

**CAVAET EMPTOR:
COPING WITH SOVEREIGN RISK
WITHOUT THE MULTILATERALS**

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ABSTRACT

Cavaet Emptor.

Coping With Sovereign Risk Without the Multilaterals*

This paper studies how private banks dealt with sovereign risk before World War I. At that time there was no multilateral institution to bail out borrowers in default and sovereign rating had not yet developed. All the burden of information collection and processing was borne out by individual banks. We focus on the experience of Crédit Lyonnais, which grew over the period into the largest international bank in a country that was the second largest world creditor. In 1871, Crédit Lyonnais set up a Service d'Etudes Financières (SEF), a research department whose aim was to study borrowing countries. The lending spree of the late 1880s, and the bust which ensued, provided the impetus for a massive expansion of SEF, which then developed techniques to analyse sovereign risks. We argue that these methods are an essential aspect of the market mechanism as it operated before World War I: given the prominence of Crédit Lyonnais on the international scene, its perceptions influenced the size and direction of capital flows.

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NON-TECHNICAL SUMMARY

With the Asian crisis, the perils of international finance have again received a graphic illustration. Interestingly, while the debate about the role of the IMF in the crisis is far from settled, and the policy implications far from obvious, a number of private bodies (most notably, investment banks) are taking actions to minimize their exposure to currency risk. Several investment banks have developed models seeking to predict currency crashes: *Credit Suisse First Boston* has an 'Emerging Markets Risk Indicator', *J P Morgan* an 'Event Risk Indicator', and *Lehman Brothers* a 'Currency Jump Probability Measure'. This private research agenda has connections with another, separate research agenda, carried out by academic economists working in relation to the IMF, and who seek as well to identify 'early warning' indicators. While the scientific challenges that both private and public researchers encounter are similar, the implications for each group are quite different. While official researchers seek to provide either regulators or multilateral bodies with signals that would serve to prevent crises from exploding then spreading, private banks seek to determine when to get out of a given currency, either to avoid big losses or to make big bucks. Yet from the point of view of policy recommendations, these two research programmes have important interdependencies. Indeed, the possible emergence of a standard of risk perception in the private sector will have actual implications for the interventions of multilaterals. The point is nothing else than the old 'beauty contest' argument. If all market participants believe, for example, that a low level of reserves is a signal for an impending crisis, they will step out, thus provoking the crisis. In turn, the multilaterals are bound to factor in the effects of market opinions, whatever they think of the actual severity of the situation.

This article seeks to assess the significance of the development of privately produced 'indicators' and 'opinions' for the functioning of the international monetary system. In order to study the impact of private research on what we call investors' 'willingness to lend' we focus on an experience of globalization where the market mechanism operated without the intervention of multilateral bodies. Specifically, we investigate the experience of the international gold standard during the nineteenth century. We focus on the experience of *Crédit Lyonnais* one of the largest international banks of the time, in a country that was the second largest global creditor, only surpassed by the United Kingdom. We look at the *Lyonnais* sovereign risk analysis department, which got involved in producing a debt crisis indicator. During the period under study, this department, called SEF, grew into a large research centre with numerous and ample means. We provide a detailed study of how SEF

indicators were constructed and speculate on the contribution of these assessments to the operation of the market mechanism.

Several lessons can be drawn. First and foremost, this episode sheds light on how late nineteenth century investors reacted to the absence of official data, formal ratings, and international bailouts. Both the enlargement of SEF and the design of a systematic framework of financial analysis were prompted by the collapses of international banks most notably, of *Baring*. Very much like today, the process accelerated during the severe international financial crisis of the early 1890s, when *Lyonnais* realized that it needed to determine which, among the various sovereigns of the gold standard periphery, deserved support. The decision to internalize a number of methods for monitoring sovereign risk is thus evidence of the key contribution of the market mechanism to pre-World War I 'globalization'.

A second lesson is the considerable importance of investors' perceptions in shaping the market mechanism itself. While a large amount of literature has studied the determinants of debtors' willingness to pay, we found that cognitive aspects of the assessment of public finances played a crucial role for, what we call, investors' willingness to lend'. In particular, we demonstrate that the favour in which investment finance (as opposed to consumption finance) was held proved decisive in comparing sovereign risks. This belief was pushed to its logical conclusion in SEF's measure of debt sustainability that discounted from interest service the net dividends from government 'assets' and was responsible for an event risk indicator which, most characteristically, featured Russia as a 'blue chip' country. Because most loans to the Russian government were used for industrial investments and because these investments provided revenue, Russia's 'indebtedness' remained moderate in the eyes of *Crédit Lyonnais* economists. This finding is obviously important in view of the well known attraction which Russia had on French capital: clearly, market designed screening devices loom large in determining who gets money and who does not.

Our last conclusion has to do with the economics of financial information. Our discussion of nineteenth-century experience suggests that privately collected information is not without faults. Indeed, SEF was not a research department picked at random in a large population of competitors. It was not an individual voice in a broad market of opinions. Rather, SEF was the research unit of one bank that took a prominent position in French and international finance. While *Lyonnais*' willingness to retain its credibility certainly encouraged it to do its homework, it is likely that this also led other banks to pay much less attention. The absence of other serious domestic competing opinion and the secretive attitude which *Lyonnais* took towards SEF output, probably induced other

banks to get on board of *Lyonnais'* led syndicates without due caution. But finance is a game where one makes money because one's view becomes the market view, not because one is right: the externalities of being a market leader cannot be ignored.

We believe these conclusions may help to shed some light on current developments and suggest a few policy implications. First, the aggressive move which investment banks have taken towards emerging market risk research seems to provide evidence that, contrary to a popular opinion, bailouts are not systematically expected by the market: otherwise, why should they pay so much attention? In a sense, *Crédit Suisse First Boston*, *Lehman Brothers* and *J P Morgan* are just doing what *Lyonnais* did a century ago – and for the same reasons. Second, we find evidence of the enormous influence of past collapses for the design of current indicators. The *Lyonnais* method was a formidable tool to track 'Argentinean-like' rises (of the kind that had brought the 1890 Baring collapse) but was totally powerless in cautioning against Russian default: this problem is still a serious challenge for today's data miners, whose predictors are based on past data. Third, the *Lyonnais* tale should warn multilateral bodies against the dangers of relying on market sentiment when designing their policies. Because opinion is a public good as much as anything else, private endeavors to define a standard of risk are liable to manipulations and should thus be taken with a pinch of salt. For academic economists, this means that the 'predicting financial collapses' econometric agenda should perhaps come to an end.

Caveat emptor: to those who forget the maxim, each new financial crisis brings an opportunity to relearn their lesson. The turmoil that has recently swept South East Asian countries is no exception: once again, it has produced classic tales about late investors buying out of ignorance. According to some economists, rating agencies should take their share of the blame: they failed to provide appropriate signals to the market through early downgrades, and then followed the market mood as it spiraled down (Larrain et al. [1997]). For their defense, rating agencies emphasize that their grades are not (and have never been) meant to establish any kind of standard on which one could base investment decisions: the availability of formal ratings should not discourage investors to devote time and effort to get their own opinion. Why look out for someone to blame? It is after all in the nature of risk to bring its crop of regrets.

At a deeper level, these recurrent complaints may be seen as illustrating the complexities of the economics of economic intelligence: the supply and demand of information are nested into an institutional setting from which they cannot be separated. This setting in turn provides incentives which contribute to more or less risk taking on behalf of agents. For instance, the expectation of an eventual bail out by some public body (national or multilateral) reduces investors' incentives to collect data and process it in original ways: less attention is paid to discussing economic developments in borrowing countries, less analyses are supplied, and of lesser quality.

Hence the organization of economic intelligence should be a research topic in its own right. Yet problems of identification pave the way. While a theoretical case can be made that the expectation of a rescue amplifies the magnitude of risk taking, it is an altogether different and more difficult matter to prove it empirically. History on the other hand provides a way to ask that question in reverse : one only needs to look for occurrences when the market mechanism is « bail out free ». One such episode is the years before the first World War. True, some authors have tried to argue that a measure of central bank co-operation existed between 1890 and 1914, and that this could work, on occasions, as a partial substitute for international lender of last resort facilities (Eichengreen [1992]). But such schemes (which in any case were not outright bailouts) were very occasional, often failed and depended on a set of complex factors on which it was dangerous to

bank (Flandreau [1997]). The concern about moral hazard was a close companion of late nineteenth century *laissez-faire*. The boldest proposal for an international mechanism to prevent crises from spreading (Luzzatti [1908]) was met with the belief that irresponsible behavior — not contagion — was the real danger.

Of course it could still be that, even if they did not anticipate to be bailed out by domestic monetary authorities, 19th century investors expected their government to help them « bail in » foreign debtors. Lending countries used in cases military expedients which mitigated the meaning of « sovereignty ». The inclusion in sovereign debt contracts of collateral clauses provided a legal justification for military intervention. International control, as in Turkey and Greece, could ensue (Herbault [1901]). But muscle flexing is not without costs and requires to be effective, a fair amount of lender coordination. Coordination was far from natural in the explosive political climate of the pre-W.W.I years, when global providers of capital were also global rivals.¹ Defaults did take place, and military intervention, when it occurred, did not result in complete recovery of lost funds. Banks had thus to watch their steps : in France, an early *Crédit agricole* went under in 1876 as a result of the Ottoman default. In England, Baring had to pay a high price for its way out of Argentinean losses.

This makes the pre-1914 experience of globalization 'without the multilaterals' fascinating. A large number of classic studies have demonstrated that capital did move across boundaries, either through the agency of financial markets (Jenks [1927], Imlah [1958], Cameron [1961], Levy-Leboyer [1964] Wilkins [1989]), or increasingly, through foreign direct investment or other arrangements such as 'free standing companies' (see Wilkins, this volume). These studies have paid much attention to the geographical distribution of international investment, to its contribution to economic growth, or to the trends and cycles of international finance. Yet the question of determining *how* investment priorities, were set remains obscure. In what is perhaps the only study that has explicitly tackled the issue, Herbert Feis [1937] maintained that 'politics' had been the overarching factor in allocating (or misallocating) capital. To date, no fully fledged alternative has

¹. On strategic debtor-creditor interactions see Aggarwal [1996]. On international politics see Lipson [1989].

been provided. We know very little about the nineteenth century devices to screen potential borrowers, balance risks, and 'rate' sovereigns. This may explain the resilience of the popular myth of 19th century investors lured by politicians.² Didn't sovereign rating only begin after the Ist W.W when US capital arrived in the Old World?³ To many, this is *prima facie* evidence of the lack of economic literacy among pre-W.W.I European bankers.

