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ABSTRACT

The rapid growth of derivative markets has raised concerns about counterparty risk. It has been argued that their mutual guarantee funds provide an adequate safety net. While this mutualization of risk protects clients and brokers from idiosyncratic shocks, it is generally assumed that it also offers protection against systemic shocks, largely based on the observation that no twentieth century exchange has been forced to shut down. However, an important exception occurred in 1882 when the crash of the French stock market nearly forced the closure of the Paris Bourse. This exchange's structure was very similar to today's futures markets, with a dominant forward market leading the Bourse to adopt a common fund to guarantee transactions. Using new archival data, this paper shows how the crash overwhelmed the Bourse's common fund. Only an emergency loan from the Bank of France, intermediated by the largest banks, prevented a closure of the Bourse.

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The spectacular crash of the French stock market in 1882 inaugurated a deep recession that lasted until the end of the decade.[1] Unlike other stock market busts, the surprising features of the 1882 crisis were that it was largely confined to France (Kindleberger, 1993) and it nearly brought about the demise of the Paris Bourse. In his magisterial study of the crash, Jean Bouvier (1960) detailed the rise and fall of the bank, Union Générale, which played a central role in boom and collapse of the market. However, Bouvier focused less on the propagation of the crisis and more on the politically charged question of whether there was a conspiracy to bring down the bank. In the wake of the crash, the bank's founder alleged that its demise was caused by Jewish-German banks and Freemasons who sought to destroy emerging financial institutions that backed a conservative Catholic political agenda. This myth found favor with the anti-Semitic right (Ferguson, 1999). Bouvier (1960, 1968) concluded that there was no evidence of a conspiracy and that Union Générale was destroyed by its leveraged position and accounting fraud. While Bouvier's findings have been generally accepted, what remains unclear is why the collapse of this bank proved to be so devastating. Using new archival materials and data on the finances of the Bourse, this paper examines how the Bourse's common fund failed to safeguard the liquidity of the exchange. This failure stands out as an extraordinary exception to the otherwise exemplary record of similar institutions in the twentieth century that are cited as examples of how markets can effectively manage risk privately and reduce the danger of a liquidity crisis (Edwards, 1984; Bernanke, 1990; and Kroszner, 1999 and 2000).

In the French market, forward contracts were the primary instrument for trading securities; and in rapidly moving markets, these contracts could expose brokers to substantial counterparty risk. Well before futures markets set up guarantee systems, the Paris Bourse recognized these problems and created a common fund designed to guarantee the completion of contracts. However, while this fund could manage idiosyncratic, it was unable to absorb a systemic shock. In the midst of the 1882 crash, fourteen of the sixty stock brokers appeared to be in imminent danger of failure and seven ultimately proved to be insolvent. The more severely afflicted *bourse* of Lyon was liquidated, and closure of the Paris Bourse was only averted by an emergency loan from

[1] Real GDP did not reach its 1882 level until 1888. (Lévy-Leboyer and Bourguignon, 1990).

the Bank of France, mediated by a syndicate of bankers. This timely credit from the lender of last resort ensured there was sufficient liquidity for the end-of-January settlement of forward contracts. These events have no parallel today or in the other stock markets of the era. An equivalent disaster in the U.S. would have resulted in the closure of the Boston or Philadelphia exchanges and the rescue of the New York Stock Exchange by an emergency loan from the U.S. Treasury.[2] The Bourse managed to repay the emergency loan by levying an assessment on its members. But recovery and recapitalization of the common fund lasted until the end of the decade, weakening the Bourse at a critical time when it faced increasing competition from the Coulisse (the curb market).

I. The Microstructure of the Paris Bourse

The Paris Bourse was founded by Napoleon's decree of 27 Prairial X (June 16, 1802).[3] Combined with a law enacted on 28 Ventôse IX (March 19, 1801) and the Code de Commerce in 1807, it set the basic microstructure of the nineteenth century exchange. These laws gave the *agents de change* or stock brokers a monopoly of trade in government securities and other securities "susceptible" to being quoted.[4] The remaining securities were left to the free market or the Coulisse. Entry was strictly regulated, each *agent de change* was required to post a bond of 60,000 francs, later raised to 100,000 in 1805; and the number of brokers was fixed at sixty in 1816. New brokers were nominated by their predecessor, subject to the approval of the *bourse*. The *agents de change* formed a corporation, the Compagnie des Agents de Change that was governed by a *chambre syndicale*. This governing committee was elected by the members and led by a *syndic*.

The brokers were forbidden to trade on their own account by the Code de Commerce (Article 85).[5] Commissions were fixed and determined by the *chambre syndicale*. Yet, the Napoleonic laws had very little to say about the rules that would

[2] In the pre-Federal Reserve era, the U.S. Treasury sometimes conducted central banking operations.
[3] See White (2003) for a more detailed explanation of the exchange's evolution from the *ancien régime* through the Napoleonic era.
[4] This definition led to a long struggle between the Bourse and the Coulisse over which securities the former had exclusive trading rights.
[5] The curb brokers were not prohibited from making a market, although they were legally obliged to notify their clients when they traded on their own account as a counterparty.

govern trading.[6] Article 22 of the 1802 decree charged the brokers with the creation of the rules needed for "internal discipline." These rules would then be forwarded to the Ministry of the Interior (after 1816, the Ministry of Finance) to receive government approval and thereby gain legal sanction.

