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#### **Why and how to measure stock market fluctuations?**

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with special reference to the French case**

**Pierre-Cyrille Hautcoeur**

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# Why and how to measure stock market fluctuations? The early history of stock market indices, with special reference to the French case<sup>a</sup>

Pierre-Cyrille Hautcoeur<sup>\*</sup>

## 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, the evolution of the economy, and its position in international comparisons. But financial indices are still more useful for traders or investors seeking for summary, accurate, easily and rapidly available information on stock markets. History shows that a great variety of indices has been created in order to measure the performance of stock markets. This variety grew especially rapidly in the recent years. Nevertheless, little discussion of the methodology of indices is conducted today in economics or business classes and handbooks, and data series are used for purposes sometimes quite different from the ones they were constructed for, sometimes with little caution and potentially misleading conclusions. For example, 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, Rajan Zingales 2001).

After their invention by successful journalists at the end of the 19<sup>th</sup> 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 both within the late-19<sup>th</sup> century context of well developed financial markets and from today's perspective is that the scientific study of indices did not result initially from the stock market's importance in finance (for firms financing, for savers' portfolio choices or for investment banks' decisions). 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

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commission”. In France, the delay was even longer, at least as concerns any practical use of these indices.

This article describes the origins of stock-market indices in the interwar period, with an emphasis on France and the United States. It links this evolution with contemporary economic theories, index number theory, financial practices, and the other motivations of their authors. It examines the consequences of the methodological choices that were made and suggests that they had a surprisingly large impact on the results. In particular, we analyse in detail the motivations and technical characteristics of the most important indices that were produced during the interwar period by the French government statistical office (the *Statistique générale de la France* or SGF). We suggest that these indices cannot be easily compared to most usually discussed indices for other countries and that new calculations are required before international comparisons.

Section 1 presents the indices that were built by the financial press and private financial organisations for the use of financial markets’ operators. Section 2 shows how emerging macroeconomics reinvented indices in a mostly independent way. Section 3 examines in more details the construction of both types of indices and their relationship with changes in economic thought and the economic context. It shows that the risks involved in using them indifferently for any purpose was clearly understood in the interwar period, maybe more than today. The most important indices used are displayed in the appendix.

## **I. Early origins and first development : the financial press**

### US origins and primacy

The first stock-market indices were constructed and published by financial newspapers as day-to-day summaries of the stocks price fluctuations. We may imagine that providing easy to calculate, to understand and to remember, reliable and sufficiently detailed indices adequate to the investment strategies of the readers became progressively a competitive instrument among financial newspapers or financial information providers more generally. However, it took a long time. 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 pure stock-prices index since the British one included the prices of several bonds and, under

the name “Dow Jones”, it became the world’s most famous index for decades (Stillman, 1986)<sup>1</sup>.

It was only much later that other journals followed and provided new indices, either because the demand remained limited or because the press was not very responsive to that demand<sup>2</sup>. The increase was dramatic in the 1920s, a booming period both for the stock markets and the financial press. For example, the *New-York Herald Tribune* mentioned indices not only in its heavy Sunday edition, but even in its daily editions, with a table giving an index of 70 industrial stocks, one of 30 railroads and one of 30 bonds, with sub-indices by industries<sup>3</sup>. For each index, values for the previous week (max, min), the last day and one year ago were given, and, in another table, maximum, minimum and last values for each of the last five years. Some editions (Sundays and Mondays in 1929) published graphs of these data, and confronted to other economic indicators, such as production indices, price indices, stock market volumes of transactions, broker’s loans, interest rates or monetary aggregates. Such a quantity of information is quite remarkable, especially for a journal which did not specialize in financial information (it published 5 pages of stock exchange quotations, including bonds and the “curb” market, but almost no analysis).

More specialized publications, such as *The Annalist*, the weekly financial supplement to the New-York Times, were even richer, with early regular publication of indices both in tables and graphs. In 1925, it already published detailed graphs giving weekly values (min and max) for the last few years for a “25 industrials” index and a “25 railroads” other, and tables with daily values and yearly max and min since 1913 for the same indices, as well as bonds and return indices (for 40 and 10 bonds respectively). In 1929, this information had been promoted from page 19 to page 2ss, which gave a weighted index for « eight leading industrial stocks »<sup>4</sup>, graphs comparing stock indices with interest rates, stock transactions, etc. On the other hand, no index is given either for other US markets or for foreign ones, although some prices are given (mainly for other US markets).

Some firms pioneered the gathering on a large scale of financial and other statistics, mostly in the U.S. where this activity was consistent with the Chandlerian impetus toward the control of

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<sup>1</sup> The almost mythic character of the Dow Jones is revealed by the exhibits which focuses on its history in Manhattan in 2005 : [http://www.financialhistory.org/EXHIBITS/survival\\_fittest/](http://www.financialhistory.org/EXHIBITS/survival_fittest/)

<sup>2</sup> The following affirmations are based on a necessarily limited sample of journals, but one we consider representative.

<sup>3</sup> At the end of 1929, the “industrials” index had the following sub-indices: Mfg (manufacturing) : 15, Oil : 10, Utility : 8, steel : 6, C’prs (consumption products ?) : 7, Eqpmt (Equipment) : 4, M stors : 10, Food : 5. Railroads were subdivided in great networks and others; bonds in railroads (great networks), other railroads, « utilities » and « industrials ».

<sup>4</sup> The index is calculated as 36,6 + Sum of weighted prices. Weights are published and the methodology given in detail in the January 6, 1928 issue. Stocks included on July 5<sup>th</sup>, 1929 were : US Steel, GM, Am. Can, Chrysler, GE, Anaconda, Radio, Mont. Ward.

large markets and complex production processes<sup>5</sup>. The most famous example was the Babson's Statistical Organization, the producer of the Babson barometer of economic activity, which was already sufficiently renowned in 1913. The barometer incorporated an original stock market index, which played an important role since it was one of the three indices (on a total of 25) that benefited from a double weight.

A much later case is the Standard Company, which produced detailed financial information, in particular what became the Standard & Poor's index. More precisely, the Company produced, on a 1926 basis, both small and large sample indices. Like newspapers previously, it targeted finance professionals needs by providing them three daily indices (one for 50 industrials, one for 20 railroads and one for 20 utilities shares). It also published weekly industry indices and a broad 392 shares index (324 industrials, 35 utilities and 33 railroads).

### English hesitations

In England, the *Financial News* (the predecessor of the *Financial Times*) was at the same time presented in a much more traditional fashion, without any quantified data or graph. Comments on the stock exchange mentioned neither indices nor any aggregate data, even though the journal published many quotations of the London Stock Exchange and built its own index, a daily average of 30 industrial ordinary stocks (1918=100). The journal also gave a lot of attention to foreign markets (mostly New-York, Paris and Berlin, but also Vienna, Amsterdam, Milan, Montreal), publishing substantial samples of security prices (60 for Paris for example), but mentioning no index.