This paper challenges this view. It argues that the type of analyses that are at the heart of formal rating had in fact developed in Europe at least a quarter of a century before the first World War. We take a look at one French bank: France was in the late nineteenth and early twentieth centuries, the second largest international investor. It specialized in lending to the « risky » countries of the European Continent, such as the Mediterranean, or Russia, where public debts were large and sovereign default a potentially huge problem. We focus on the *Crédit lyonnais*. The choice, which in view of some recent developments may sound ironic, is not fortuitous: the *Lyonnais*, a private commercial bank created in 1863, grew patiently and prudently from being a financial underdog to becoming at the turn of the century the largest European institution (Bouvier [1963]). At that point it established itself as a prominent actor in foreign lending, even displacing to some extent from this market traditional players of the Rothschild kind.

This paper's first lesson is that in the absence of international agencies, private risk analysis played an essential rôle in bringing about out financial integration before the Ist W.W. We show that the lack of official provision of international statistics and rating led the *Lyonnais* to integrate the collection and analysis of data: its financial studies unit, the *Service d'Etudes Financières* (SEF) constructed series that permitted direct comparisons between the macro-economic health of various borrowers. The second lesson is that the lack of multilateral agencies, while it does provide incentives for private investment in information gathering, does not necessarily lead to an efficient provision thereof. The externalities in the supply of information can lead to monopolization. In the instance, we show how the *Lyonnais*, sought to become a kind of mood-setter in the Paris market.

² . Ignorance and herding behavior plays an important rôle in the boom and bust approaches to international lending of (Kindleberger [1985]).

³ . The first edition of Moody's *Government and Municipals Manual* appeared in 1919.

The remainder of the paper is organized as follows. The first section is mostly descriptive. We start at the most micro-economic level and survey the background in which SEF emerged and developed. The second section focuses on the *Lyonnais*' methods to assess public finances and sovereign risk. We show that these methods led to a straightforward way to rate countries in risk categories. The conclusion, finally, discusses lessons from the 19th century experience.

Section I. The Service des Etudes Financières, 1871-1914.

1) The founding of the Service des Etudes Financières: speculations

The *Service d'Etudes Financières* was set up in 1871 upon request from Henri Germain director and creator of *Crédit lyonnais*. Its proclaimed objective was to provide facts and figures that would assist investment decisions. Over time, the SEF grew into a large research unit with a reputation.⁴ d'Eichtal [1905], in the short hagiographic obituary he wrote on Germain, makes a special reference to SEF. Its creation, he explained, resulted from the great man's « passion for political economy ». We suggest to relate instead the founding of SEF to the general background of the market for economic information around 1870.⁵

The 1850s and 1860s were years of an « information revolution ». This revolution had its technical side, with the installation of the cable between London and the Continent (1852) and later between Europe and America (1866). The cable brought national financial markets closer together, shortened drastically transmission lags from market to market, and reduced cross border uncertainties. This revolution had of course an important economic side: the technical possibilities for channeling funds from market to market improved at the very same time when both the supply and demand of funds were growing more competitive. The period after 1840 displayed a massive expansion of the key financial markets as global centers. The capitalization of both London and Paris accelerated, and cumulated securitized foreign lending amounted to a large share of both

⁴ . It was towards *SEF* that the Bank of France turned when it was asked by the US National Monetary Commission to provide data on the French Monetary System. And it would be towards SEF that French officials would turn when they sought to assess the German reparations after WWI.

⁵ . Bouvier (1963), p. 289 ff. provides a somewhat different narrative of the evolution of SEF between 1871 and 1873 but concurs with our view of the « information revolution ».

England and France's GDP.⁶ Other industrialized countries, such as Belgium or Switzerland also contributed to the process, exporting their own capital through the pipes of the leading financial centers (Lévy-Leboyer [1964]). The networking of railways across the Continent and the need to finance new nations in both their military and industrial enterprises also multiplied the number of possible outlets.

For lenders, this called for increased screening capacities. More information was required on more projects. With the growth of the number of markets, geopolitical coverage had to expand. The move that had began in England with the creation of *The Economist* in 1844 extended to the Continent. *La Semaine financière*, the most comprehensive and well informed French language weekly began in the 1850s in Brussels. The quality of its information was enhanced by a freedom of tone provided by its ability to escape from French political censorship. Progressively the success of *The Economist* led to a multiplication of continental offspring: in 1873, at about the same time when the SEF was launched, Paul Leroy-Beaulieu created *L'Economiste français*. Other clones followed.

The multiplication of sources of economic data also created a need for reference. Financial handbooks listing quoted bonds and collecting official information in a systematic way came much in vogue. From 1863 for instance, *The Economist* started issuing the *Investor's Monthly Manual*.⁷ In France, Alphonse Courtois published the first edition of his *Manuel des fonds publics et des sociétés par actions* in 1856. The volume described systematically all public and private bonds listed in Paris. The book was a hit, and would be re-published several times. It would later have an official competitor, the *Annuaire officiel des agents de change* issued by the association of Parisian brokers.

Such volumes, however, were mere compilations of official pamphlets which borrowing institutions circulated when new loans were floated. The need to provide background information relating to the general macro-economic, institutional, and political, outlook thus remained.

⁶ . For instance, cumulated foreign issues in Paris amounted to about 8 billions in 1865 while French Net National product was of about 18 billions.

⁷ . See also King [1937], p. 266.

Macmillan seized the opportunity in the 1860s, when it started issuing *The Statesman's Yearbook*. Another slightly later attempt at improving the statistical background was that of the *Société Internationale de Statistique*, an international network of statisticians created in the 1880s, which held conferences every four years. The meetings, which drew both official and independent statisticians, sought to define statistical « best practices ». Proceedings were published. In some cases, the *Société Internationale* also lobbied to obtain some changes in the way official returns were either collected or presented (Levan-Lemesle [1995]). However, political resistances were turning the odds against the feasibility of such 'multilateral' endeavors, suggesting that more solitary investigations were better equipped to succeed. This may explain the large supply of individual statistical compilations, impressive by modern standards yet often redundant, and among which Mulhall's (Mulhall [1896], [1909]) stand out prominently.

On the other hand the expansion in the competition for foreign credit implied that borrowers had growing incentives to become more transparent. Bilateral relations were increasingly replaced by broader multilateral underwriting syndicates which then turned to a large crowd of customers. This meant that borrowing governments could shop around for lower prices. But this also meant that they had to find some way to communicate with the rich public of the lending countries. The practice thus developed among borrowing governments to publish, on an annual basis, detailed financial accounts. While in Western Europe, transparency of public accounts had been a companion of the rise of parliamentarism (the lenders to national governments were the domestic *bourgeoisie*) financial accountability developed in other countries with international lending. Fiscal returns were often bilingual : Russian accounts were published in Russian and French, Hungarian ones also used French, while Japanese returns (after 1900) used both English and French. Thus every year from the 1860s and 1870s onwards, a huge crop of government documents flooded the market place.

This information 'overflow' was both a challenge and an opportunity: if exploited intelligently, information could give an edge to newcomers. For years, international finance had been the private hunting ground of the traditional investment bankers. The *Haute banque*, with its high profile

customers and correspondents, collected money and information almost in the same move. By its extensive political and economic networks, the *Haute banque* had a first hand knowledge of the risks involved, and through its political clout even a degree of command on the risks themselves (Polanyi [1944], Gille [1967]). The limited extent of democracy in several borrowing countries also implied that less levels of government were involved. Personal contacts had a premium: over 'macro-economic' analysis. This sort of intelligence clearly outsmarted any attempt at putting together figures which in most cases just did not exist. But the expanding supply of statistical returns meant that the time of bankers who kept your account in the back of their mind was passing over. It is thus no wonder that the SEF was created in the midst of the early 1870s boom in foreign lending. As a newcomer on the financial scene, the *Lyonnais* did not have as strong political connections as the establishment. Being an outsider, it was excluded from the safest bets, and had to take calculated risks.

2) *The first years of the service 1871-1889*

The link between the expansion of financial press and the creation of SEF is a direct one : while Desseilligny (a board member) was responsible for general supervision, Courtois (the author of the famous *Manuel des fonds publics et des sociétés par actions* to which we referred earlier) was appointed head of the service. An archetypal self-taught financial journalist, Courtois had according to some sources worked for the *Lyonnais* since the 1860s.⁸ He was well acquainted with financial techniques and had authored a famous *Traité des opérations de bourse*. He had also been a pioneer in data collection : his *Tableaux des cours des principales valeurs*, (Courtois [1877]) provided time series for bonds and stocks on the Paris bourse since 1797. An opponent to government intervention, and a member since 1851 of the *Société Economique Politique*, the French *laissez-faire* lobby, he had argued forcefully in his books that governments should not tamper with the

⁸ . See *Dictionnaire de biographie française*, vol. IX, p. 1036. Vapereau [1893], p. 386, concurs albeit in loser terms. We could not check the accuracy of this information. Documents from the *Crédit lyonnais* written at the time of the creation of the SEF refer to Courtois as a « *publiciste* », suggesting that he was really a journalist at the time.

stock market. In short, the *Lyonnais* had appointed a specialist of the French Bourse, well acquainted with the *tout Paris* of economics.

The correspondence surrounding the creation of the SEF suggests that the whole process took place under much pressure from the top management. Abundant space and resources were devoted to the project. Two kinds of information were sought. First Germain wanted SEF to provide « insider » information that would fuel profitable trading. Second, he wanted it to perform « modern » economic analysis, which derives value from the intelligent use of publicly available information. This multiplicity of purposes was reflected in duality of names : the « *service des études financières* » as the unit was known was alternatively referred to as « *bureau des renseignements* » (« information office » : a reflection of the first role), or « *bureau des études* » (« research bureau » : a reflection of the second one). This caused much confusion for both Courtois and later historians.⁹ While both roles initially coexisted, the latter one would gradually dominate.