There was, however, one important restriction that Napoleon imposed on trading. Although the cash market for securities (*marché au comptant*) was left unregulated, the forward market (*marché à terme*) was not given legal status. Napoleon shared traditional suspicions that short selling fostered speculation and insisted that forward trading remain outside the law. The decree of 1802 enjoined brokers to have in their possession securities for selling customers and cash for buying customers before they traded. Although left in legal limbo, the forward market soon became larger than the cash market. Because no merchandise or cash changed hands, time contracts were treated as gambling debts. According to Article 1965 of the Code Civil, the state would not enforce a gambling debt (Vidal, 1910.). This principle was tested several times in the courts and the established position was maintained. In 1842, the leading bankers sent a memorial to the government, pleading for the forward market to be made legal; but they were rebuffed. In 1867, an Imperial commission was appointed to investigate the question and concluded in favor of revising the law; but only after the crash of 1882 was there sufficient political pressure. Forward contracts became legally enforceable after the passage of the Law of June 28, 1885. Although most customers honored their commitments because they wanted to remain active in the market, the possibility that they could walk away from large losses added to the potential risk in the forward contracts, though it was not the sole factor as some contemporaries presumed.

A distinctive physical feature of the Paris bourse was the ring around which the *agents de change* congregated. Protected by an outer rail or barrier, the brokers faced one another around an inner ring or *corbeille*, while trading orders were delivered to them by their clerks (*commis*), and commission brokers (*remisiers*). Brokers announced their orders to their colleagues around the *corbeille*, seeking counterparties. The *agents de change* handled the official forward market for securities. On the *petites corbeilles*,

[6] The Bourse was later made subject to public regulation (article 90, Code de Commerce, October 7, 1890). Yet, it remained largely self-governed.

smaller rings, their clerks operated the official cash market for securities and the official forward market for French *rentes*. These markets were in the central hall of the bourse—the *parquet*—named for its flooring. The rest of the market, the Coulisse was taken up by the curb brokers or *coulissiers* who worked outside under the peristyle of the building.[7]

By the third quarter of the nineteenth century, the Bourse developed a distinct set of rules for trading. Orders were announced by brokers in a continuous market, with clerks moving back and forth from the floor to their office stations, relaying information about prices and receiving new orders. In the cash market, orders were given to the brokers at a fixed price (*à cours fixe*), a best price (*au mieux*) or the average price (*au cours moyen*), which were good until cancelled by the customer.[8] However, the forward market was the dominant market, where large investors and speculators typically operated. Here, buyers and sellers agreed to exchange a fixed number of shares for a fixed price on the fifteenth day or the end of the month.[9] Bulls or *haussiers* would buy in the *marché à terme* with the intention of reselling at a higher price, while bears or *baissiers* sold contracts, expecting prices to fall.

Although securities and cash were not in hand, risk to the broker was controlled partly by margin (*couverture*). No regulations governed margin, which was determined by the broker on the basis of the securities in question and the client's account in general (Proudhon, 1857).[10] Although it was common for brokers to obtain margin and demand an increase if the value of a security fell quickly, it was not until 1890 that brokers were given the legal right to demand and receive margin (Robert-Milles, 1892; Boissière, 1908, and Poiteux, 1928). Margin was set to prevent defaults when prices changes were in the "normal range." It was the first line of defense against a defaulting customer. However margin imposed a real cost on traders, and brokers were obviously reluctant to

[7] See also, Walter (2001) for additional details.
[8] At the end of the day, the highest and lowest of the prices were averaged to obtain the average price at which the orders *au cours moyen* would be executed. (Vidal (1910), pp. 34-36)
[9] The duration of these contracts was determined by settlement dates (*liquidations)*. Settlements were semi-monthly on the fiftheenth (*liquidation de quinzaine*) and the last day of the month (*liquidation de ultimo*), or the following day if it was a holiday. The exceptions were the French *rentes*, shares of Crédit Foncier, and railroads which were only settled at the end of the month (Vidal, pp. 70-71). The number of days for clearing varied, depending on whether the transaction occurred in the cash or forward market and whether it was a registered security (*titre nominantif*), which bore the name of the owner, or a bearer security (*titre au porteur*), where the holder was presumed to be the owner (Vidal, 1910).
[10] Similarly, before the New Deal imposed margin requirements in the United States, margin was set at the discretion of the broker.

set margin so high that it would rule out all possible price changes, especially those resulting from extremely rare events such as crashes (Bernanke, 1990).