The situation was quite similar in specialized business weekly journals. The international reference, the old *Economist*, started quite late, publishing "by courtesy of the Standard Statistics Company, Inc, of NY" its "index figures of American securities values and yields, 1926=100", both restricted and broad samples<sup>6</sup>. Prices of important stocks and transactions amounts were also published (the second one from 1930 only). But data for the London market appear even later, from February 1<sup>st</sup>, 1930 for the "*Financial News* daily average of 30 industrial ordinary stocks (1918=100)" (with data for the previous week and maximum and minimum since the start of the year). From March, 1930 on, the "Monthly supplement" provides among other domestic statistics the "security values" (the *Banker's magazine* index

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<sup>5</sup> For a French more specific example, see Flandreau, 2003).

<sup>6</sup> It published the daily indices values over the last week, and the broad ones in tables giving only maximum and minimum yearly values on the last three years.

of 365 securities, December 1921=100), and a table comparing indices in various European countries and the United States<sup>7</sup>.

## France

In France, interest for indices appeared very little. The first two attempts by financial periodicals at producing indices quickly aborted : the weekly *Reforme Economique* published in 1901 an index of 81 stocks in 7 groups<sup>8</sup>, but discontinued it as soon as 1902 ; another index was published from November 1912 in the *Situation économique et financière* by P. Dromel<sup>9</sup>, but the publication stopped in July 1914. We found no use of these indices in other publications, which is not surprising since most financial commentators limited their articles to discussion of the variations of the price of government debt (the *rentes*) and some important stocks.

Even in the 1930s, general information daily newspapers didn't publish indices. *Le Temps*, the bourgeoisie's daily, did not even mention indices either for Paris or any other market. During the 1930s, its "financial day" section sometimes mentioned New-York indices<sup>10</sup>. The financial press was usually not much more modern : it published neither indices nor any comments based on them. Comments based on a small number of important securities (mostly bonds) contrasted with the rapid increase in the number of listed stocks<sup>11</sup>. One important exception was the *Agence économique et financière* (AGEFI), a daily newspaper published from 1911 under the direction of Y. Guyot by a financial information firm of the same name. It published regularly the Dow Jones index in the 1930s, and some other foreign indices on a less regular basis (taking them, apparently, from German newspapers). Most importantly, it created in the early 1930s its own indices (a general one and indices by industry for the two main Parisian markets, the *parquet* and the *coulisse*<sup>12</sup>). Many other economic and financial data were

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<sup>7</sup> Stocks and bonds indices of *Banker's magazine*, an official index for 49 industrials from the Netherlands, a 32 industrial stocks index from National Bank of Switzerland, an official index of 79 industrial stocks from Canada, the official Swedish index, the Standard & Poors, all in monthly values.

<sup>8</sup> Banks : 7 shares; railways : 6; coal mines : 30; other mines and metallurgy : 16; transportation : 10; insurance : 5; other: 7.

<sup>9</sup> 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.

<sup>10</sup> « These were the indices : industrials : xxx ; railroads : yyy ; other stocks : zzz » (see e.g. July, 2, 1937, p.7). Such a rapid and un-precise mention suggests some familiarity with the indices on the part of the readers.

<sup>11</sup> For example, *Le Capital, dernières nouvelles économiques et financières* (published since 1913) mentioned sometimes « the » New-York index (« the index for industrials is xxx ») in the late 1920s... but not even in a page-long editorial on the New-York market on October 19, 1929 !

<sup>12</sup> More precisely, indices were calculated for : 1. « marché officiel ; terme et créée » (with sub-indices for : « rentes françaises » ; « banques » ; « transports, canaux, navigation » ; « eaux, gaz, électricité » ; métallurgie ; charbonnages ; mines métalliques ; « pétrole, engrais, produits chimiques » ; valeurs étrangères) ; 2. « marché en banque (terme) » (with sub-indices for « sud africaines » ; « charbonnières » ; « mines métalliques » ; « caoutchoutières » ; « pétrolières » ; « industrielles et diverses ») ; 3. « indices généraux » : marché officiel ; marché en banque ; ensemble.

progressively added, some under graphic form, which made the journal the quasi-equivalent to US journals.

Most other periodicals remained sceptical. *L'économiste français*, the business reference weekly, inspired by *The Economist*, published in its financial section detailed information on monetary policy, exchange rates, and financial information, but when presenting stock-exchanges (either Paris or, more briefly, London, New-York, Canada, the Netherlands, Switzerland, Brussels) kept mentioning commented lists of quotations without any use of indices, synthetical tables or graphs, as late as 1938. More detailed comments on stock exchange fluctuations (not a frequent exercise) didn't use indices either. For example, the yearly paper published by Edouard Payen on « the quotations of the main securities » compared prices in 1913 to the most recent years (e.g. in January 1929, year-end prices for 1926, 1927 and 1928), but without calculating an index (although the main elements for building it were there, most importantly the list of stocks considered as important (in whatever sense)<sup>13</sup>.

The weekly financial supplement of *Le Temps* started during the 1930s publishing the AGEFI indices. *Le messager économique et financier*, a purely financial weekly, published a lot of qualitative and quantitative informations on listed stocks (balance sheets, coupons payments, general meetings) and some financial market general analysis, as well as many prices for Paris, foreign or provincial stock exchanges. It was interested in quantitative analysis, since it published regularly tables comparing prices during several years for all listed securities. But it never mentioned indices. The same was true for *L'économiste et le rentier*, a bi-monthly publication started before World War One which provided generous investment suggestions.

### **Why such international differences ?**

How can one explain such an hostility of most French financial observers towards an instrument which was increasingly used in other countries and that themselves used for discussing foreign events<sup>14</sup> ? This question is related to the general reluctance of the French press<sup>15</sup>, part of the academia<sup>16</sup> towards the use of statistics in order to observe and understand the economic and social reality. However, we consider that finance, as a relatively

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<sup>13</sup> For example, in the early 1929 paper, stocks selected were distributed as follows : 10 railroads, 4 foreign railroads, 16 banks, 12 transportation, 6 electricity, 5 mining and iron and steel, 4 coal mining.

<sup>14</sup> Paradoxically, a systematic look at all articles on the stock market in *Le Rentier* and *L'Economiste Français* from 1929 to 1932 shows that comments on the New-York crash, based on *The Economist*, used indices (e.g. Viallate, 1929), when no article used the SGF indices to discuss the French situation at the same moment.

<sup>15</sup> As an example, during the 1920s, *L'Economiste Français* almost never mentioned the price or production indices that were regularly published, except for a few articles, when any legal or regulatory change concerning securities or the stock market was examined in detail.

<sup>16</sup> Other parts of the academia pioneered the use of statistics: see for example Durkheim on suicide, etc.

independent field, mostly dominated by business needs and behaviours, could have had its own evolution and is worth a specific explanation.

So let's ask again the question: why didn't the French financial press use up-to-date observation techniques such as stock market indices?