The search for insider information involved spying on other banks and governments : the service hired foreign 'agents' (in French, '*correspondants*') working in competing finance houses. One of the first agents in Vienna was an employee at Rothschild's. Agents were paid for their tips, and in cases valuable information was given in return. To maximize the flow of information and avoid the risk of being framed by its own *correspondants*, the *Lyonnais* arranged redundancies: two agents were hired in a single market, without their knowing.¹⁰ Of course, insider information was not limited to foreign markets : some SEF employees in Paris (« *employés sédentaires* » or *resident employees*) were hired because they were thought to be «well acquainted», or for their abilities « at

⁹ . This tension is the origin of the alleged formal distinction which Bouvier thought to have identified between « *renseignements* » and « *études* » (Bouvier [1963]). Bouvier's claim is swept away by a letter from Courtois who lost patience « we are called *Etudes financières* ! » (letter oct 13, 1871, Historiques DEEF) (October 13, 1871). Clearly, the '*bureau des renseignements*' was a sub-section of '*Service des Etudes Financières*' not a separate unit. This interpretation is fostered by the eventual use of the expression '*bureaux*' as a substitute for SEF '*sections*' (DEEF 62694).

¹⁰ . Key financial centers included New York, Rio, Buenos Ayres, Berlin, Frankfurt, Vienna, Saint Petersburg, Constantinople, Florence, Madrid, Lisbonne, Brussels, Alexandria. The *Lyonnais* had a branch in London.

finding [their] ways in ministries »¹¹. To conduct its economic studies, the SEF had to collect statistics. For this, it was equipped right away with a reference library which started purchasing books, newspapers, periodicals, and official reports of economic. The library was meant to be comprehensive. This was to some extent similar to what the *Library and Record Department* of the *Council of the Corporation of Foreign Bond Holders* was doing at about the same time, although the library of the *Lyonnais* (which was substantially larger than CFB's) was meant for private use only.¹²

The output of SEF was of two kind. First, the service had to produce a daily « bulletin ». The bulletin contained financial information of general interest made out of clippings from the international press. The daily bulletin's circulation was restricted to top management use: only heads of both the Paris and Lyons offices and of the main branches received it. Second, and more importantly, the service had to produce specific reports made upon request from the executive office. Reports could cover a wide variety of topics ranging from the prospects of PLM railways, to Austrian finances.

Courtois had been asked to find the appropriate people. His correspondence is an echo of the obstacles he encountered. In 1871, political economy (not to mention applied macro-economics) was not much taught in France (Levan-Lemesle [1995]).¹³ Courtois thought to hire people from the *Bourse* (stock exchange) or the financial press. Results were disappointing.¹⁴ Germain suggested recruiting from the offices of the ministry of finance, where one could find « hard working, intelligent, and moreover low paid, young men ».¹⁵ Germain must have referred to services such as the *Bureau de statistique et de législation comparée*, which statistician Alfred de Foville headed since 1867.¹⁶ But potential employees did not turn out to be as bright as Germain had hoped.¹⁷

¹¹ . Letter of November 3, 1871.

¹² . See the *CFB*, Annual Report of 1899.

¹³ . The only business school in Paris, the *Ecole Supérieure de Commerce de Paris* was described by one of its former graduates as being at the time « school were there were indeed a few lectures on trade, but whose main occupation was to teach French to young men from Latin America, who came to study these things which one learns so well in Paris » (Levan-Lemesle [1995], vol. II, chapter 10).

¹⁴ . 62AH 20 Letter from Mazerat to Letourneur.

¹⁵ . Letter of October 4, 1871.

¹⁶ . Levan-Lemesle [1995].

Courtois then sought to recruit economists through recommendations from members of the *Société d'Economie Politique* of which he was a member. He used social events such as the dinner of the *Société* to carry on his investigation, paid personal visits to some economists : again, with limited success.¹⁸ He then turned to second best solutions. Reasonably appropriate applicants, whose background would show their adaptability, could be tried. One of the first employees was a graduate from *Saint Cyr* (the French Military Academy) who had left the army and had become a merchant, then a broker, in various towns. This ensured that he was both numerate and flexible: the rest would have to be learned on site.

Looking through the *Lyonnais* files, one gets the feeling that the search was also impaired by the bank's own position. At that time, the *Lyonnais* was still a relatively recent institution and a career there implied a measure of risk taking. As a matter of fact one civil servant from top government engineer schools which the *Lyonnais* was lucky to hire turned out to be a second order type of which the administration was happy to part.¹⁹ The difficulty to actually *attract* people is also evident from Germain's suggestion to recruit females.²⁰ It is probable that Germain had realized that top male graduates would not consider work at the SEF as sufficiently attractive. Yet even this did not succeed.

To what extent did these obstacles hamper the initial development of SEF? From its projected 12 employees in 1871 the staff rose to about 20 in 1881. This was quite large by the standards of the time, but in a sense fell rather short of the original ambitions. Moreover, the size of the staff did not increase much during the first 20 years. While it kept accumulating books, statistics and studies, the SEF did not meet the grand scheme which had been initially envisioned. In effect it would take the development in the teaching of economics in France, the rise of *Lyonnais* as a major bank, and the international banking crisis which climaxed in 1890 for SEF to meet its initial goals.

¹⁷ . One potential candidate who was approached turned out to be a typical « *rond-de-cuir* » (lazy bureaucrat) : he asked whether he could work at home.

¹⁸ . Showing up at Cernuschi's mansion, he was answered that the famous bimetalist was touring silver standard Asia.

¹⁹ . Information provided by Cécile Omnes.

2) *The rise of SEF: 1889-1914*

During the board meeting of November 5, 1889, Germain announced that he wanted to increase the size of SEF. « Time has come », he said, « to give to the operations of the SEF maximum scope and efficiency ».²⁰ René Brice, a member of the council of administration was asked to head the service. He had no special skills in political economy: his appointment really reflected the increased control which Germain took at that point over SEF, and from that date on, the service expanded.

One factor explaining this evolution was the removal of bottlenecks on the supply of human capital. The *Lyonnais'* initial dissatisfaction with the general background of graduates had been a widely shared feeling in French commercial circles. The defeat of 1871 and the ensuing concern about economic decline provided the impetus for the creation of a number of institutions devoted to the teaching of business and economics (Levan-Lemesle [1995]). At the *Ecole Libre des Sciences Politiques* (which was set up in 1871) Leroy-Beaulieu opened in 1872 a course in public finances. Although Leroy-Beaulieu quitted teaching in 1880, the number of courses in 'macro-economics' (political economy, money, finance) kept increasing. In 1883 these course were organized within a formal curriculum in economics and finance — the '*section économique et financière*'. In 1891 students of this program could major in either private or public finances. Those two majors became separate curricula in 1909-1910. Lecturers at *Ecole Libre* (or '*Sciences-Po*' as it was already known at the time) were recruited among the top brass of statistics and economics (Levan-Lemesle [1995]).²²

The Paris business school on the other band (known as *Hautes Etudes Commerciales* or HEC) was created in 1881. Garnier (1881-1883), then Courcelle-Seneuil (1883-1888), both leaders of the French Political Economy lobby, taught there. According to Levan-Lemesle ([1995], p. 472),

²⁰ . Germain encouraged Courtois to hire Félicité Guillaumin. Félicité, 25 at the time, was the elder of two daughters of the famous publisher of Political Economy.

²¹ . Minute of the Conseil d'administration, 5 novembre 1889.

²² . They included Levasseur, Juglar, Foville, Aupetit (a student of Walras), and Cheysson (a founder of modern econometrics). Levan-Lemesle, [1995].

when Octave Noël took over the course in 1888 he gave it a practical twist which was most welcome. Octave Noël was a prolific writer who had published extensively on railways, money, central banking, etc. His lectures were intended to make the case for *laissez-faire* on the basis of practical examples. For instance, in a 1888 book, Noël explored the economic and institutional record of a number of European central banks in an attempt to show the advantages of central bank independence from government intervention — a view which would later become the conventional wisdom under the *Belle Epoque* (see Flandreau et al. [1998]). This approach reflected Noël's special concern about the relevance of his teaching for his 400 annual students.

Taken together, graduates from HEC and Sciences-Po's '*section économique et financière*' represented a total of about a half thousand students with a degree in economics. Moreover, the rising prestige of *Crédit lyonnais* (it was by now no longer a 8 years old outsider as in 1871, but an over 25 years old bank which often led major syndicates and had successfully resisted the 1881 stock market crash in Paris) had implications on its ability to attract first class graduates from all schools. On top of economists from HEC or Sciences-Po, the *Lyonnais* hired engineers from *Ponts et Chaussées*, *Mines*, *Arts et Métiers*, *Polytechnique*. This was especially important given that investment opportunities generally included a technical aspect for which 'pure' economists were inadequate.

While the availability of graduates with the appropriate background was probably a necessary condition for the growth of SEF, it nevertheless did not prompt the November 1889 decision to expand. Rather, Germain's decision must be related to the rising risks in international banking which developed as a result of the lending spree of the late 1880s (Kindleberger [1985]). The escalating tensions precipitated the collapse of *Comptoir d'escompte* in 1889 and that of Baring in 1890. The *Banque de Paris et des Pays-Bas* recorded heavy losses in Argentinean railways in 1890-1891 and in general many banks suffered. Contagion ensued and the bonds of weaker governments depreciated. The exchange rates of a number of South American or Mediterranean countries declined. Several suspensions of interest payments followed. In this context, and given the *Lyonnais*' compulsive concern about liquidity and mismatches (an attitude in which was

Gernain's trademark) the decision to expand SEF seems quite understandable. The *Lyonnais* had probably realized that those who would survive would be the most careful students of international finance.