Settlement day forced traders in the forward market to decide if they wanted to liquidate their positions. A buyer might not want to take the securities if the current cash price was below the contract price. In the hope that the price might rise in the future, a buyer could renew his position by means of a *report.* If he had contracted to buy on the fifteenth of the month, then on that date he would buy at the agreed upon price and immediately sell the securities at the clearing price, or *cours de compensation*, entering a new forward contract to repurchase the securities at the next settlement date. The difference between the two prices was the *cours de report*. The *cours de compensation* was fixed on the settlement day by the *syndic* and was usually the average quoted price for that day in the cash market. The investor, or *reporté*, obtained funds for this operation from *reporteurs* who were financial institutions or *agents de change*.[11]

II. Counterparty Risk and the Common Fund

In futures or forward markets, there is significant risk of default on contractual obligations because of the lag in time between contract and delivery dates. During the course of a contract, losses can grow, exacerbated by the incentive for a customer in distress to take on more risk (Kroszner, 1999). Brokers on the Bourse thus faced the risk that a customer might default, when unexpected changes in the customer's net wealth affected his or her ability to meet their contractual obligations. If a customer was unable to settle his account, he was subject to a procedure known as an *exécution*. In an *execution*, a broker was obliged to complete his customer's transaction, buying-in and selling-out the securities; and if the margin were insufficient, the broker absorbed the loss (Boissière, 1908).

But, there is an additional risk factor, counterparty risk. In the process of clearing and settlement, the failure of one broker could produce losses for other brokers. On the Paris Bourse, if a broker defaulted, the *syndic*, on behalf of the *chambre syndicale*, made an *exécution* against the broker buying-in and selling-out the securities for the other brokers. This counterparty risk is a significant problem for forward and futures markets,

[11] See Courtois (1892).

and the bankruptcy of one broker can yield large and extensive losses to others. For example, the failure of one member of the Chicago Board of Trade in 1902 led to some losses for 42 percent of the members (Moser, 1998).

The high volume and rapid speed of the verbal market on the *parquet* required customers and brokers to be certain that their orders would be completed. Consequently, the Bourse adopted rules to control counterparty risk. Surveying the regulations contemporary exchanges use to manage this risk, Edwards (1984) found that they employed a mix of expulsion, monitoring, margin, position and capital requirements, and price limits, some of which were explicit and others discretionary. While margin requirements tied to other regulations were the first line of defense, the integrity of transactions on these exchanges was ultimately protected by a guarantee fund coupled with ex post member assessments. This mutualization of counterparty risk through the agency of an exchange (usually with the fund based in the exchange's clearing house), thus ensures the market's liquidity, allowing investors to trade without concern about the creditworthiness of their counterparties. However, mutualizing counterparty risk makes it necessary for an exchange to devise regulations and a monitoring system to manage the resulting problems of adverse selection and moral hazard (Edwards, 1984; Bernanke, 1990).

In advance of the futures markets, the Paris Bourse developed a very similar set of regulations and institutional structure to ensure the successful completion of all trades and manage counterparty risk in the early nineteenth century. Had the letter of the law of 1802 been applied and trades were made with securities and cash in hand, there would have been minimal counterparty risk, but the time delay in forward contracts created the potential for large risks. The need to control counterparty risk on the Bourse had emerged very quickly. Beginning in 1818, the hottest question in the General Assembly's meetings was whether to establish a common fund.[12] Responding to several failures, a common fund, the *caisse commune* was established in 1822 to provide

[12] The *bourse* of the *ancien régime* had maintained a small fund to pay for collective expenses, but it had not common fund. In the nineteenth century European coffee and grain markets were the first futures markets to create liquidation funds (*caisses de liquidation*) to guarantee full payment to the injured parties by collecting from the defaulter and drawing from a members' mutual fund (Emery, 1896). Diffusion of was slow. In the U.S. the Minneapolis Grain Exchange was the first to employ this system in 1891. It only adopted by the Chicago Board of Trade in 1925 (Moser, 1998).

temporary credit to an illiquid broker or in case of insolvency permit an orderly liquidation that would not halt other brokers' operations.[13]