It is difficult to argue that the reason should be found in the underdevelopment of the financial market. The Paris market was one of the most important of the world in the late 19<sup>th</sup> century. As the London market, it was arguably more directed toward government bonds than the New-York market (partly because the U.S. government debt was small, partly because few foreign governments issued their debts in the more onerous New-York market before the war). The Parisian stock market was smaller than the London one in 1914, but stock issues increased markedly in the 1920s, as well as the number of stocks listed and their liquidity (see Hautcoeur, 1994, 1999).

The number of stock holders may be more of an explanation: they were still few before the war, but their number increased in the U.S. with the trust movement and the invention of priority stocks (Baskin, ). It may have increased less in Europe where firms were usually smaller. In France, the State had transformed the big railways stocks (everywhere the basis of any stock portfolio) into quasi-bonds by giving a dividend guarantee, which may have increased the investor's reluctance toward risk. Nevertheless, the number of stock holders probably increased rapidly during the 1920s (Hautcoeur 1994). This development should have increased the demand for financial information and indices.

Behaviours changed: before the war, in France as in many countries, 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<sup>17</sup>. After the war, these commentators remained biased toward fixed income securities, but they started encouraging stock holding. This developed rapidly in France since stocks were supposed (and observed) to protect against inflation, which accelerated up to 1926. Reference portfolios published by financial periodicals increasingly gave an important and sometimes dominant place to stocks<sup>18</sup>. Diversification was recommended, even if no precise evaluation of what it meant was given, and it was widely practiced.

The organisation of financial systems probably played a role too. First, the techniques for stocks issues were different in the U.S., where few banks had the large networks able to sell

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<sup>17</sup> Even for rich investors, the maximum 30% proportion of shares they recommended was far away from the 80-90% that similar advisers suggest today.

<sup>18</sup> See for example, *Le messenger économique et financier*, 7/1/1920 : the « Tableau d'un ensemble de valeurs à revenu fixe et à revenu variable susceptibles de plus values et représentant une fortune totale d'environ 300.000 francs » suggests (almost in the front page) holding only 73.000 francs (24.3%) in bonds (among which only 45.000 in public bonds). On July, 10, 1929 (around the market peak), for a 170.000 francs portfolio, it suggested only 19.300 francs in bonds, less than 12% of the total.

stocks all over the country, contrarily to the French case. This may explain why French investors, if they trusted their bankers, asked for less outside, public, information, whereas U.S. (or even English) investors, being less confident in the small intermediaries selling stocks, required more independent information (Merril Lynch pioneered large scale brokering only after World war two, see Perkins, 1999).

Maybe more importantly, the rapid development of investment trusts in the U.S. during the 1920s (Carosso, 1970 ; White, 1990) was probably a good reason for the increase in the demand for financial information and especially of stock indices, since they helped evaluating the performances of fund managers. In 1929, an article in *Revue d'économie politique* (Lazard, 1929) described their development in Britain and the U.S.<sup>19</sup> and asked for the suppression of the tax regulation that almost prohibited their creation in France (since dividends paid the income tax twice).

A third explanation for the absence of indices could be the low level of transactions on the Paris stock market in comparison with the New-York market. Low transactions could result from “buy and hold” strategies, which themselves may have resulted from high transaction costs (which increased substantially during the early 1920s, either through brokerage commissions or through taxes on transactions). Such strategies would make unnecessary to follow the short term performance of the market. This argument should be substantiated, since transactions volume are still little known for the Paris market<sup>20</sup>.

A last explanation could be found in the techniques used for stock market analysis in various countries. Technical analysis (*chartisme* in France), a method which never gained academic acceptance, was developed early and widely accepted in the U.S. The “Dow theory of investment”, attributed to Charles Dow, the founder of the *Wall Street Journal* and of the Dow Jones index, explicitly used the two indices (“transportation” and “industrial”) it calculated from 1897. The theory affirmed that the future movements in the market could be predicted through the detailed examination of the past levels (and movements) of the indices. It gave way to the development of an industry of “scientific” portfolio advising which was used even by sophisticated investors. For example, when Comer (1929) presented the Standard Company stock indices, he suggested adapting the Dow theory to the major fact of the 1920s financial market: the massive development of utilities. Significantly, these techniques never reached, as far as we know, the old continent, where, by contrast, financial

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<sup>19</sup> Lazard evaluated the number of trusts in Britain to 55 in 1890 and 150 in 1929, with managed funds of 30 billion francs, and in the U.S. the number to 18 in 1924 and 200 in 1929 with managed funds of 37 billion francs. Carosso gives a number of 750 trusts in the U.S. in 1929.

<sup>20</sup> *L'Agence économique et financière* published transactions for a small number of securities from 1932.

newspapers abounded in “tips”, proposed by “well introduced” persons, and probably similar to those nowadays diffused by spamming<sup>21</sup>.

There are then a lot of reasons in financial practices to explain the lack of publication of financial indices in 1920s France. But if one thinks that information is an important determinant of expectations and speculative behavior, the reason why French *financiers* did not ask for indices more adequate to their needs will require further studies in order to be better understood. The paradox is then that French statisticians are among the pioneers of the production of the most scientific of such indices, those produced by the governmental statistical office, the Statistique Générale de la France (SGF), indices which were not directed toward financial investors and never became a standard instrument in financial periodicals<sup>22</sup>.

## **II. Academic indices : from macroeconomics back to finance**

### The other origin of stock market indices

Paradoxically, both the actual origin of stock market indices in France, and the rise of a more scientific attitude in the construction and use of such indices in countries where they were in more general use, must be traced to the emergence of macroeconomics more than to the development of financial markets and practices.

As it is well known (Desrosière), economic crises were certainly among the main reasons for the development both of government statistical offices and academic interest in price, wage and later production indices, at the end of the 19<sup>th</sup> century. For example, the 1907 crisis led in France to the creation of a parliamentary commission which strongly recommended a development of the production of economic statistics. Both in the U.S. (the Bureau of Labor statistics), in France (the Statistique générale de la France began working for the Office du travail, and produced price indices from 1911), and in other countries, official price indices were constructed in order to measure the impact of crises on the standard of living and more generally to fight economic crises. The political importance of these statistics, in contrast to previous private (newspapers) indices published for example in England by *The Economist*

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<sup>21</sup> Is the early diffusion of significant scepticism toward science an explanation of such a transatlantic divergence? The fact is well known that the U.S., rapidly growing thanks to science and technology, kept the positivist faith longer than war-affected Europe (see the evolution of Bergson, Nobel prize in 1927). Even before the war, Bachelier had introduced some uncertainty in his analysis of the behaviour of stock market prices. A comparison between the comments by A. Neymarck and R.W. Babson in the 1913 issue of *Journal de la société de statistique de Paris* clearly suggests that the “science de la Bourse” is more considered a science by the American than by the French.

<sup>22</sup> 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* or investors.

(Newmarch price index since 1864) or *The Statist* (Sauerbeck index since 1885) provided the reasons for a more systematic research on the theory of statistical indices.