Recruiting thus resumed after 1890. The move, first gradual (there were still 20 employees in 1893) quickly accelerated: 80 persons worked in the service at the turn of the century. Budgets followed: before 1889 the annual budget of the service had oscillated between 100,000 and 200,000 francs.²³ Returns for the period 1890-1905 show a take off : SEF expenses trebled over the 1890s.²⁴ Drastic increases brought budgets near 800,000 francs per year after 1900. Indeed budgets were mostly driven by trends in the work force (Figure 1): general office expenses, despite the 1890 introduction of the typewriter as well as of a number of computing machines and massive purchases of books for the library amounted to little in comparison to employees earnings.²⁵

The increase in the number of SEF employees also outpaced the growth of labor inputs for the bank at large. The gross wage of SEF represented about 1.5% of the total wage burden in 1894.²⁶ This proportion almost doubled, rising to 2.5% in 1900. Similarly, the number of SEF employees rose during the same period from 0.5% of the overall *Lyonnais* work force to about 0.8%. The average wage in SEF (which came to about 6300 francs per year) was roughly three times higher than the average at *Lyonnais* (about 2100 francs per year). This reflected the greater share of highly skilled employees in the service. The share of graduates lied somewhere between 40 to 60%, while at the same time these represented only 10% of the *Lyonnais* at large.²⁷ After 1905 however, the growth of the service stalled. Budgets and probably staff stopped expanding. Yet with about 100

²³ . Bouvier [1961], pp. 294.

²⁴ . Archives du *Crédit lyonnais*, DEEF, "Bd des Italiens".

²⁵ . Non wage costs were limited to journal or periodical subscriptions, purchase of books, paper, pencils, and travel expenses for missions. A breakdown of these expenses is found in *Archives du Crédit lyonnais*, DEEF, sans cote, *Bd des Italiens*.

²⁶ . Author's computation on the basis of SEF archives and Omnes [1997].

²⁷ . For the *Lyonnais* at large, the estimate is provided by Omnes [1997]. For SEF the estimation is made as follows: Kaufman [1914] claims that there were before the war about 50 white collars (economists, lawyers, accountants) working in the service. Given the figures we have for the overall SEF workforce, this implies that there were about as many clerks without university degrees.

employees (Kaufman [1914]) and an annual budget between 500,000 and 600,000 francs the SEF stood on the eve of the war unparalleled by contemporary or even modern standards.²⁸

The growth of SEF also led to a rationalization of its organization. During the 1890s work was gradually divided up among a number of research groups called 'sections'. Each section was headed by a *chef de section* who worked under the authority of the *Directeur du Service des Etudes* (head of SEF). Twelve formal sections emerged. Among 'administrative sections', we find the « *section du bulletin* » which collected clippings from the press, edited the daily house magazine of which 30 copies were made and circulated to managers. The « *section des notes* » wrote briefs to answer the queries of individual customers' or official bodies (ministries, etc.). The total number of replies per year rose from 5710 in 1893 to 11297 in 1896, 17110 in 1899 and 20057 in 1902, with a growing fraction for public administrations.²⁹ The *section des notes* could rely on the help of the « *section des archives* », which kept and stored records as well as of the « *section du répertoire* » which maintained a huge data base of facts and figures on companies, banks, etc.³⁰ Secretarial aid was provided by the « *section de copie* » which typed memos, drew charts, etc.

There were on the other hand five research sections. These sections had the largest staff and worked under full separation from the rest of the bank. They were never directly involved in investment decisions, and their reports could not be communicated to other departments without management approval.³¹ One section dealt with industries and mines (« *section des mines et de l'industrie* »), one with railways and navigation (« *section des transports* »), one with banks (« *section des banques* »), and one with public finances « *section des fonds d'états* ».³² In addition, the « *section de statistique* » had to collect 'macro-economic' data (agricultural and industrial

²⁸ . For budgets, Kaufmann [1914] quotes even higher figures (between 600,000 and 800,000) but it is not clear to what period he refers. The slowdown in the growth of SEF was both absolute and relative. By 1913, the SEF had returned to about 1.5% of total wages and 0.5% of the Lyonnais total workforce.

²⁹ . 3554 in 1901, 6875 in 1902. Archives du Crédit lyonnais, DEEF, sans cote, « Bld des Italiens ». In a later document of July 10, 1916, the section des notes is called « section de renseignement », (DEEF 62694).

³⁰ . We are told (Archives du Crédit Lyonnais DEEF 62694) that in 1904 the *Répertoire* contained 117000 referenced items. 243 volumes listed information on governments, municipals, and 51000 joint stock companies. The *répertoire* has been lost.

³¹ . Archives du Crédit Lyonnais, DEEF 62694. This is reminiscent of the 'Chinese wall' that exists between commercial and research departments in modern banks.

product, money, population, etc.). Over time, the *section de statistique* also developed an expertise on fiscal issues, which gave birth after W.W.I to separate « *section de législation fiscale* ». Finally two sections provided technical support. The « *section des cotes* » recorded exchange rates and stock prices. The « *section des calculs financiers* » on the other hand used or constructed logarithmic tables to make actuarial computations.³³

SEF operations were not limited to the Paris facilities. The creation of agencies or branches in leading financial centers provided the *Lyonnais* with a ready infrastructure to collect or double check information. The former policy of paying for tips was progressively abandoned, or at least did not feature as prominently as in the past. Offices were opened within the *Lyonnais'* foreign branches. In 1905, there were permanent representatives in London, Berlin, Saint-Petersburg, New York, Johannesburg. These outposts were run by civil engineers from SEF who conducted audits of local companies.³⁴ In Saint-Petersburg for instance there was a « *bureau de l'ingénieur chargé des études industrielles et financières* » (office of the engineer in charge of industrial and financial studies).³⁵ In general, foreign facilities also served to the intercourse between SEF and local officials, bankers or entrepreneurs. A quite fascinating letter of 1898 from the Lisbon branch for instance recalls the visit of a Portuguese official who was offered a position in the ministry of finances and wanted to look at the *Lyonnais* figures on Portugal before accepting the position.³⁶ Finally, there were also extensive expeditions which were sent abroad to prospect markets. These included Australia, Mexico, South America, China, the Danubian States etc. Most of these missions took place between 1897 and 1905 and feature prominently in SEF expenses (Fig. 2)

3) *The public debts unit.*

We do have quite detailed records on the personnel from *section des fonds d'états*, which formalized as a specific unit in the late 1890s.³⁷ From 1896, the number of *chargés d'études*

³² . See also Kaufman [1914], who finds only 8 sections.

³³ . DEEF 62694.

³⁴ . DEEF 62694.

³⁵ . Historique DEEF.

³⁶ . Archives du Crédit lyonnais, 'Visite de M. Figueira'.

³⁷ . 'Fonds d'états, composition de la section', « Historique DEEF », Archives du *Crédit lyonnais*.

monitoring sovereign debts increased steadily. A first surge took place between 1899 and 1906, when the section reached 9 *chargés d'études*. This puts the section at 20% of SEF (including clerks and auxiliaires). A second surge occurred after 1905. Between 1908 and 1912, there were 12 to 16 *chargés d'études* in the section, or a total of about 30 employees, one third of SEF. This evolution ran counter the general trend of SEF in the ten years preceding the war, which was one of relative stagnation: the pre-War growth of the *section* thus took place at the expenses of other sections.³⁸ This suggests a tremendous activity in *Fonds d'Etats*.³⁹ The movement stalled in 1912, (Figure 3).⁴⁰ The interruption of French foreign lending with the outbreak of the First World War was a final blow to the section which was nonetheless revived after the war with the resumption of international capital flows.

All *chargés d'études* from *Fonds d'Etats* came from either HEC, or *Sciences-Po*. The right candidates had strong skills in accounting, high performances at school, and a command of foreign languages. *Fonds d'Etats* produced a kind of elite. One Dujardin, a *major* (prize winner) from HEC became later head of the Paris offices. Another Escarra became head of SEF and later CEO of *Crédit lyonnais*. Most departures from *fonds d'états* on which we have information were really promotions. Those who left the *Lyonnais* received attractive offers to head or create small research departments in other financial institutions. One Hennequin, a graduate from HEC who had worked for *fonds d'états* between 1900 and 1911 became chief economist at the *Banque française de commerce et d'industrie*. One Laroche became *chef des études* at the *Banque de la Seine*. One Droz moved to *Union parisienne*. Over time, SEF had been able to overcome the initial human capital shortages to the extent that it could now export employees it had trained.

³⁸ . Mostly from the *section de statistique*, the *section des banques*, and the *section du bulletin*.

³⁹ . The number of governments (local and central) covered rose from 182 in 1905 to 206 in 1907. At that date, there were 2519 tables, 436 notes, 30 maps, 2182 budgetary returns and 817 memos on individual loans. DEEF 62694.

⁴⁰ . This reduction took place to the benefit of the rest of SEF. There were 8 departures to other sections between 1910 and 1914 against 4 arrivals from other sections. See DEEF, « *Fonds d'états, composition de la section* ».

4) *The glory and the power: SEF propaganda during the Belle Epoque.*

The *Belle Epoque* was the heyday of SEF. With its impressive library of more than 30.000 volumes, its 45.000 files on countries, industries, railways and banks, its catalogue of firm specific data, and its hundred of employees, it clearly surpassed anything that existed at the same time either in France or abroad. Kaufman [1914] argued that in France only the *Comptoir national d'escompte* had a somewhat analogous service. But this service, created only a few years before the first World War, was of much more limited scope. As for Europe, Kaufman believed, no other bank, British, German, or other, could stand the comparison.⁴¹

Having heavily and steadily invested in SEF, the *Lyonnais* was fully aware of its superiority.⁴² This unique position had many advantages which could be exploited in ways. One possibility would have been to sell its 'ratings' to the market place. In effect however, the bank never abandoned a strict policy of secrecy: it never disclosed more than limited parts of its reports. It is striking that, although contemporary economists were aware of the existence of the service, they apparently never got access to the figures it collected, nor to the precise way SEF combined them.⁴³

There were two mutually reinforcing advantages for this policy. The first had to do with the notes which SEF wrote for customers. Without disclosing complete returns, the *Lyonnais* could provide depositors with topical memos on specific issues. This was a way to attract more depositors and increase market share. Second, the expertise of SEF could become a resource to

⁴¹ . Kaufman [1914], p. 353. According to my colleague Richard Roberts the *Lyonnais* example was also unparalleled in the UK before the war. Knut Borchardt told me during the Princeton Conference that he could not think of a German equivalent.