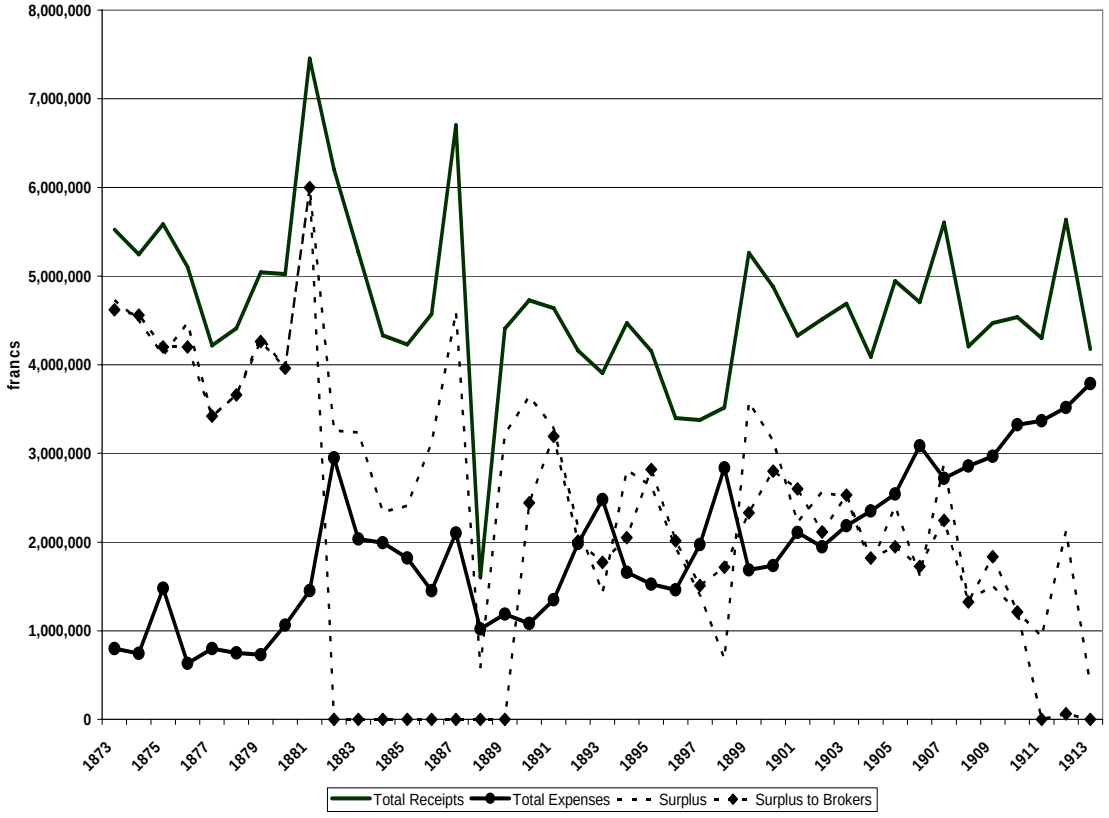
Given that a mutual guarantee was offered, moral hazard became a problem and monitoring to limit increased risk-taking was needed. Even though the small number of brokers facilitated mutual monitoring, the *chambre syndicale* began to require twice yearly reports of brokers' income and capital. When one of the sixty seats became vacant, candidates were carefully vetted. There were no capital requirements, but by 1880 a broker's total capital, including the 250,000 franc security bond and his 100,000 franc share in the common fund, was quite high, typically 1.5 to 2.5 million francs.

Using the archives of the Paris Bourse, I obtained the *caisse commune*'s income statements and balance sheets. The revenues and expenditures of the Compagnie des agents de change for 1873 to 1913 are presented in Figure 1 and given in greater detail for the critical years of the crash in Table 1.[14] The ordinary operation of the common fund can be seen in events of the year 1873. The Compagnie secured almost all of its revenue from three sources: a stamp tax, brokerage fees for the *rentes*, and interest for funds invested in *reports*. By far the most important source was a stamp tax imposed on the special paper used by brokers to record their operations, the price of which was determined by the brokers in their General Assembly. Roughly, this was a tax on the volume of activity on the bourse and it was borne in proportion to the activity of each broker.[15] The greater a broker's volume, the greater his exposure to this risk, and hence this revenue had a positive relationship with counterparty risk. In 1873, the stamp tax provided 4.1 million of a total of 5.5 million francs of revenue. The next most importance source of revenue was the brokerage fees (*courtages*) obtained from the Treasury's trading activities. In 1862, the Fonds Spécial des Trésoreries Générales was established to handle the orders to buy and sell French *rentes* for government's tax collectors (*receveurs généraux*), rather than have individual agents execute them. To manage this operation a special fund was created, with a precautionary reserve. The income from the fees on these trades was 922,425 francs in 1873. The last significant

[13] See the Assemblées Générales *Rapports* 1852, p. 80 where the founding of the *caisse commune* is discussed at the time it was reorganized on June 17, 1852.
[14] Figure 1 and Table 1 begin after the disruptions of the Franco-Prussian War of 1870-1871.
[15] Volume was not recorded.

source of revenue was the interest earned on the common funds from their employment in *reports*. This activity brought in 399,845 francs.[16] If needed the *chambre syndicale* had the right to request that the fund be supplemented by extraordinary assessments on members.

Figure 1
Revenues and Expenditures
of the Compagnie des Agents de Change de Paris
1873-1913



[16] In addition, there was some occasional revenue from fees from the reception of a new agent de change, interest on loans from the common fun, income from the securities and property owned by the Compagnie, and seat fees levied on others attending the Bourse. (Poiteux, n.d., p. 83-85.)