Government intervention, economic theory, public sensitivity to business and price fluctuations, and the development of statistics reinforced each other (Desrosières, 1993). Theories of business cycles and economic fluctuations (among which the quantity theory of money, which revived during that period) required a detailed assessment of the chronological relationships between the fluctuations of different variables (since antecedence was frequently considered as equivalent to causality). Financial variables, which were not included in these early statistics (except for public finances), were added when the academic study of business cycles emphasized, both theoretically and empirically, the role of financial speculation among the precursors or the determinants of fluctuations.

Academic economists were mainly responsible for the development of these early macroeconomics, and official institutions developed most of the first global statistics which later led to national accounts. Nevertheless, some of the private firms that started publishing indices for stock market operators also ambited to play a larger role in economic information and even in their macro-economic interpretation. Babson's Statistical Organization was so developed as early as 1913 for the head of the SGF, Lucien March, to visit its Boston headquarters in 1913, and later to support before the Société de statistique de Paris Babson's project of an international association of statistical institutes. Babson's firm sold economic and financial information to private firms. It had 60 employees and 100 correspondents all over the United States. Babson pretended to more than selling already existing information: he aimed at understanding and predicting business cycles, the purpose of his barometer, inspired by Newton's physics<sup>23</sup>. Nevertheless, likely because of the limits of the information gathering available to a private firm, Babson's pretensions were rejected by official statistical institutions despite the support of President W. Wilson and a wide public success<sup>24</sup>.

Among the academic pioneers of the study of business cycles, some became involved in the construction of stock-market indices. 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). Magee (1913) introduced stock prices among the prices which relationships with the stock of money he examined. In France, where business cycles were studied since the early days of

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<sup>23</sup> Although the name barometer does not make reference to mechanics, it was the proper (and asserted) reference of Babson. The prediction methodology consisted in examining the position of the synthetic index (the barometer) relative to its long term average, under the assumption that « the general index forms successive ondes of constant surfaces around the basic axis » (March, 1913, p. 84).

<sup>24</sup> Although he never gained academic credentials, Babson was widely followed, or at least this is what popular Wall Street stories tell even today. See for example: <http://www.housepricecrash.co.uk/forum/lofiversion/index.php/t3966.html>.

Clément Juglar, a similar orientation was pursued by Ch. Rist (1913) or Ch. Mourre (1913), for the period starting in 1871. Rist produced new indices of stock prices, and, like Mourre, gave them an important role in the prevision of crises. An index restricted to “9 iron and steel stocks” was the first published regularly by the SGF, from April, 1914, and during 10 years. It benefited from a place in the first page of the *Bulletin* (although not from 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 many of its foreign equivalents, was reinforced (Sauvy, 1984). International institutions such as the International Labour 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 later published the famous “Harvard barometer”. Frickey (1919) in the US, Persons, Silberling and Berridge (1922) and Bowley (1922) in the UK, M. Lenoir (1919, 1920) and M. Bourbeau (1921a) in France, constructed stock indices in the same macroeconomic perspective<sup>25</sup>.

French scholars participated the international movement of business cycles measure and theory. Nevertheless, one French peculiarity was the division between *ingénieurs économistes* (educated in the “grandes écoles” responsible for the education of State engineers and more generally high level civil servants, such as Polytechnique, Ponts et Chaussées, Mines) and academic economists, which were quite hostile to the entry of statistics and mathematics in their field<sup>26</sup> (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 never resulted in scientific publications similar to the *Review of Economic Statistics*. The application of statistics to economics remained *de facto* the exclusive domain of the *ingénieurs économistes*<sup>27</sup>, who developed the government statistical offices: SGF and later INSEE. For example, the SGF’s head from 1899 to 1920, Lucien March, was a *polytechnicien* and an excellent statistician (Jovanovic & Le Gall, 2002) who participated the business cycles

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<sup>25</sup> 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).

<sup>26</sup> 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)

<sup>27</sup> See L. March (1921, 1930), F. Divisia (1926) or R. Roy (1935).

debate (March, 1913a). This gap in education and the political context led to a separation between the development of statistics and macroeconomics on one side (that of the State's *ingénieurs économistes*) and finance on the other. With the development of State intervention in the economy (from the 1936 nationalization of the railways and the Banque de France up to the large nationalization movement of 1945), finance became almost a government prerogative, the stock market almost disappeared, and if stock market indices were still calculated, it was only by tradition<sup>28</sup>.

It is then not surprising to observe that stock market indices were little used in academic journals during the 1920s, even if their use elsewhere was recognized. For example, in the 1929 issue of *Revue d'économie politique* (the leading academic journal in France then), H. Laufenburger made reference to a German index of 329 stocks which "has the same predicting role as the one recognized since long to the Harvard speculative curve" (Laufenburger, 1929, p.1121), but a similar article on Britain mentioned no stock exchange data (Pouyanne, 1929). In the yearly issue on the French economic situation, some of the articles on the main industries mentioned neither a firm's name nor a stock price (e.g. on chemicals or automobile in 1930) when others used stock prices, and compared them to sectoral stock indices (Adam, 1930). This reflected a growing role of business cycle theory, a theory in which stock market indices gained some role during that period.

#### The place of stock market indices in business cycles theory : the French case.

As suggested above, macroeconomic theory gave during the interwar period a substantial role to stock markets fluctuations, something which later disappeared for a long period. This is mostly exemplified in the French case by the evolution of articles in *Revue d'économie politique*. In the early 1920s, the only regular article dedicated to the stock exchange was one by a young scholar named Marcel Bourbeau. After writing a dissertation on the subject (Bourbeau, 1921a), he published from 1921 on stock market indices of his own<sup>29</sup>, accompanied by some mostly descriptive comments. The impact of economic and mostly political events on the stock exchange fluctuations was discussed, and most space was dedicated to analysis at the industrially or the individual stock levels. The same was true for the somewhat more economic-minded article by Jean Lescure (1923).

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<sup>28</sup> INSEE would even build, *a posteriori*, an index of nationalized firms (INSEE, 1950).

<sup>29</sup> Bourbeau' index includes 238 securities groupes in 8 bonds subgroups and 18 shares subgroups (within which 26 subsubgroups). The complete list is given as an annex to Bourbeau (1921b). In 1926 and 1927, he adds two graphs to the tables, one with the general index and the exchange rate of the pound sterling, the other with several indices (French bonds, foreign bonds, shares).

This changed when Jean Dessirier started, in 1928, publishing his analysis of the relationships between the stock market fluctuations and the economy. Although he didn't give up industrial or even individual stock analysis, most of his comments were strongly grounded in official indices of prices, industrial production, monetary aggregates, Banque de France operations, stock exchange operations, interest rates, and aimed at developing a theory of their relationships with stock market fluctuations (Dessirier, 1929a, p. 499ss). Dessirier's method was an empirical and mostly graphical one: he compared stock market indices and dividend yields ("taux de capitalisation") to each other and to indices of real activity, both for France in the 1920s (1928a, 1928b, 1929a), for France before World War 1 (1928a, 1929c) and for a sample of countries (1929b). Comparing the dates of maxima and minima, and the correlations in variations, he showed for example that stock market indices are good predictors of crises but not of recoveries, something he explained by a theory of expectations formation.