⁴² . The scathing description of the Bank of France research department made by an employee from SEF in the 1890s is one example. The *Lyonnais* ridiculed the meagre resources, three employees staff, and six squared meters of the *bureau des études économiques*. Des Essarts, the chief economist was reportedly « completely left to himself, working at random, without any method, any guide, any compass » He had been hired as a reward for the « numerous services » he had rendered to the Bank of France not for his skills. His rôle was merely to produce, « once or twice per year, the situation of the reserve of Banks of Issue ». Archives du Crédit Lyonnais *Historique DEEF*.

⁴³ . *Historique DEEF*. With the departure of a number of SEF economists to other banks around 1910, it is probable that the *Lyonnais* methods became widely known. But by the time this took place, the huge volume of past studies was the bank's best protection. There were probably cases where specific individuals were shown original returns. One such instance was the conversion of Luzzatti to favorable views towards Russian finances, a conversion

foster the bank's influence as a market mood setter. The *Lyonnais* thus took great care to make sure that the general public realized that it had access to valuable information. Prestigious foreign guests were thus invariably brought to SEF when they visited the *Lyonnais*. In the early 1900s, an explicit campaign was even ? by the bank's management.

One high of this campaign was the April 1904 visit which the *Lyonnais* organized for the international press. The occasion was to show the bank's new facilities on *Boulevard des Italiens*. A crowd of journalists gathered at SEF, and during the following days, long articles appeared in the French, English, Spanish, German, Italian, and American press.⁴⁴ From the striking similarities between the various articles, it is obvious that the *Lyonnais* had provided journalists with a document upon which they could canvass, perhaps monetary incentives as well. The articles praised SEF in forceful words. For instance, A. Johnson, from *The New York Herald*, wrote: « From a financial point of view [the *Etudes Financières*] is a 'veritable practical university'. I have never heard of a similar organization either in France or abroad. Figures taken from official documents, accounts of sovereign states and reports of limited liability companies are tabulated methodically by *employés* chosen in the majority of cases from prize winners at the *Polytechnic*, the *Ecole Centrale*, the *Ecole des Mines*, and the *Ecole des Hautes Etudes Commerciales*. The most rigid impartiality presides at the making up of these tabulated records, without the *employés*, who do not know about the conclusion of the affairs studied by the bank, having other care than the finding out of the truth. The *clientèle* of the *Crédit lyonnais* is greatly benefitted by this department, which acts as its secretary, and which, upon a request to that effect, addressed to the branch office with which the client transacts business, will go through all the documents published upon any commercial, industrial or other affair ».⁴⁵

Virtually identical accounts with carbon copy wording (including the reference to the "practical university" which also features in Germain's obituary (d'Eichtal [1905]) were found in other

which reportedly occurred after an extensive stay at SEF (see *L'Economista d'Italia*, 1908, n.d. clipping found in DEEF 73316/1).

⁴⁴ . *Une journée au Crédit lyonnais*. Paris, 1904.

⁴⁵ . *The New York Herald*, European Edition, Paris, Saturday April 23, 1904.

newspapers.⁴⁶ They reflected the attempt at presenting the *Lyonnais* as a standard of informational reliability. The claim was everywhere the same: the *Lyonnais* had paid a high price to have a huge database which you could not bank against. So you were better advised to bank with the *Lyonnais*. As one French journalist wrote: "We got the message: the *Lyonnais* is well informed" (*Crédit lyonnais* [1904]).

Section II. Sovereign "rating" at the *Lyonnais*

1) *Fiscal concerns, statistical doubts, and the making of a framework of analysis*

While the need to attract foreign capital had created pressures on borrowers to release financial information, efforts at increasing formal resemblance between national returns remained nonetheless inconclusive: the definition of 'revenue' and 'expenditure', the units in which outstanding debts were denominated, or even the comprehensiveness of public accounts varied significantly among countries. This was not always disingenuous, but in some cases, concerns about the implications of deficits on borrowing costs led governments to creative accounting: as one Portuguese official confessed to the *Crédit lyonnais* in 1898, the annual abstract of Portuguese finances was « filled with intended errors ».⁴⁷

One reason for this was the lack of national (let alone international) consensus on the appropriate framework. This problem was widely recognized at the time, because fierce battles were fought over figures in almost every country.⁴⁸ Such disputes were not clearcut bouts that pitted fudging governments against benevolent opponents. Rather, information was retained, released, corrupted, and criticized according to the interests of the various groups involved. The press (domestic and

⁴⁶ . Whole parts of the *Herald* article can be found in *The Daily Telegraph* of May 2, under a different name.

⁴⁷ . Archives du *Crédit lyonnais*, "Visite de M. Figueira", AH ...

⁴⁸ . See the various issues of the *Statesman's Yearbook* or of the *Bulletin de la Société Internationale de Statistique*. In fact the contemporaries reluctance to swallow official figures is in contrast with the gullibility which rating agencies would display during the interwar. In its general introduction, Moody's *Government and Municipal* (1926) plainly stated: « The information furnished on foreign governments and their securities is derived from original sources [i.e. official documents]. We have taken great pains to gather facts and figures directly from the governments and municipalities of the whole world. And the prompt and very satisfactory replies were indeed most gratifying. » One may doubt that statistical honesty had much changed over the war to warrant such trust.

foreign) was often bought. Perhaps the most famous illustration of this was the debates within the Russian Imperial Council in the late 1890s and early 1900s, where statistical accuracy became a political issue.⁴⁹ The Russian case was not exceptional. As SEF economists concluded: « If one were to judge from the disputes surrounding the yearly vote of the budget, it would seem that it is absolutely impossible to assess the financial situation of any given state with enough precision. Except in rare instances, those who participate in those discussions do not seem to be prepared to agree on the calculus that serve as a basis of their discussion. Concerned more than anything else with the need to free themselves from any kind of controls, they oppose unfounded rebuttal to unfounded assertions, and if by chance, debate develops, the general tone of the discussion quickly deteriorates without bringing any clarity ».⁵⁰

This situation was discouraging in view of the kind of systematic quantified comparisons which investors were looking for. Yet one could dream of a "rationalist" alternative, which would require designing a framework in which itemized public accounts could be split and then reconstructed. This framework, by fixing the methodological problems, would in turn help to focus more specifically on accuracy. For ambitious as it is, such was the route which the *Lyonnais* adopted. It is possible to identify the main stages in the development of the *Lyonnais*' method. Economists had long been aware of the relations between public finances and the price of debt instruments. For instance, in his *Traité des opérations de bourse*, Courtois claimed that the financial situation of a given government determined the likelihood of an increase in its demand for funds. The greater that probability and the lower would be the price of its bonds.⁵¹

These views were echoed by those of Germain who displayed an early interest about the empirical assessment of the way public finances would behave in the wake of given shocks. In 1871 he asked SEF economists to perform some 'stress analyses' in their fiscal reports, in order to determine for instance how public finances would react to a one time increase in spending: given

⁴⁹ . The more recent controversies between Von Laue [1953], and Kahan [1967] illustrate how partisan views on the topic have transpired until more recent debates.

⁵⁰ . *Etudes financières*, « Comment faut-il ?... » p. 1, Historique DEEF.

⁵¹ . Courtois, *Traité des opérations de bourse*, p. 157.

the inertia of some expenses (such as interest service), he reasoned, one could get an idea of the amount of free resources which would be available. He further argued that this could be used to extrapolate the borrowing capacity of any government given alternative scenarios on the evolution of its revenues.⁵² Such analyses however, remained fairly rudimentary, at least until the early 1890s (Germain [1886]).

The crisis of 1890 was again a watershed. In 1891, as the Argentinean crisis was spreading, Germain received several reports among which were memoranda on Spain, Portugal, and Italy with whom the *Lyonnais* was in business relations and whose bonds had been seriously shaken. Germain was perceptibly anxious about financial developments in these nations, and he wanted to better understand each country's macro-economic prospects. In particular, he wanted to disentangle permanent weaknesses from transitory difficulties, and to understand whether there were structural differences between the countries under study. This led him to write a detailed technical memo.⁵³

Germain's blueprint for public finance research combined four main directions. First was the concern about accuracy. All government accounts (general and special) had to be investigated in detail. To track inconsistencies, Germain recommended constructing separate 'capital' and 'operating' accounts, and to decide whether they matched: variations in public indebtedness had to be mirrored into government deficits. Government borrowing accounts, he emphasized, should include on top of the long term debt, short term obligations. These included government bills, overdrafts from both private and 'central' banking institutions and foreign loans. The importance of short term debt was of special concern because it could be more easily concealed. Moreover, short term debts, facing a rollover risk, were inherently riskier.

The second direction was to use a « historical approach » which would serve « to characterize with more certainty the country's performance ».⁵⁴ A country's tendency to run persistent deficits could escape the scrutiny of an observer focusing on short frequencies but would come to the

⁵² , Letter dated 19 Octobre 1871, *Archives du Crédit lyonnais* AH 9-58.

⁵³ , Historique DEEF. The idea of ascertaining 'scientifically' the economic situation of economic entities was emerging at the time. Cheysson [1887/1911].

crudest light when extended time periods would be considered. The historical approach also served as a guide to extrapolate current trends, as it would give some clues on what should be considered as « permanent » versus « transitory ». Finally, the historical approach permitted to check the consistency of returns, revealed hidden items, and provided indications on each country's propensity to turn to short term debt in case of fiscal needs. In practice, Germain asked for a 20 years period.⁵⁵

Third was the concern about the dynamics of government *assets*. Germain advised to provide a breakdown of government revenue between 'taxes' and 'income from government assets' (railways, forests, state monopolies, state properties, etc.) in order to underline the element of enterprise in the fiscal machinery. Similarly, spending should have to be differentiated to highlight its nature. Government investment was not the same as consumption. The former would eventually bring an increase in government revenue. This view was quite pervasive at the time: the nature of government spending was a frequent theme of the annual reports of the *Council of Foreign Bondholders*. Similarly Mulhall's estimates of public debts sought to disentangle 'consumption debt' from 'railway debt' although his estimates only focused on railways (Mulhall [1896], p. 54).⁵⁶

The last direction was to require that the new accounts be tabulated along with background information regarding the country under study: imports, exports, exchange rates, interest rates, population. Space was saved for comments: this could be used to mention specific events with fiscal relevance. Germain asked that three studies be made right away according to the new principles. The first would focus on Russia, the second on France, and the third on Italy. Dozens of others would follow. While a substantial share of these studies have been lost, those remaining

⁵⁴ . Henri Germain, 1891, note 'Finances portugaises', Historique DEEF.