Table 1
Revenues and Expenditures of the
Compagnie des Agents de Change de Paris
1873-1890
(francs)

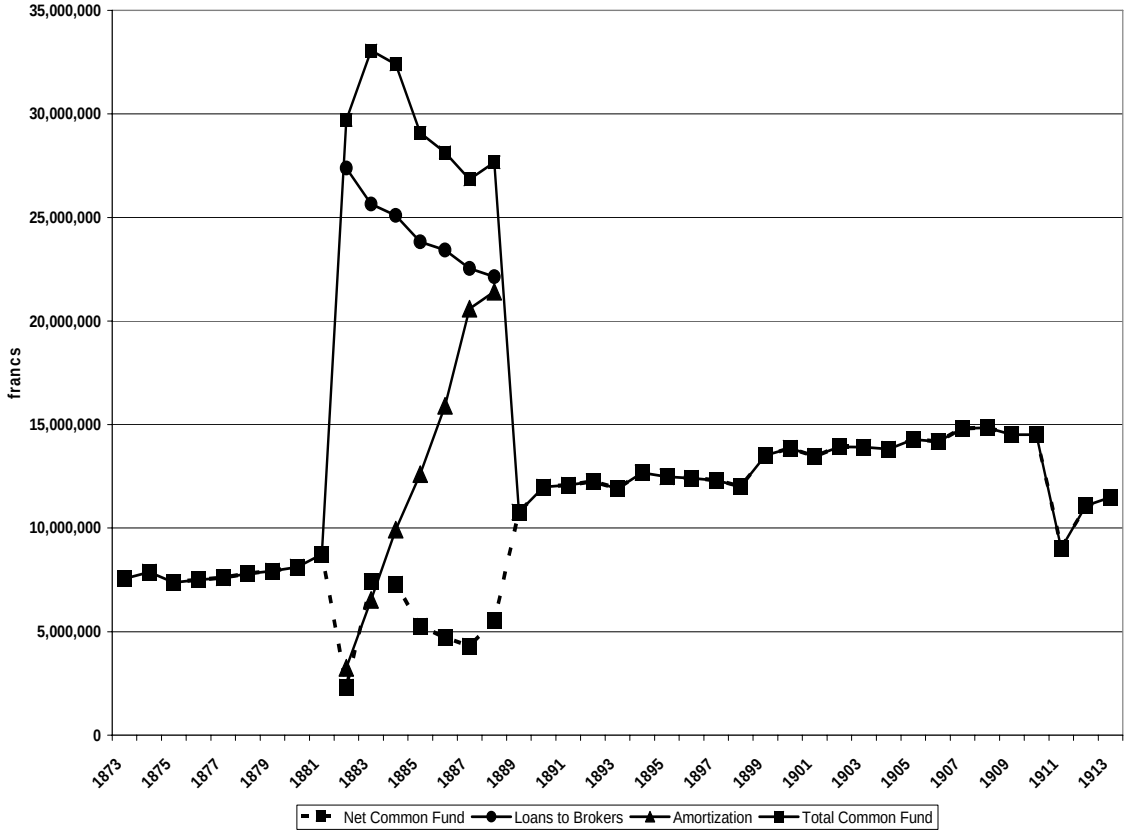
YEAR	TOTAL RECEIPTS	STAMP TAXES	INTEREST ON REPORTS	TREASURY FEES	OTHER	TOTAL EXPENSES	SURPLUS	REIMBURSED TO AGENTS	TO THE COMMON FUND
1873	5,525,920	4,128,162	399,845	922,425	75,488	797,300	4,728,619	4,620,000	108,619
1874	5,244,029	3,769,235	333,934	1,073,522	67,338	742,642	4,501,387	4,560,000	-58,613
1875	5,585,136	4,287,462	219,370	1,011,890	66,414	1,477,885	4,107,251	4,200,000	-92,749
1876	5,103,606	3,878,635	106,195	1,058,981	59,795	633,075	4,470,530	4,200,000	270,530
1877	4,219,873	3,123,385	20,875	1,023,104	52,509	799,873	3,420,000	3,420,000	0
1878	4,408,746	3,209,235	86,845	1,066,589	46,077	748,746	3,660,000	3,660,000	0
1879	5,042,788	3,787,019	204,687	975,900	75,182	728,762	4,314,026	4,260,000	54,026
1880	5,022,464	3,781,175	208,276	913,170	119,843	1,062,464	3,960,000	3,960,000	0
1881	7,452,967	6,222,483	344,216	782,475	103,793	1,452,967	6,000,000	6,000,000	0
1882	6,204,923	4,641,979	682,479	789,373	91,092	2,948,026	3,256,896	0	3,256,896
1883	5,270,763	4,316,647	86,617	769,265	98,234	2,033,883	3,236,880	0	3,236,880
1884	4,330,153	3,385,659	146,762	738,922	58,810	1,990,971	2,339,181	0	2,339,181
1885	4,226,892	3,304,611	119112	735,685	67,484	1,818,701	2,408,191	0	2,408,191
1886	4,570,201	3,650,435	109,951	742,626	67,189	1,450,792	3,119,409	0	3,119,409
1887	6,698,759	5,693,092	110,874	746,871	147,922	2,101,842	4,596,917	0	4,596,917
1888	1,599,595	625,171	120,387	742,537	111,500	1,021,071	578,524	0	578,524
1889	4,408,479	3,405,579	222,598	687,156	93,146	1,188,810	3,219,669	0	3,219,669
1890	4,726,823	3,768,665	210,875	658,711	88,572	1,080,723	3,646,100	2,484,986	1,161,114

Source: *Rapports de la Commission de Comptabilité de la Caisse Commune en Assemblée Générale de la Compagnie*, 1873-1907.