Interestingly, stock market indices were used in the debate on business cycles that took place in the 1920s in France, like in other countries, between empiricists and theoreticians. On the one hand, radical empiricists constructed "black-box" barometers aiming at anticipating crises (Babson, 1913; Brookmire, 1913; see Armatte, 1992): their construction methodology was hidden and probably debatable, and the success in prediction was the unique criterium of excellence that their authors recognized. They never gain much acceptance in France during the interwar period, because of the limited private demand for their results, but they were seriously discussed in the U.S. (for example in Harvard). On the other hand, theoreticians denied any scientific validity to such a method, and asked for the statistical measure of the rigorous concepts they used.

In France, Dessirier, although his method was quite empirical, refused both the Babson barometer ("automatic", "based on too few elements", and "with no actual economic sense", 1928, p. 154) and the Harvard one (because the three synthetical indices "represent a small number of particular elements, associated and calculated in arbitrary fashion", *ibid*). To the "rigidity" of fix weighting of different economic indices, he preferred a more eclectic method. Nevertheless, this did not impede him from calculating and presenting graphically a band within which the stock index should fluctuate, band which boundaries were given by 2.75 and 3.25% dividend yields applied to the stock index, a quite rigid method indeed. At the opposite, Ch. Mourre (1913, 1929) gave the priority to the theory, arguing that only monetary factors could have a significant impact on economic as well as stock market fluctuations, and invoking the tradition of Torrens and Spiethof.

All this suggests that debates on the use of stock market indices were very similar in France and in the U.S. or the U.K. Before rigorous econometric modelling, inductive approaches remained either simplistic or eclectic, and deductive ones remained poor.

This macroeconomic tradition of stock indices continued under the auspices of the NBER in the US, as can be seen in the work of Cole and Frickey (1928), and the synthesis by Mitchell (1938). In France, a few scholars kept searching for a theory linking macroeconomics and financial markets through new statistical methods (e.g. Guillaume (1932), at the crossing of the walrasian and SGF traditions). Nevertheless, with the Great Depression and the rise of Keynesian macroeconomics, the stock market came to be seen mostly as the locus of irrational behaviour and was marginalized in macroeconomic thinking. It came back only more than two decades later, when new theories started to give it a new role in investment behaviour (e.g. Tobin, 1969), that is, when the macroeconomic tradition came to encounter the new-born modern financial theory.

### **Financial indices**

Academic theoretical as well as empirical finance was a different, mostly independent, and surprisingly late origin of the calculation of stock market indices. Before WW1, portfolio strategy was already an almost independent set of literature, at least in the business press; but it lacked a serious theoretical and quantitative basis. The increasing importance of finance in business and in personal saving led to its development as an academic discipline. In the US, business schools strived and developed doctoral programs and academic journals in business (Wharton : 1921, Harvard : 1922, *Harvard Business Review* : 1922, *Journal of Business of the University of Chicago* : 1928). Academics and students started examining such questions as investor's behaviour (portfolio optimisation) or manager's choices (among various financial resources). This did not happen in France, where business schools were deeply separated and suspicious of the academic community (and reciprocally).

Fisher (1925) was again a pioneer in trying to evaluate the performance of various investments and studying the possibility of forecasting the stock market. Another example is Jackson (1928). But the biggest impulse was given by Alfred Cowles who created the Cowles Commission in 1931, partly in order to understand his own failure as an investor (Wilson & Jones, 1987). An important task of the Cowles Commission was the retrospective calculation for the years 1871-1925 of a stock market index consistent with the Standard & Poor 500, which had been published since 1926 (Cowles, 1939). That perspective was followed by the CRSP at Chicago, which started registering daily prices and market operations of listed US firms.

Even in the U.S., empirical studies had to wait for the achievement of the CRSP database and the development of computers, and theory went ahead in the 1950s without much empirical verification (Markovitz, CAPM) (see Berstein) In France, neither theory nor empirical studies developed much since the financial market was so much in the hands of the State.

### **III. Methodological choices in the construction of stock market indices**

The construction of statistical indices faces a number of methodological problems which were understood only progressively throughout history. Debates were important during the pre-world war one period, and were mostly closed with a book by Irving Fisher (1922). Nevertheless, as Armatte (2003) showed, these debates concerned mostly consumer price indices, something which may affect badly the construction of stock market indices. In particular, it appeared early that weighting problems were not secondary in that case, because of the enormous differences in size between firms that, combined with important differences in price fluctuations among shares, could lead to substantial errors<sup>30</sup>. We will try below to analyze the methods used by the most important of the old indices that we mentioned above. The major problem we will face when pursuing this analysis is that the precise methods were frequently not described, especially when contemporaries chose implicit solutions to problems they were not conscious of. We will nevertheless try to understand their choices and evaluate the consistency of the methodological choices that were made. Before turning to that, we summarize now the choices that one faces when constructing or continuing a stock market index. These choices include:

- The choice of the market which the index summarizes: it can be the entire financial market of a national economy or that of a specific institution (U.S. market vs New-York Stock Exchange).
- The choice of a frequency of publication (during the interwar period, it could go from daily to monthly).
- The choice of the kind of prices used: either the average of the prices during a period (day, week, month) or a particular price (e.g. the closing price of the last Friday in the month).

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<sup>30</sup> Weighting problems were discarded as secondary by Edgeworth (1896), but concerning price indices. Still, some weighted price indices were constructed (SGF, 1928)

- The choice of the securities included: stocks, bonds, specific securities such as privileged stocks, convertible bonds, multiple voting shares<sup>31</sup>. Legal changes could affect indices through these choices.
- The choice of the number of securities included, and that of the selection method (including for changing the list). Differences in liquidity between securities, which could be important, made that choice crucial; but liquidity was not always measured (or published).
- The choice of sub-groups among which the securities should be distributed (among industry, legal considerations such as nationality, market of listing, kind of security, etc).
- The choice of the weighting method (either constant or variable) and the weighting variables (capitalization, liquidity, float).
- The method for allowing for capital operations affecting firms (mergers, acquisitions, dividend payments, share splits, etc.).
- The way the entry or exit of securities are taken into account in the index, whether they are provisory (missing values were very frequent during our period, especially for small firms), or definitive.
- The consistency problem between indices built backward (retrospectively) and forward (without any information on the future).

All these choices depend on the purpose of the index and on the practices that dominate the financial (and/or the statistical) industry. They also depend on the data available (for example, prices on unofficial markets may be difficult to find with a reasonable accuracy), and of the cost and time they require (a substantial problem before computers). One may argue that all these choices, especially the weighting ones, are very important, especially because the diversity of behaviours is especially important among stocks (in comparison with consumer prices).