⁵⁵ . Germain's Memo, 1891, historique DEEF. This lag, not accidentally, coincided with the creation of SEF.

⁵⁶ In a recent article, Kelly [1998] found that in the 1890s, the nature of government spending had favourable consequences on sovereign debtors willingness to pay. The difference between investment finance and consumption finance was also emphasized by Fishlow [1985].

are rather impressive: huge spreadsheets, spanning 3 feet by 5 with extra columns pasted or pinned, listed for time periods of about 15 to 20 years scores of statistical series.

2) 'Une méthode rationnelle'

The actual method which SEF developed was a response to both Germain's requests and to the practical challenges encountered along the way. In line with Germain's emphasis on the entrepreneurial functions the state, SEF tables were organized around « revenues and expenditure accounts » on the one hand and states' « balance sheets » on the other hand. These accounts were constructed through an investigation of all government records, which involved careful corrections.

The next step was the construction of what SEF called *comptes d'ordre*. These recorded, in an attempt to measure the net income from specific taxes as well as the net cost of given expenditures, either expenditures implied by revenue collection or rainfalls associated with given expenses. On the revenue side one had for instance to pay the taxman : the net return from taxation was the difference between taxes and tax collection expenses. On the spending side, a government which subsidized education could nonetheless collect some tuition fee which partly covered expenses: net subsidies to education were the difference between the two items. *Comptes d'ordre* were handled with special care when it came to state business. National accounting techniques created spurious fluctuations in official revenue and expenditures: one example was the Spanish tobacco monopoly, which until 1887, was State run. Spending on personnel, etc., was thus recorded among government expenditures, and gross income was recorded on the revenue side. The resulting net profit until 1887 was an annual income of about 70 million of peseta. In 1887 however, the Spanish government farmed its monopoly out. The franchised company had to pay a 90 million peseta annual duty. These 90 million became the only item recorded on the revenue side. This represented a 20 million improvement on net revenues, but also implied that *total* government income was reduced. If one wanted to assess the « normal income » of the Spanish government, the *Lyonnais* reasoned, one would have to correct the pre-1887 returns in order to purge both the

income and expenditure side from gross expenses. This way returns would display a 20 millions increase in government revenue in 1887. By contrast measures based on gross revenue would display a spurious weakening of government income.

The *Lyonnais* method had the effect of making accounts leaner : revised revenues and expenditures (called '*recettes et dépenses normales*') were constructed by netting out items. This implied a seemingly smaller burden of government in economic activity, and was thus in contrast with the more familiar concept of government share in the economy, where aggregate income and expenditures are compared to national products.⁵⁷ In fact, this comparison with modern practices underlines the *Lyonnais*' view of states as investors and its corollary concern about efficiency, as opposed to the keynesian view of states as spenders and its corollary concern about weight. The *comptes d'ordre* allowed to focus on the net income from government activities, thus getting closer to a concept of comparative profitability.⁵⁸ As lender to governments, the *Lyonnais* wanted to trace what governments had done with private monies.

Moreover, *comptes d'ordre* were an intermediary step in the construction of state balance sheets which compared public debts and public assets. Indeed, while constructing debt estimates merely required care and patience, the asset side involved much greater challenges. Official assets accounts were poorly maintained if at all. Only some countries such as Scandinavia, Switzerland, and a number of German states published such returns.⁵⁹ Existing accounts overlooked amortization, recorded assets at their nominal purchasing price, and gave a positive price to loss making enterprises.⁶⁰

Comptes d'ordre by contrast, provided a way to circumvent these shortcomings : the itemized accounts of government activities yielded a direct measure of 'dividends' (net of maintenance, reparation, etc.) from public assets. One way to look at net indebtedness was thus to capitalize net

⁵⁷ . See e.g. Schuknecht and Tanzi [1995].

⁵⁸ . For instance it was well known (see Block [1898]) that the corrupted Russian Internal Revenue Service brought a lower return than other nations' revenue services.

⁵⁹ . See *The Statesman's Yearbook*, various issues.

⁶⁰ . Mulhall's [1896] net debt estimates were flawed by this very problem.

dividends at an interest rate equal to the government marginal borrowing rate. A 100 franc debt bearing a 5% interest and issued to finance the construction of a railway whose net return was 4 francs per year implied a corresponding asset of 80 francs — a 20 francs net debt. Another way to look at net indebtedness was to focus on flows. SEF suggested comparing state dividends to the annual flow of interest payments on the public debt. As SEF reckoned, each way to assess net indebtedness had weaknesses of its own. The stock approach raised the question of which interest rate should be used to capitalize dividends ; it compared a known expense to an uncertain income. On the other hand, the flow approach was unable to handle non interest bearing assets or debts : two governments that were similar in all respect but for an interest free debt (e.g. an overdraft at the central bank) would feature in a similar way in the flow approach and yet would be in a different situation. Taken together however, these measures were much superior to anything existing at the time, and could in addition allow more rigorous comparisons of real indebtedness.

3) Towards quasi-cardinal 'ratings'

The measures of net indebtedness which SEF constructed opened the door to recommendations for investment strategy. The trick was to find a denominator to which indebtedness could be compared in order to provide a measure of 'debt sustainability'. The hierarchy of risk which would emerge from this could then be compared to hierarchies of prices and signal profitable portfolio reallocations. Modern approaches to sovereign debt sustainability typically use the ratio of public debts to national income, measures of openness, etc. Nineteenth century economists believed in stocks more than in flows and the consensus view was that national *wealth*, not national income, was what mattered. Public obligations would have to be serviced out of taxing private agents: a sovereign's ability to pay was thus best measured by comparing its current stock of debt to the present value of private wealth owned by the agents it could tax.

This conceptual clarity contrasted with the dearth of data. One exception was Mulhall [1896] who computed wealth estimates for 1895, and provided pointwise debt-to-wealth ratios for Europe,

the United States, Canada, and Australia (Figure 4). Mulhall's estimates had serious limitations. Mulhall used fixed coefficients (calibrated on the basis of estimates for countries for which he had returns) to capitalize national earnings : land was capitalized at 30 times the annual agricultural production, houses at 16,5 times the gross rental, etc. Contemporaries were critical especially when it came to late developers whose economic structure was likely to differ from the countries upon which coefficients had been calibrated. Canovai, a leading Italian economist, thought that Mulhall's figures « lacked scientific basis » (Canovai [1898], p. 344). The whole issue was further complicated by matters of national pride, as well as international politics: because political alliances had a financial side, official statisticians were under much pressure. On top of all, Mulhall's returns were only comprehensive for 1895 and were never updated: the 1909 edition of Mulhall's *Dictionary of statistics* still relied on estimate for 1895.⁶¹

Contemporaries thus used proxies, that would serve to monitor financial evolutions over shorter frequencies. National income figures were as scarce as wealth estimates. A frequent denominator was population (Baxter [1871], Théry [1887], Haupt [1896], Canovai [1898]): *faute de mieux*, this was seen as a crude substitute for wealth.⁶² Such ratios however, were not computed out of candor : readers were immediately warned against the deficiencies of such measurement. Different levels of economic development meant very different income per head: for instance, dividing both Russia's and Britain's debts by their respective populations gave a fictitious advantage to the former.⁶³ Poor countries such as India or China, had the largest populations.

⁶¹ . These dilemma proved quite resilient: they were still present a quarter century later when formal sovereign rating developed. For instance, the 1926 introduction of Moody's *Government and Municipal Manual* sought to provide debt-to-wealth tables in order to document comparative debt burdens: « The best single index to the credit or standing of foreign governments undoubtedly is the wealth per capita. [...] In the past unfortunately, estimates of wealth have been too much biased by national prejudice. Even learned economists have placed high estimates upon the wealth of their own and related peoples, and low estimates upon that of unrelated and disliked peoples. Besides this, even now, there is a great dearth of data regarding both total wealth and per capita wealth ». *Government and municipals manual*, 1926, p. Xiii.

⁶² . See e.g. *Comment faut-il ?...*

⁶³ . The use of population as a proxy for GDP was traditional up to the 1870s, for instance in international treaties. It had the advantage of being a well known figure, and thus one on which it was easy to agree upon. When the Latin union was created in 1865, for instance, national quotas for issued of debased coins were expressed in percentage of the population.

As anybody else, SEF had thus to rely on its own tools. But contrary to others, its way to reorganize government accounts yielded an almost straightforward way to compare debt burdens. The flow approach to net indebtedness led to a natural choice of the denominator: dividing the annual flow of interest payments net of dividends from government assets, by « normal revenues » (that is, SEF-corrected gross government revenues minus '*dépenses d'ordre*') gave an index of sustainability. Indeed, this ratio measured the proportion of government income that was earmarked for debt servicing: the smaller this ratio, the less likely was the government to meet servicing problems. This in turn could be thought of as an index of « sovereign riskiness ».

Rating agencies are explicitly concerned with providing assessments of sovereign risks. As a result, their output is highly formalized. Grades are given to each country, and the significance of each grade is explained. But because SEF analyses were home made and home consumed, they did not need to be summarized through explicit grades. This of course is an obstacle for modern researchers. Yet in one instance, the SEF did provide a formal classification of countries: we found three spreadsheets, constructed in 1898, which ranked foreign sovereigns in three groups.⁶⁴ Each document displayed a list of countries belonging to a given 'risk group', and provided an estimate of the ratio of net interest service to 'normal revenues' in 1897-98 (plus a reference to the level of that ratio ten years earlier). The first list included countries « whose financial management is of first order » (« *Pays dont la gestion financière est de premier ordre* » in *Lyonnais'* words).⁶⁵ The second group included intermediary nations, whose « financial management is of second order ». Finally a third list included nations « of third order ».⁶⁶ The lists also included brief comments on each country and an indication of whether a default or repudiation had occurred in the recent past.

⁶⁴ . DEEF, 72879/1. « Généralités, 6. Classification des Etats d'après les résultats de leur gestion financière ». The tables included, along with pure sovereigns, a number of borrowers that belonged to federal or confederal states countries (Prussia, the Swiss cantons), and colonies (the British and Dutch Indies).