Expenses for 1873 totaled 787,300 francs. The largest element of expenditures was salaries for the bourse's personnel including the guards and concierges, which were 255,700 francs, followed by rent, taxes, and insurance totaling 78,308 francs. Remaining expenditures included legal fees, clearing operations, and telegraphy. The Compagnie set its expected revenue much higher than its expenses to ensure that there was a sufficient buffer against counterparty risk. Consequently, the Compagnie was left with a large surplus of 4,728,619 francs, which could have been added to the common fund or rebated to the brokers. Some extra income was annually transferred to the common fund but most of this surplus was rebated to the members. For 1872-1873, the Compagnie added 108,620 francs to the reserves of the common fund and rebated 4,620,000 francs or

77,000 francs to each broker.[17] The rebate was not proportional to the members' payment of the stamp taxes or other sources but was distributed in equal shares, thus redistributing some revenue from higher to lower volume brokers. The surplus revenue was in effect a refundable ex ante assessment against potential losses, where the assessment was set in rough proportion to the business each broker conducted and hence his exposure to risk. Given the redistribution, the Paris brokers must have been deeply concerned about counterparty risk, as it has been argued (Pirrong, 1997) that the Chicago Board of Trade did not adopt a mutual fund until 1925 because of objections by strong members to the implicit subsidy to weaker members and the potential for moral hazard.

Figure 2
The Common Fund
1873-1913
(francs)



[17] This rebate was distributed twice yearly after the liquidations of May 31 and November 30. There was an additional 10,498 francs in the Common Fund, representing assets to be recovered.

In its annual report to the General Assembly, the accounting committee for the *caisse commun* reported that on November 10, 1873, the common fund stood at 7,558,394 francs. Figure 2 shows the common fund for 1873-1913, with Table 2, focusing on the years 1873-1890. Each *agent de change* owned a one sixtieth of the fund. The fund was administered by the *syndic*, and it was monitored by a deputy (*adjoint*) of the *syndic* and three *agents de change* appointed by the General Assembly. The largest component of the common fund, 6 million francs, was composed of the 100,000 franc security bonds deposited by the 60 brokers. To this was added the reserve of 644,304 francs for the Trésoreries Générales. Un-rebated surplus revenue over the years had contributed to secondary reserve of 794,972 francs by the end of the previous year. The 108,620 francs for 1872-1873 raised this reserve to 903,592 francs. Most of the common fund was placed in *reports*, earning interest, except for the reserves for Treasury transactions that were held in *rentes*.

Table 2
Assets and Liabilities of the Common Fund
1873-1890
(francs)

	ASSETS			LIABILITIES					
	TOTAL	REPORTS, RENTES AND CASH	ADVANCES TO BROKERS	TOTAL	SECURITY BONDS	SECONDARY RESERVES	TREASURY RESERVES	BUILDING, PRINTING OTHER	AMORTI-ZATION OF LOAN
1873	7,558,394	7,558,394		7,558,394	6,000,000	903,592	644,304	10,498	
1874	7,880,174	7,880,174		7,880,174	6,000,000	859,130	743,560	277,484	
1875	7,378,326	7,378,326		7,378,326	6,000,000	556,943	821,382	1	
1876	7,501,148	7,501,148		7,501,148	6,000,000	580,795	885,353	35,000	
1877	7,599,904	7,599,904		7,599,904	6,000,000	564,998	926,135	108,771	
1878	7,801,960	7,801,960		7,801,960	6,000,000	636,066	1,029,450	136,444	
1879	7,929,245	7,929,245		7,929,245	6,000,000	674,071	1,118,297	136,877	
1880	8,117,527	8,117,527		8,117,527	6,000,000	714,548	1,202,529	200,450	
1881	8,726,625	8,726,625		8,726,625	6,000,000	1,282,770	1,201,481	242,374	
1882	29,713,277	2,324,600	27,388,677	29,713,277	23,700,000	1,354,812	1,161,568	240,001	3,256,896
1883	33,063,918	7,412,113	25,651,805	33,063,918	24,000,000	1,052,122	1,227,770	240,000	6,544,026
1884	32,397,821	7,299,354	25,098,467	32,397,821	6,000,000	15,000,000	1,231,112	240,001	9,926,708
1885	29,093,277	5,274,692	23,818,584	29,093,277	6,000,000	9,000,000	1,244,852	240,001	12,608,424
1886	28,144,871	4,720,824	23,424,046	28,144,871	6,000,000	6,000,000	0	240,000	15,904,871
1887	26,841,531	4,311,478	22,530,053	26,841,531	6,000,000		0	240,000	20,601,531
1888	27,665,105	5,533,440	22,131,665	27,665,105	6,000,000		0	240,000	21,425,105
1889	9,487,994	9,487,994		9,487,994	6,000,000	1,954,447	1,293,547	240,000	
1890	10,649,108	10,649,108		10,649,108	6,000,000	3,072,774	1,336,334	240,000	

Source: *Rapports de la Commission de Comptabilité de la Caisse Commune en Assemblée générale de la Compagnie,* 1873-1907.