### **Early indices**

As we presented above, the initial development of indices was done by newspapers as day-to-day summaries of the market's evolution. The readers' satisfaction was key, and the best way to convince them was to present the indices as simple portfolios similar to theirs, including only the most famous and undisputable stocks, all listed on the same important stock-

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<sup>31</sup> For example, in France, « parts de fondateurs » were a category of shares with no voting right and the right to a fixed share of profits after the payment of a « normal interest » (usually 5% of face value) to normal shares. Other specific securities also existed.

exchange. Until reputation was established, the possibility for the dubious reader to replicate the index was important, so the list of included stocks was published and the calculation method kept simple<sup>32</sup>. Another important reason was the daily publication of the journals, a few hours after the close of the stock exchange, which required simple calculations.

Early indices like the Dow Jones are good examples of this: the Dow was calculated as the simple arithmetic sum of the prices of a group of stocks listed on the NYSE, without any effort to weight or correct them in order to take into account either their market capitalization, their liquidity or anything else. The list included famous stocks, but their choice was not discussed. The list changed very little, except for the early separation of the “industrials” and “railroads” indices. Babson’s index was also based on a limited sample of stocks, all of them railroads with the exception of one, the Pullman Company<sup>33</sup>! The only early index that included a greater number of securities was that of the *Banker’s magazine*, a weekly publication, which as we mentioned included both stocks and bonds.

Difficulties probably emerged rapidly in the calculation of these indices, but they were not really presented by the newspapers, which purpose was not to educate or impose calculation sophistications to their readers. In the medium term, dividends were to count as much as price variations, splits and any other capital operation could give the choice to capitalists between various options, which affected the value of their portfolios, which should also be rebalanced more or less regularly. All these “details” appeared in the comments of the financial journals, but without affecting much the indices they published. This was not much of a problem as long as investors were mostly interested in the main fluctuations of the indices (as was the case for those using the “Dow theory”), not in comparing their portfolio return with an independent reference or target. Another challenge was the increase in the number of industrial stocks listed on stock-exchanges, which made indices limited to “blue chips” appear restricted.

Actually, new methods were to enter the financial press through two “detours”: one through the development of macroeconomic indices and academic debates on indices, the other via the emergence of mechanical and electronic calculators after the 1930s, a necessity if the calculation of indices was to be frequent and rapid enough in order to be used by financial operators and the daily press.

## **Macroeconomic indices outside France**

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<sup>32</sup> The fact that their reputation was already established could explain why some newspapers chose not to publish their method, like AGEFL.

<sup>33</sup> The precise list can be found in Mourre (1913, p.204)

The methodological limitations of the early indices led sophisticated statisticians and academic economists wanting to test business cycles theories to reconstruct indices for long term periods, which led to much methodological progress.

The macroeconomic perspective led to important choices in the construction of stock market indices. First, the sample was not chosen in order to represent a typical investor's behaviour, but to include firms of all important industries in order to be representative of the economy. This led some of them to include more stocks, sometimes listed on various stock-exchanges, and to calculate sub-indices for various groups (by industry, by firm size, by type of security). Furthermore, the purpose was not to include the diversity of behaviours represented among listed securities (in what would be an essential tool in a portfolio diversification strategy), but to reflect the common variations of the market, in order to link them to those of the economy. The sampling methods adopted by the U.S. scholars show this perfectly. 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. Other authors sometimes did not change that structure. They included all shares for which prices were regularly available, without concern for their actual importance on the market<sup>34</sup>, they included little (if any) correction for capital operations and didn't weight prices either by market value or transactions.

### **French indices:**

Like in other countries, methodologies improved with time in the construction of French indices. Actually, this is what one must guess, since early indices' methodologies were usually not published<sup>35</sup>. As late as 1921, Bourbeau (1921a) could publish in a doctorate dissertation an index without explaining how it was constructed<sup>36</sup>. It was nevertheless a private and limited attempt, and cannot be compared with the dominant indices produced by the SGF.

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<sup>34</sup> Some indices included very few shares. For example, Fisher's index, published in *Review of Economic Statistics* (1921, 1926) included only 20 shares. It was nevertheless well considered by some commentators (Dessirier, 1929a, p1466).

<sup>35</sup> This was the case for example for the indices by Rist (1913) or the first SGF pre-war index.

<sup>36</sup> His index was a broad one, including several industry groups. Actually, the methodology was not even mentioned by Bourbeau, and we had to reconstruct it by using his data: each industry index as well as the global one were the arithmetic means of included individual securities' indices, without any correction for capital operations or any weighting.

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

The index was calculated and published starting in 1919 on contemporaneous data. It was a broad composite index, including 186 stocks in 1919, 194 in 1926, 288 in 1927 and 300 from 1929 to the war. It covered mostly the official Parisian stock-exchange (the *Parquet*), with occasional prices taken from the unofficial *Coulisse* or from provincial stock-exchanges<sup>37</sup>. Most but not all the shares were ordinary ones, which made the index quite homogeneous<sup>38</sup>. The index was a monthly one from 1919 to 1929 (end of month prices<sup>39</sup>) and weekly from 1930. All these characteristics confirm that the index was undertaken in the macroeconomic vision that we described.

Nevertheless, the index aimed at more than measuring business cycles. When defining the index for each share's price, Lenoir (1919) explicitly mentioned adjustment for new issues. SGF (1927) explained 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<sup>40</sup>. This could be consistent either with a portfolio management perspective, or - more reasonably given the size of the index - with a macroeconomic cost of capital perspective.

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, each one including from 1 to 26 different shares (median : 5). The general index was the arithmetic mean of the groups' indices.<sup>41</sup> Little reasons were given for the group's construction. Lenoir (1919) actually suggests an economic and not a financial perspective on the construction of these groups, since he discusses the differences in the chronologies of fluctuations among industries in terms of their market power and fixed-price contracts in the face of global price level

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<sup>37</sup> The market was not mentioned in Lenoir (1919), but SGF (1927) mentioned one share listed in Lyon, one in Lille, nine in the *Coulisse* (including 2 foreign firms). SGF (1932b) mentioned six listed in the *Coulisse* and none outside Paris.

<sup>38</sup> SGF (1927) mentioned 14 *actions de jouissance* (among which 5 from the great railroads) and 2 priority shares (respectively 7 and 1 in 1932 : see SGF, 1932b).

<sup>39</sup> Prices were taken from the daily *Cours Quotidiens* published by the official *Compagnie des agents de change*.

<sup>40</sup> Nevertheless, it is not clear whether calculations between 1919 and 1927 took into account all these operations or only new issues.

<sup>41</sup> Little reasons were given for the group's construction. Lenoir (1919) actually suggests an economic and 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.

fluctuations. Most comments in *Revue d'économie politique* (see above) also used the group indices as proxies for the competitiveness or health of the industries covered.