⁶⁵ . Moreover, the SEF hinted that the way countries were listed in the category had to be interpreted as formal intra-category ratings: some cursory comments explained the position of given country in the list of well-behaved countries. No intra-group ratings were provided for the second and third category.

⁶⁶ . Extensive footnotes described first and second order countries in some detail. Third order countries, by contrast, did not receive any mention, apart from records of the net interest service before and after the default.

These tables were not comprehensive and the exercise was never made again.⁶⁷ Yet they can help us to demonstrate that the *SEF* measure of debt sustainability loomed large in shaping its perceptions of sovereign risks. Consider that *SEF* operated on the basis of some implicit function (the *Lyonnais* formula) which related each given country's diagnostic statistics (e.g. the ratio of net interest service to normal revenues) to a score. Depending on the score which a given country obtains, *SEF* then decided to put it either in the first (low risk), second (average risk), or third (high risk) group. The *Lyonnais* formula is unknown to the modern researcher and the score is unobservable, but we do observe the final allocation. Assuming that the *Lyonnais* formula was linear, it is possible to implement an econometric technique (described in the appendix) which yields both the parameters of the *Lyonnais* formula and the thresholds at which countries switched from one category to the other one.

The explanatory variables which we use are *SEF*' estimates of the net burden of interest service as a share of normal revenue and a 'dummy' variable which captures the recent occurrence of sovereign default. Defaults or debt repudiations, while they lowered the interest service, also signalled a higher riskiness, and this balanced the seemingly 'good' performance which interest service alone implied. Results are presented in Table 1 (groups of countries are listed in Table 2). Figure 5 displays the estimated score (a low score means a low risk). Countries whose score are less than zero were put in the top category (group I). Countries between zero and 5.6 were put in the intermediate category (group II). Finally, countries whose score is above 5.6 are put in the high risk group (group III). The best score (equal to α_0 or -3.06) was obtained by countries with essentially no net interest service and no recent default: Sweden, Finland, Switzerland (Federal state), Denmark and the Transvaal. In general, category I includes countries with a low net debt service and no payment problems. One such country was Russia which thus featured within group I. This resulted from Russia's policies of public investment: the large involvement of the Russian state in the domestic economy implied that substantial net dividends accrued to the government.

⁶⁷. It is not fully clear what led *SEF* to include or exclude given borrowers from the list. Note that in terms of volume the list included most of the outstanding bonds, although some substantial sovereigns, such as Mexico or

These compensated the annual flow of interest payments, bringing it (as a share of government income) below 10%. No default countries, on the other hand, got downgraded to the second category when they reach a net interest service around 15% of normal revenues: this was the case of Holland, a nation with otherwise sound finances. The switch to the third category occurred when the interest service moved beyond 40% (again, with no default).⁶⁸ Recent defaults, finally, automatically put a country (whatever its interest service burden) in the third category.

One way to assess the performance of the model is to examine its ability to replicate the *Lyonnais'* actual groupings as presented in table 2 : most countries (20 out of 24 or 83%) are adequately allocated by the model. Misallocated countries obtain scores which are borderline and thus in fact very close to the group where they « should » have been put. The model, despite its simplicity, is extremely close to perfection, suggesting that the explicit scoring formula which we have reconstructed is a very good approximation of the *Lyonnais'* perceptions of sovereign risks. The important conclusion is obviously that *SEF's* sustainability measures played an overarching role in deciding of relative risks.⁶⁹

On the other hand, the small discrepancies between the *Lyonnais'* predicted scores and the observed allocation of sovereign debtors suggests some qualifications regarding the attitude of *SEF* towards its own measures. First, it seems that the ratings had not been constructed in a mechanistic way. A naive implementation of the net debt burden measure for instance would have implied putting the UK in the second category. Yet it is obvious that the « richest and most developed economy in the world » —as was written on the margin of the document— had to be put in the

France were excluded. Data limitation cannot explain this, as *SEF* had files on virtually every country.

⁶⁸ . Interestingly this echoes a mention in *SEF* files that « no trouble has been observed in countries whose net interest service was below 40% » (Archives Crédit lyonnais, Historique DEEF).

⁶⁹ . It is in fact very hard to improve on the model given the almost perfect allocation provided by the net debt service measure alone. Adding additional explanatory variables, such as a dummy for each misallocated country or a measure of deficits, creates a situation which is equivalent to the well known « complete separation » problem in a binary probit model. Provided that the extra variables are able to capture the little variance that's left out in the original model, the data fits the new model perfectly. In this case, the coefficients want to become infinitely large although preserving their relative magnitude.

lowest risk category, despite a net interest service at 16.8% of revenues.⁷⁰ Similarly, the inverted ordering of Spain and Italy (respectively just below and above the switching line, and yet placed by SEF economists in the third and second category) reveals an awareness to current developments. Italy, while being the most heavily burdened European nation (Canovai [1898]), had by 1898 stabilized its public debt and reorganized its fiscal process, without default, thus paving the way for a successful debt conversion a few years later. Spain on the other hand, was in 1898 in the midst of a military conflict which could push it to the verge of bankruptcy (as a matter of fact, a note on the margin of the document recognized that partial repudiation was an option). Finally, the allocation of Japan to the second category—despite a debt burden that should have had it mechanically in the first one—might have been related to the monetary system of the country: indeed, SEF economists argued that while stabilization on the gold standard was under way in Japan (see Eichengreen and Flandreau [1996]) the nature of the monetary regime was not yet fully established.

Thus a number of factors balanced the lessons from SEF's sustainability measure. As emphasized in the 1903 memo, the SEF fulfilled a «purely scientific» role and had no ability to determine the incidence of some complex facts on creditworthiness.⁷¹ SEF's task rested mainly in providing information to the *Conseil d'Administration* where responsibilities remained. This may explain why formal 'ratings' were never performed again after the 1898. Instead, SEF country studies came to be accompanied with a number of qualitative notes, economic, political, or financial.⁷² Such were the elements which, along with the more general policy orientations of the

⁷⁰ . The same would have probably also hold for France, which was not included in the risk tables but which would have probably featured in group one despite a net flow of interest service of 39.4% in 1887 and 30.4% in 1897 (see « Etude de la situation financière de la France », p. 42, Table 'Comparaison du produit net de l'actif de l'Etat et du service de la dette').

⁷¹ . « Note sur la méthode ... », p. 12.

⁷² . These included a list of comments on macro-economic outlook, a general assessment of financial policy, informations on specific questions (monetary or fiscal reforms, etc.), a note on the evolution of the public debt, a note on the political regime and bureaucracy, and a political chronology since 1875. Interestingly this is exactly the type of information on which credit agencies would rely 20 years later. Moody's *Government and Municipal Manual*, 1929 edition, recommended to enquire on « Geography, ethnology [by which it meant 'culture'], history, type and stability of government, actual and potential wealth, enterprise, international position [creditor vs debtor and underlying trend], fiscal, monetary and banking systems, government budget, taxation and debt, and finally an assessment of the « vitality of civilization ». « A knowledge of all the foregoing subjects », Moody's concluded, « will enable the investor to determine intelligently the question of credit in a broad, general way ».

bank, drove investment decisions. Yet it remains that the statistical exercises performed by the *Lyonnais* were undoubtedly, by their clarity and 'objectivity' an essential piece of information, and thus an essential aspect of decision making. It is possible to claim, on the basis of existing evidence, that they loomed large in orienting the direction of French foreign investments: how to resist relating the surprisingly good grade obtained by Russia, or the excellent mark which Scandinavia received, to the well known attraction which these countries' public debts had on French monies, especially from the 1890s? While more evidence and further research is needed, we believe that our finding is a first hint that, contrary to the conventional wisdom, economics, not politics, were a key factor in allocating French exports of capital. At least, we hope to have convinced readers that the *Lyonnais*' sustainability accounts, for what they were worth, made a decisive contribution in shaping the opinion of French financiers regarding foreign investment opportunities.

Conclusions: market opinion and willingness to lend

This article has described the evolution of the *Crédit lyonnais* sovereign risk analysis department, the *Section des Fonds d'Etat* a sub unit of SEF, *Lyonnais* research department, over the period 1871-1914. We described how SEF grew into a large research center with numerous and ample means. We also studied the making of its 'ratings'. Several lessons can be drawn. First and foremost, this episode sheds light on how late 19th century investors reacted to the absence of official data, formal ratings, and international bail outs. Both the enlargement of SEF and the design of a systematic framework of financial analysis were prompted by the collapses of the *Comptoir d'escompte* and Baring. The process accelerated during the severe international financial crisis of the early 1890s, when the *Lyonnais* realized that it needed to determine which, among the various sovereigns of the gold standard periphery, deserved support. The decision to internalize a number of methods for monitoring sovereign risk is thus evidence of the key contribution of the market mechanism to pre-WWI « globalization ».

A second lesson is the considerable importance of investors' perceptions in shaping the market mechanism itself. While a large literature has studied the determinants of debtors willingness to pay, we found that cognitive aspects of the assessment of public finances played a crucial role for what we suggest to call investors' willingness to lend. In particular, we demonstrated that the favour in which investment finance (as opposed to consumption finance) was held proved decisive in comparing sovereign risks. This belief was pushed to its logical conclusion in SEF's measure of debt sustainability which discounted from interest service the net dividends from government 'assets', and was responsible for a grading formula which most characteristically featured Russia as a 'blue chip' country: because most loans to the Russian government were used for industrial investments and because these investments provided a revenue, Russia's « indebtedness » remained moderate in the eyes of *Crédit lyonnais* economists. This finding is obviously important in view of the well known attraction which Russia had on French capital : inasmuch as SEF ratings mattered (and we suggested they did), they provide a strong case for arguing that economics, not politics drove French capital in Saint-Petersburg.