If a broker requested a loan from the *caisse commune*, he had to provide collateral equal to the advance from his security bond, and the *chambre syndicale* set the interest on the advance. Further collateral came from a broker's *office* or seat on the exchange. If a broker failed, he could not obtain a loan from the common fund, and the *chambre syndicale* substituted itself for the defaulting agent to wind up his affairs and make good on his obligations. The years 1873 and 1874 were without incident; additions were made to the surplus of the common fund, but most revenue was rebated to the brokers.

III. L'affaire Jumel: an idiosyncratic shock

A typical operation of the common fund can be seen in the failure of the broker Alexis-Alphonse Jumel, in 1875. Jumel had been an *agent de change* since 1867. Although little is known about the circumstances of his failure, Jumel was forced to give up his office on May 7, 1875.[18] On August 23, the General Assembly voted to pay out 1,590,000 francs to wind up Jumel's position. Of this sum, 250,000 francs represented the seizure of his security bond, 340,000 francs from his assets, and 1,000,000 francs from the reserves of the *caisse commune*.[19]

Jumel's demise proved costly to brokers who had traded heavily with him. After the cancellation of his bond, the Compagnie paid one-third of the value of his outstanding debts to fellow brokers. His trading apparently had been highly concentrated, and this partial compensation was a big hit for certain *agents de change*. Paul-Alphonse Saint-Evron experienced the greatest loss and received a third of what Jumel owed him or 136,206 francs out of a total debt of 412,746 francs.[20] The remaining brokers received one-third of the value of their claims or 814,625 francs, with 389,168 francs set aside for obligations coming due. Nevertheless, all the Bourse's customers who had been on the other side of Jumel's trades were made whole, ensuring confidence in the exchange.

With surplus revenues of 4.1 million francs, the brokers in the General Assembly could have paid out all of Jumel's debts in full, which rose to 2,852,493 francs, but they

[18] Compagnie des agents de change, *Filiation des Charges d'Agents de Changes près la Bourse de Paris* (Paris: November 1961).
[19] Assemblées Générales, *Rapport de la Commission de Comptabilité de la Caisse Commune*, December 20, 1875.
[20] Saint-Evron was probably forced out of business by this and other losses, as he gave up his office on July 15, 1875.

did not. Instead, the common fund was allowed to drop from 7.9 to 7.4 million francs, and 4.2 million francs was rebated to the brokers. Why the Assembly decided to saddle the brokers trading heavily with Jumel with large losses was not explained. However, the General Assembly seems to have thought that the brokers who had traded heavily with him should have been more observant and did not want to burden all of the brokers' equally.[21] Using its discretionary authority to limit payments, the Compagnie was acting in a manner consistent with increasing private incentives to monitor risky behavior and thereby control the moral hazard created by the insurance fund.

In 1876, when revenues, especially those from the stamp tax fell, the secondary reserve was little changed; but, as the *syndic* explained to the brokers in the General Assembly, the Compagnie was obliged to pay out an unexpected 340,000 francs to settle additional debts of Jumel.[22] The next year, revenues continued to fall, and the rebate to brokers was cut to 3.2 million francs with a small additional decline in the precautionary reserve. Only in 1878, with revenues again on the rise, was the common fund increased, as were rebates.[23]

Although the failure of an individual *agent* had produced substantial losses, it was an idiosyncratic shock, related primarily to one broker. As such, the Compagnie could be satisfied that its common fund gave adequate protection against counterparty risk. However, the demise of Union Générale in 1882 overwhelmed the system, as it was a systemic shock arising from the collapse of a new group of financial intermediaries. Without assistance from the Bank of France, the Bourse would have collapsed

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[21] For American futures exchanges, Edwards (1984) noted that there was a trend away from unlimited liability for the members of the clearing house fund.

[22] Compagnie des agents de change, Assemblées Générales, *Rapport la Commission de Comptabilité de la Caisse Commune*, December 18, 1876. When it was announced that the former broker. Augustin-Jean-Baptiste-Félix Pestel who had sold his office to Jumel and was thus probably one of his silent partners had made the final payment of 75,000 francs on his debts it was met with loud applause.

[23] Expenditures rose by about 300,000 francs in 1880 due to 94,729 francs of work on a building, and other higher expenses.

