				1,8	2,3
THOMSON HOUSTON	3,0	5,4	4,2	3,3	2,9	2,1	1,0	1,1	1,4	1,4	1,7	1,4	1,2	1,4							
TRAMWAYS ELECTRIQUES DE SANGHAI						1,1	1,0	1,4	1,5	1,5	1,1	1,3	1,1	1,6	1,5	1,3	1,1	1,3	1,0	1,2	1,1
TRANSATLANTIQUE	2,7	1,4	1,4	0,9				0,9	1,2	0,7	0,5	0,4									
TREFILERIES ET LAMINOIRS DU HAVRE	1,4	1,7	1,4	1,0	1,4	1,1				1,4	1,4	2,0	0,7	0,8							
UEIF					1,0	1,5	1,3	1,2	1,3												
CAPITALIZATION BY MARKET																					
TERME	65	67	66	64	64	67	69	72	72	72	75	72	78	82	88	88	87	96	96	92	91
COMPTANT	35	33	34	36	36	33	31	28	28	28	25	28	22	18	12	12	13	4	4	8	9

In order to evaluate the representativeness of the Paris-30 index in the entire market, we calculated the share of the index in the total market capitalization of the Paris Bourse. In spite of the limited number of firms included in our index, it represents between 25 and 30% of the total market capitalization. As a comparison, we calculated the shares of the shares included in the SGF indices : the SGF 200 (before 1927) represents around 50% of the market, and the SGF 300 (from 1927 on) represents around 70% of the market during the all period. It appears that it requires an enormous increase in the number of firms in the index to raise significantly its representativeness.

The index

1) Comparing Paris-30 with the SGF indices : We compare the Paris-30 index with the SGF general (broad) index and the SGF narrow post-1931 index. The comparison is done for the entire interwar period and for three sub-periods separated by the two dates at which SGF indices were profoundly modified : July 1927 and February 1931. In July, 1927, the SGF index moved from 200 to 300 firms and from the average of industry indices to the average of individual indices. July 1927 is also exactly between the *de facto* and the *de jure* stabilizations of the franc in 1926 and 1928. In February 1931, The SGF narrow index was created, including half foreign firms and weighted by transaction volumes. It's publication also began almost when the stock market reached its post crash minimum. The comparison in table IV-3 includes the following statistics : yearly geometric and arithmetic averages and standard deviation of the monthly returns calculated from the indices levels, and end-to-beginning of period growth. The last columns of the table summarize the performances of the various indices by displaying ratios of the value of an investor's portfolio at the end of each period to its starting value : e.g., from 1919 to 1927, a Paris-30 portfolio had its value multiplied by 2.54, a SGF portfolio by 1.84.

In the first period (1919-1927), the standard deviation of Paris-30, 23%, is significantly higher (at 0.02%) than that of the SGF broad index (17%), and the return of the Paris-30 is also higher, which financial theory suggests to interpret as the premium for a superior risk. During the 1927-1931 period, the new broad SGF index doesn't differ significantly from the Paris-30, neither in mean or standard variation. This suggests that Paris-30 was probably a well-diversified portfolio since contemporary experience shows that after 30 shares, a portfolio's variance stops decreasing and converges toward non-diversifiable risk.

During the last period, 1931-39, the SGF-30 narrow index had a higher standard deviation than the Paris-30, for a similar number of shares. It is surprising since it was internationally more diversified (it had half foreign firms, when Paris-30 had only French firms, although some of them had important assets abroad). One may interpret this paradox as reflecting the

effects of exchange rates erroneous expectations : although the markets expected a depreciation of the franc quite early in the 1930s (Hautcoeur Sicsic 1999), it did not anticipate the size of the actual depreciation that occurred from 1936. This is consistent with the fact that the average return of the SGF-30 index (9%) was much higher than both those of the SGF broad index and the Paris-30, both near zero. Another explanation could lie in the very special method of weighting used in the SGF-30, incompatible with any actual investor's behaviour since it implies a weekly portfolio rebalancing in function of transaction volumes. Since transaction fluctuate heavily, it could have an important effect on the index.