Some transformations in the methodology of the index are also consistent with an economic interpretation, actually one much in line with the particular features of the interwar period's economy. First, the index was modified in order to represent more the French national economy: 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<sup>42</sup>. Ironically, the stabilization of the franc occurred within a few months after that change, making it almost useless. 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-founded 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<sup>43</sup>. The number of shares was 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 created a strong discontinuity in the index. First, around 100 firms were substituted for others and 100 new firms entered the index, without the reasons nor the impact being discussed. Second, the general index changed from the average of group indices (which were still being calculated<sup>44</sup>) to the average of individual stocks indices, which suggests a 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 interwar's general trend toward a de-globalisation of the international economy and with the increasing relative importance for the

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<sup>42</sup> Unfortunately, the index was not recalculated retrospectively, so that there exist no index of "French firms" before that date.

<sup>43</sup> From then on, re-weighting giving again an equal share to all firms occurred regularly, at least during the following years: August 1928, July 1929, September 1930 and January 1932 are known (SGF, 1932b).

<sup>44</sup> 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).

French economy and the French savers of the colonial Empire.<sup>45</sup> That situation was maintained during the following decades (INSEE, 1950, p.156s).

### **Financial indices**

The birth of modern finance led to a demand for better calculated indices. The best private answer came from the Standard Company, which indices obtained more audience than those calculated by academic economists. Comer's 1929 paper actually provides a convincing demonstration of the qualitative transformation from earlier indices to those of that Company. Not only did the Company publish many diverse indices, but it claimed it worried about the details and the methodological preoccupation of academic indices<sup>46</sup>. All indices were weighted by capitalization, which made them much better references for portfolio managers, and solved most of the technical problems with capital operations and changes in the list of shares included (Comer, 1929, p.11). The quality and representativeness of the small sample indices were also tested by comparing them regularly with the broad one. Another test was provided by comparing industry indices<sup>47</sup> to their value without the biggest firm in the sample, in order to distinguish what was really the result of economic, general, evolutions, from the specifics of one particular firm<sup>48</sup>. (Comer, 1929). Lastly, the Standard Company published dividend indices (for the 50 shares of the small sample only), which allowed the calculation of dividend yields and returns, something new among privately published indices<sup>49</sup>.

We mentioned that AGEFI started a few years later publishing similar indices in France. Unfortunately we were unable to find the methodology it used for its calculations, which at least suggests that the efforts to make it open were probably lower<sup>50</sup>. Paradoxically, it was the SGF that tried to provide indices adequate to the need of the financial community. Maybe under the influence of Dessirier (who started publishing a periodical, *Conjoncture économique et financière*, dedicated to a larger public), the SGF twice started to construct

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<sup>45</sup> 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.

<sup>46</sup> « We are not among those who have been seeking a mechanical barometer that will « forecast » stock prices, but over a period of several years our efforts have been directed to the devising of a set of adequate measures of historical price movements » (p. 9)

<sup>47</sup> Industry indices were justified not so much by economic arguments than by portfolio management ones : the « group theory » suggested that the behaviours of shares in the same industry should have much in common, so that holding one was sufficient for diversification purposes (Comer, 1929).

<sup>48</sup> In the case of the automobile industry, the exclusion of General Motors, which had performed exceptionally well in the late 1920s and had a very dominant position, changed entirely the industry index.

<sup>49</sup> The preoccupation with dividends and total return was already present among academics and statistical agencies. In the U.S. case, one example was Jackson (1928) who proposed a precise methodology for calculating the returns on various categories of stocks. He calculated yearly returns, taking into account dividends and other distributions, splits, issues and other capital operations.

<sup>50</sup> Maybe significantly, the index was during the first year of its publication included in pages of the newspaper that have not been conserved by the French Bibliothèque nationale.

small sample indices on a more frequent basis and following a methodology that took more under consideration the actual functioning of the capital market. These narrow indices were based on the idea that the volumes traded and the volatility of the stock market were worth observing in contrast with the general index's motivations. The first one appeared in 1926, when the SGF published a retrospective index for ten stocks<sup>51</sup> 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 was given on the construction of the index, and its publication was not continued.

New narrow indices were published by the SGF from October, 1932 for around 25 shares<sup>52</sup> and 10 bonds which transactions volumes it obtained from the *Chambre syndicale des agents de change* (BSGF, July 1932, p.565).<sup>53</sup> 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).

Nevertheless, these indices don't appear to have been used by actual financial operators. We may very well consider they measured financial market activity ("speculation") as macroeconomists want it. Actually, the misunderstanding toward the very concept of portfolio management appears for example in the judgement by Dessirier toward Fisher return calculations: since they were based on a changing list of « blue chips », he considered that they could not provide a continuous time series (Dessirier, 1929a, p. 1467). Not surprisingly, SGF was not the place for responding to the statistical needs of business.

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<sup>51</sup> 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.

<sup>52</sup> 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.

<sup>53</sup> 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 général" of the BSGF from July, 1933 to January, 1934.

## The improvement in indices as seen by contemporaries

Proving the superior quality of the indices one produces was as important yesterday as today, i.e. it was very important at least for private producers. What was more important than technical improvement, however, was the fact that it was driven by new questions and theories.

Comer (1929) dedicated his long article mostly to demonstrate the superior quality of the Standard Cy indices. Beside all technical details we already mentioned, a particularly funny and paradoxical argument in favour of these indices was the fact that they gave similar results to previous, established, indices (the Dow Jones and the New-York Times indices, in that case)<sup>54</sup>. The fact behind this is that the more sophisticated techniques in finance for which the Standard Company's data and indices would be useful had not yet been invented.

Another example is the critique proposed by Dessirier, when he discussed his fellow Lenoir long term series for the SGF index. Although we didn't mention it in particular, much of the energy dedicated by academics to the construction of stock indices had been used to reconstruct long term retrospective indices. This was clearly in line with the business cycles measurement objective of these economists. In France, the first attempt at reconstructing a retrospective index was Lenoir (1919, 1920). A yearly<sup>55</sup> index, it covered the 1856-1918 period and included 54 stocks as soon as 1876, using the same methodology as the SGF main index. The problem with Lenoir's index (like with most retrospective indices) is that it suffered survivor bias, being reconstructed starting from 1919 listed firms. Another, related, problem concerned the weighting of firms. Dessirier (1928a) discussed in detail that problem, measuring the impact in the long run of different years being chosen as the basis for equal firm's weights. He showed that depending of these choices, the growth rate of the index between 1870 and 1913 could vary from less than 50% to more than 500% (and even on the shorter 1900-1913 period from 20 to 50%). In the long run, regular re-weighting of portfolio was then shown to be a requisite.

This long term tendency preoccupation suggests that there may have been a more profound reason for Dessirier to work again on Lenoir's data: macroeconomists were then not only interested in observing business cycles and establishing their chronologies (something which was not much affected by tendency errors). They started being interested in long run growth rates, of which long run return on capital and long run growth of the capital stock could be

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<sup>54</sup> Furthermore, and just logically, discrepancies also appeared, which another commentator could have used in order to demonstrate the Standard's indices superiority !