Finally, our last conclusion has to do with the economics of financial information. We began this article with a reference to the challenges of sovereign risk assessment by rating agencies. Our discussion of nineteenth century experience suggests that privately collected information is not without faults either. Indeed, SEF was not a research department picked at random in a large population of competitors. It was not an individual voice in a broad market of opinions. Rather, SEF was the research unit of one bank which took a prominent position in French and international finance. While the *Lyonnais*' willingness to retain its credibility certainly encouraged it to do its homework, it is likely that this also led other banks to pay much less attention. The absence of other serious domestic competing opinion and the secretive attitude which the *Lyonnais* took towards SEF output, probably induced other banks to get on board of *Lyonnais*' led syndicates without due caution. The issue is thus not to question SEF sincerity : it genuinely believed in its reports. But finance is a game where one makes money because one's view becomes the market view, not because one's right: the externalities of being a market leader cannot be ignored.

Archives du Crédit Lyonnais, Paris

DEEF, 'Historique SEF' [the 'official' file on SEF: a collection of memos and second hand sources, of uneven reliability]

DEEF, Sans cote, 'boulevard des Italiens' [a few unreferenced documents containing detailed information on budgets, personel, etc.]

DEEF 62694, Le service des Etudes financières au Crédit Lyonnais: Objet, Organisation, fonctionnement [various semi-official descriptions of the service 1905-1916].

DEEF 72879/1, Tableaux 1898-1900: Etats dont la gestion financière est de premier, second, troisième ordre [the Lyonnais' risk tables].

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Appendix : Estimating the Lyonnais grading formula.

We use a 3 states ordered probit model. The intuition is the following: the SEF was observing a vector of (exogenous) variables (X) which it then sought to relate to a given country 'score' (q). The score (known in qualitative variables econometrics as a 'latent variable') is not observable, but we assume that it was a linear function (vector α) of the exogenous observations. ω is an error term. We have:

$$q = X\alpha + \omega$$

There are three 'states' (risk categories) available. They are mutually exclusive. Category I is the group of countries whose financial management is of first order, and so on. Let's call y the state variable. We have:

$$y = 1, 2, 3$$

If the score obtained by multiplying the performance variables by their corresponding weight is below 0, the country under study will be assigned to category I (first order country). If the score obtained is between 0 and q_1 , the country will be assigned to category II (second order country). Finally, if the score is above q_1 , the country will be assigned to category III (third order country):

$$y = 1 \text{ for } q \leq 0 \quad \text{i.e.} \quad \omega \leq -X\alpha$$

$$y = 2 \text{ for } 0 < q \leq q_1 \quad \text{i.e.} \quad -X\alpha < \omega \leq q_1 - X\alpha$$

$$y = 3 \text{ for } q_1 < q \quad \text{i.e.} \quad q_1 - X\alpha < \omega$$

The exogenous variables are I_1 (the net burden of interest service as a share of Lyonnais measured revenues) and $Fault_1$ (which takes value 1 if a default has recently occurred and zero otherwise). We have the *Lyonnais* grading formula:

$$q_i = \alpha_0 + \alpha_1 I_1 + \alpha_2 Fault_1 + \omega_i$$

The estimation procedure uses the Maximum likelihood formula, assuming that ω_i are i.i.d. Results are shown in Table 1.

Table 1. Estimating the Lyonnais grading formula:

$$q_i = \alpha_0 + \alpha_1.I_i + \alpha_2.Fault + \omega_i$$

Parameter	Estimate	Standard-Error	t-statistic
α_0	-3.06*	0.69	-4.42
α_1	0.21*	0.046	4.58
α_2	13.57*	1.23	11.03
$\sqrt{q_1}$	2.37*	0.35	6.69

n-obs= 24; Standard errors computed from analytic first and second derivatives (Eicker-White).

*: significant at 5%. $q_1=5.6$

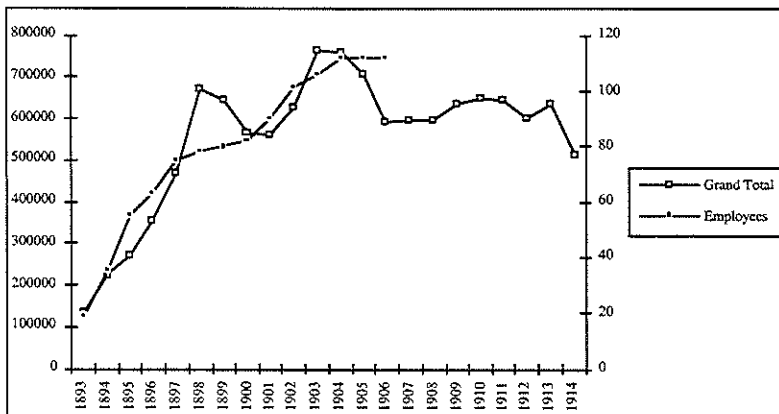
Table 2. The Lyonnais risk tables

Group 1: « Pays dont les finances sont de premier ordre »	Group 2: « Pays dont les finances sont de second ordre »	Group 3: « Pays dont les finances sont de troisième ordre »
Germany (imperial gov.),	Holland, Egypt, Japan,	Brazil, Argentina, Spain,
United Kingdom, United	Austria, Hungary, Romania,	Portugal, Greece, Serbia,
States (federal gov.), Russia,	Italy, [Chile, Dutch Indies,	[Bulgaria and 'Roumélie']
Sweden, Finland, Denmark,	British India]	
Belgium, Norway, Transvaal,		
Switzerland (federal gov.)		

Source: Archives du Crédit lyonnais, DEEF 72879/1.

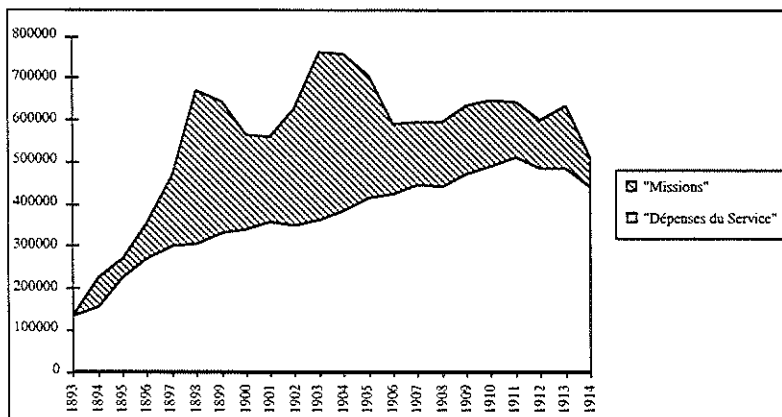
Nota: no figures reported for countries within brackets. These countries were excluded from the regression.

Figure 1. SEF expenses (French francs, left scale) and number of employees (right scale)



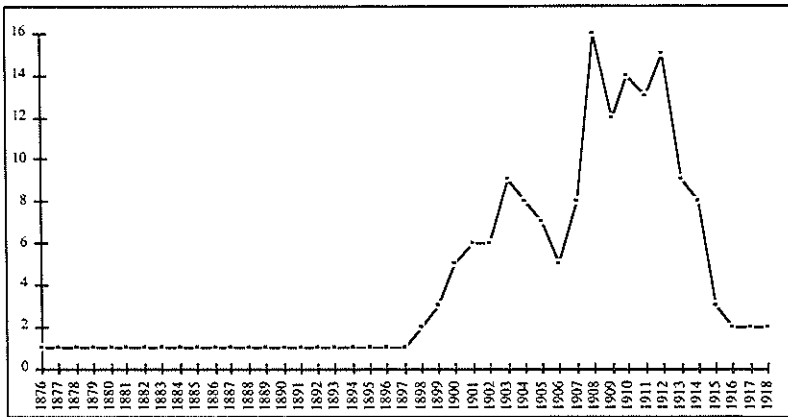
Source: Archives DEEF, 'Boulevard des Italiens', sans cote.

Figure 2. SEF expenses (French francs): « Paris » and « Missions »



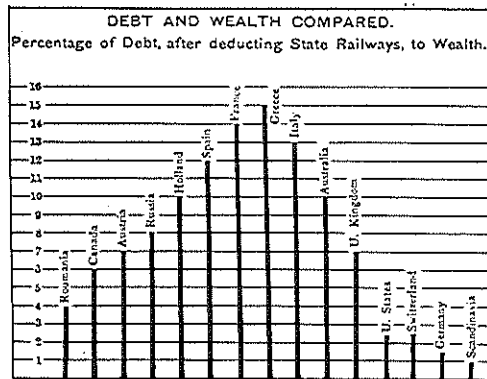
Source: Archives DEEF, 'Boulevard des Italiens', sans cote.

Figure 3. Number of employees in the *Section des Fonds d'Etats*

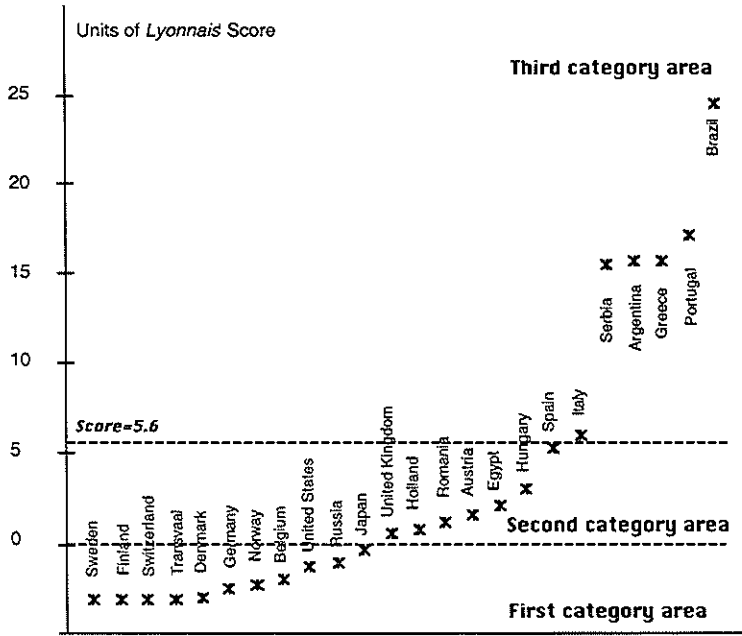


Source: Author's computation, Archives du Crédit lyonnais, Historique DEEF.

Figure 4. Mulhall's Debt to Wealth Ratios



Source: Mulhall [1896], p. 55



**Figure 5. The Lyonnais' Scoring Formula:
Predicted grades and implied category**

Source: Author's computations.