Figure IV-1 Comparison between the SGF indices and Paris-30

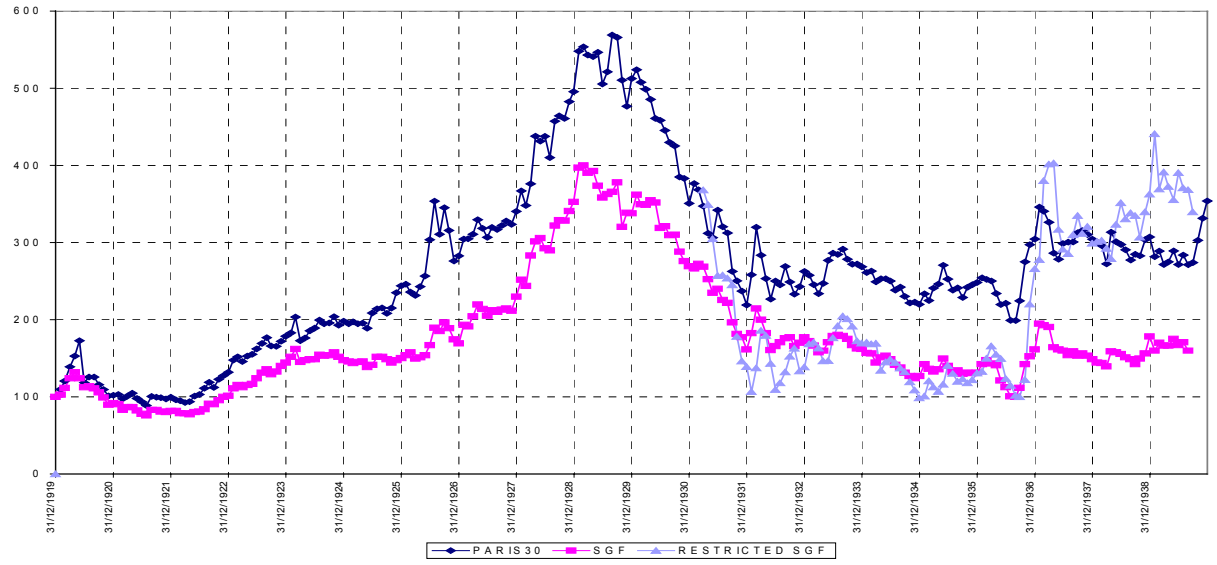


Tableau IV-3
Annual summary statistics for performance to paris30 and comparision SGF indices

	Geometric mean (%)			Arithmetic mean (%)			Standard deviation (%)			Correlation coefficient / SGF		Ending/starting wealth		
	SGF	PARIS 30	SGF 30	SGF	PARIS 30	SGF 30	SGF	PARIS 30	SGF 30	PARIS 30	SGF 30	SGF	PARIS 30	SGF 30
19-27	9,7	14,9		10,8	16,5		17	23		0,85		1,84	2,54	
27-31	7,6	6,4		9,2	8,2		20	20		0,67		1,25	1,19	
31-39	-5,8	-3,7	0,058	-3,3	-0,9	9,2	24	24	28	0,83	0,76	0,59	0,73	1,57
19-39	2,3	4,8		4,4	7,3		21	23		0,81		1,43	2,29	