<sup>55</sup> 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.

important indicators. Once again, the change in theoretical questions was, maybe unconsciously, driving the search for better methods and the criticism of older ones.

Then, the discrepancies between the indices produced during that period may reflect in part technical defects and insufficient availability of calculation power. But most interestingly, it also reflects the changing intellectual orientations of successive generations of financiers and academics. Understanding these discrepancies will not only be a source for specific financial studies, but should be grounded in the history of financial and economic theory.

## Conclusion

We showed in this article that the development of stock market indices followed a complicated path: it started with financial newspapers producing simple summaries of the market daily evolution; it then switched to macroeconomists interested in measuring and understanding long term business cycles or, later, the growth of the capital stock and the return on that stock; it finally went back to finance, when a more sophisticated demand developed there. Technical improvements in the construction of indices cannot be considered outside that intellectual evolution, which led to the synthesis of modern finance-grounded macroeconomics. Outside simple “improvements”, differences in purpose and theoretical background gave rise to very different indices, both in level and volatility, so that those indices that were constructed and used in the past must be placed in the proper historical and intellectual context before being used today in different perspectives.

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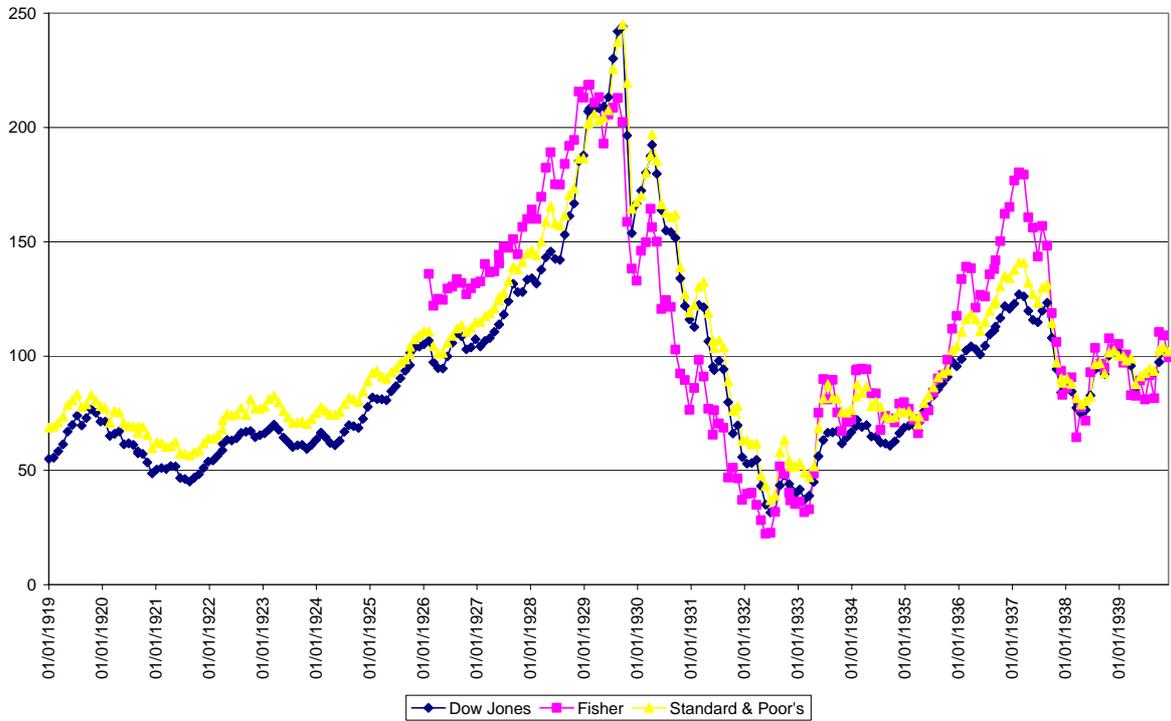
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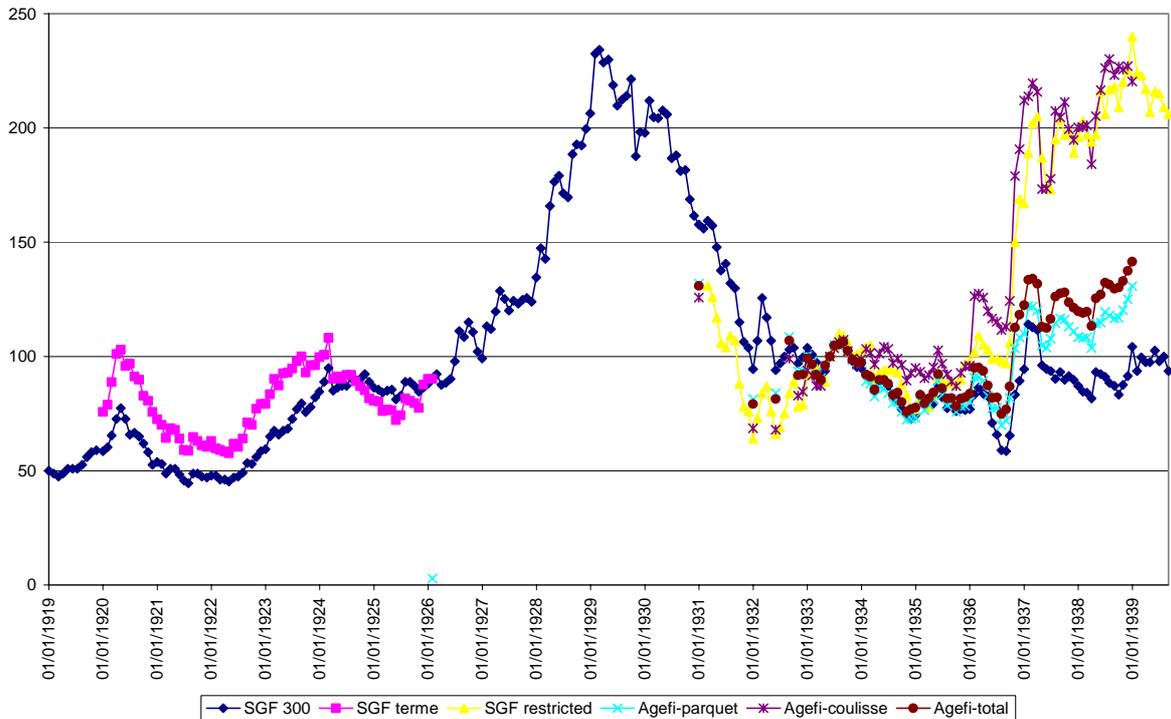
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## Appendix

Various US stock market indices (1939:12 = 100)



Various French stock market indices



SGF indices : same basis for general index (SGF 300) and forward market index (SGF terme) in January 1926. All other indices 1933:5=100.