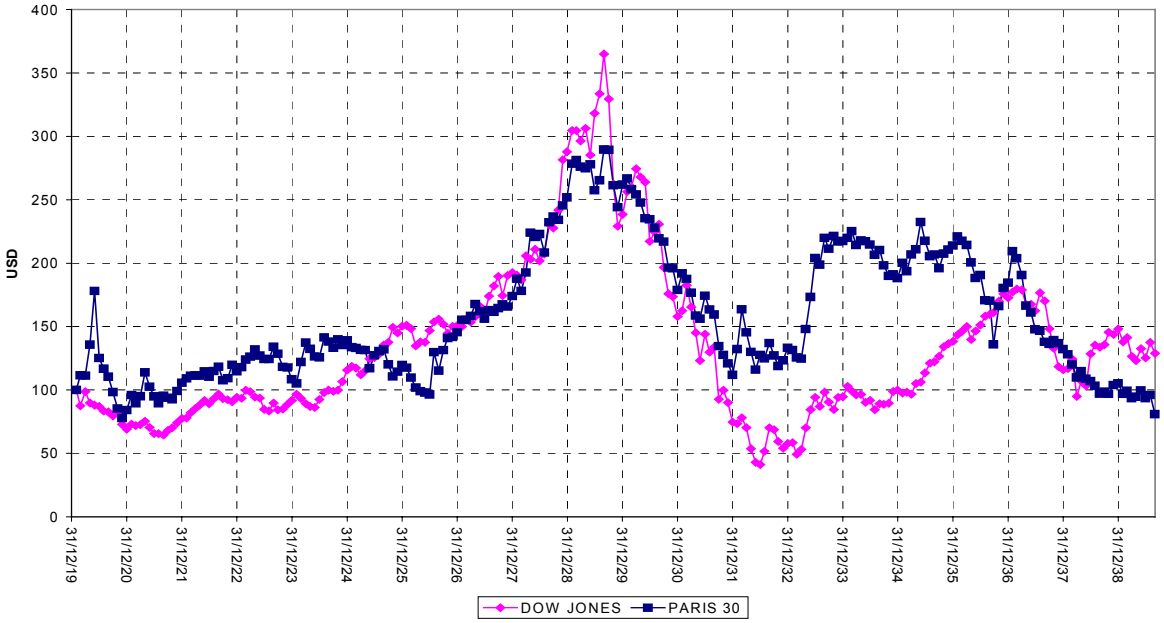
For the entire interwar period, the Paris-30 index increases significantly more. As a conclusion, the two indices presented by the SGF correspond to completely different methodologies, but also to different portfolio strategies : the broad index correspondent to such a looser strategy that no investor would have followed it; the SGF-30, on the contrary,

was a highly risky strategy which could only be followed by rich investors fearing the consequences of the franc fort policy or the *Front Populaire*.

One must also remark that, as in the US, the narrow Paris-30 index had its maximum in September 1929 when it was in February for the broad SGF index.

2) the Paris-30 and the Dow Jones : The construction method of Paris-30 makes it quite comparable to the Dow Jones. Figure IV-3 compares the two indices in dollars. Both indices are highly correlated during the 1920s, and, in spite of the differences in the French and US cycles in the interwar period, it is worth noting that there is no significant divergence between the two indices at a number of dates (table IV-2).

Figure IV-2
Comparison of the Paris-30 and the Dow-Jones during the interwar period.



From 1919 to August, 1928, both indices double in value; similarly, both decrease sharply after the 1929 bubble to a similar level around 140 (1919 = 100) in May, 1931. Then, the eye-catching Wall Street bubble and crash of 1929 can be summarized in a high volatility episode implying a short term (August 1928 to August 1929) divergence between the two indices, followed by a convergence from September 1929 to 1931. Similarly, the divergence during the great depression was followed by a convergence from 1936 until early 1938.

Table IV-2Periods when the Dow Jones and Paris-30 had similar performances

periods	Paris30	Dow Jones
December 1919 -august1928	209	227
December 1919 –may 1931	140	144
December 1919 -july 1936	154	159
December 1919 -december 1937	119	116

Both the 1921 recession and the great depression were more profound in Wall Street : the Dow Jones fell below 50 in 1932 when the Paris-30 never fell below 100. The over-reaction of the exchange rate in 1933 explains why the divergence between the Paris-30 and the Dow Jones increased then, the Paris-30 rising sharply in dollar terms. Most importantly, from 1919 to the beginning of 1938, both indices show no wealth creation, since they come back to their initial 100 level. Future research taking into account dividends will be necessary to go more deeply in the measure and comparison of these performances.

Conclusion

This preliminary study suggests that the methodology chosen in order to calculate stock market indices is important. Our new Paris-30 index is more adequate to the behaviour of investors than the broad SGF index that aimed at measuring business cycles.

Various questions require further investigation. First, the reasons for the discrepancies between the various french indices should be analysed in more detail : importance of foreign activities, differences among industries, all will be made easier by our new detailed database. Second, an investigation in the dividends is necessary in order to compare the total return for capital in France and compare it to other periods and other countries. Third, if one thinks that information is an important determinant of expectations and speculative behaviour, the reason why french *financiers* did not ask for indices more adequate to their must be better understood. This will require a study of the business press that will also allow a more detailed event study of the period.

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