IV. Union Générale, and the Boom and Bust

The crash of 1882 is closely identified with the collapse of the investment bank (*banque des affaires*), the Société de l'Union Générale, founded in 1878 by Paul-Eugène Bontoux, an engineer and one-time employee of a Rothschild railroad company. In the boom years of the late 1870s, many new enterprises in industry, construction, commerce, and transportation at home and abroad flooded the Paris markets with new issues. Bontoux organized a new financial network to channel French capital to Central and Southern Europe, aiming to challenge the position of the Rothschild-Creditanstalt group in Vienna. His plans also had a strong political agenda that appealed to French conservatives, especially legitimist nobility and clergy frustrated by the success of the Third Republic. Based in Lyon, Bontoux used Ultramontane and anti-Rothschild rhetoric to induce conservative Catholic investors in France to buy shares and deposit their savings in his bank (Bouvier, 1960).

Bontoux promoted his enterprises through a series of interlocking financial institutions. Vidal (1910) estimated that the capital raised by Union Générale and its affiliated enterprises to be one billion francs. Rapidly gaining deposits, the bank itself increased its capital from 25 million to 50 million francs in 1879, 100 million francs in 1881, and finally a planned 150 million francs for January 1882.[24] In 1881, Bontoux founded the Austrian Österreichische Länderbank, in which the Union Générale had a controlling interest. The government in Vienna granted the new institution all the privileges of the Bank of France except that of note issue. Together these institutions became instruments of the Imperial Austrian government aimed at channeling capital to railways that would enable it to dominate the Balkans. In the power vacuum created by the defeat of the Ottoman Empire in 1878, Vienna was anxious to thwart Russia's efforts to establish its hegemony in the region. Bontoux's enterprises were central to the government's plans. To build the railways into the Balkans, Hungarian assent was also required. In 1881, Bontoux persuaded the Hungarian Parliament to charter the Banque Nationale Hongroise or the Ungarische Ländesbank and to subsidize new rail lines that penetrated deep into the Balkans. Completing Bontoux's master plan, this new bank was controlled by its principal shareholders, the Union Générale and the Länderbank,

[24] See Bouvier, (1960, pp. 47ff) for a description of the various stock issues and their pricing.

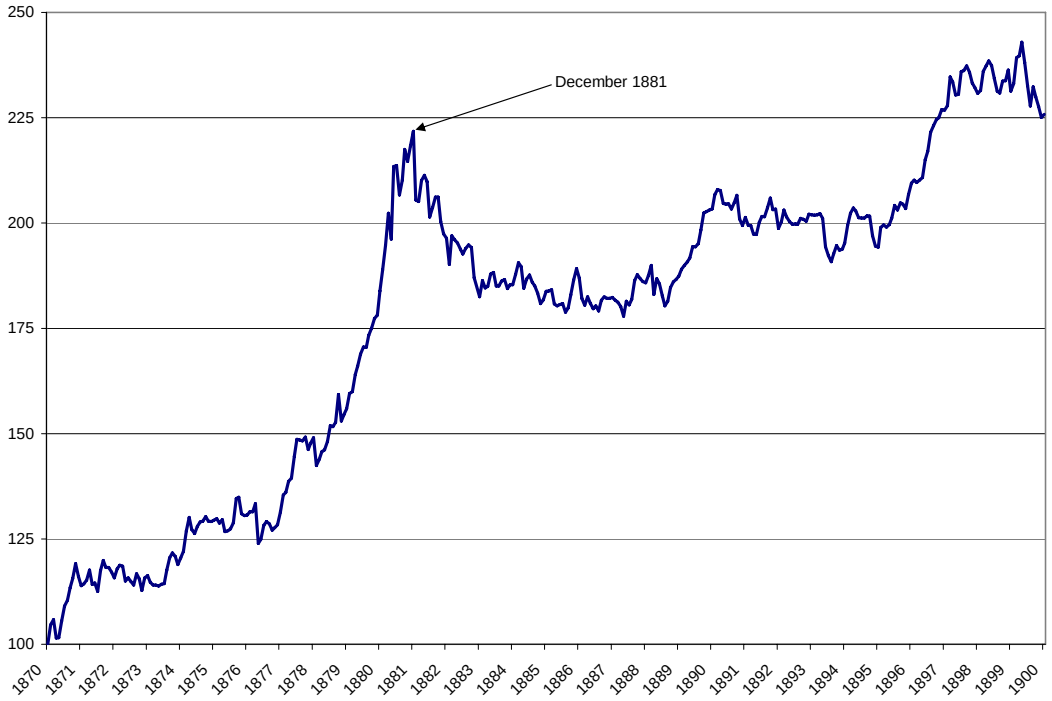
Following Bontoux' success, enthusiasm for new investment opportunities in the Balkans spread. Other new banks were created in Lyon, France's second city. The Banque de Lyon et de la Loire, was promoted by Charles Savary, who was married to the daughter of the Parisian *agent de change* Paul-Edmond Mahou.[25] When the bank opened in April 1881, Savary was president and his in-laws were on the board. The initial capital of 25 million was raised to 50 million in November, and it attracted local depositors with high rates of interest. The bank promoted industrial enterprises, including many in Russia. The established banks also joined in the boom. Credit Lyonnais doubled its capital and acquired two insurance companies (Bouvier, 1960).

The general rise in the market can be seen in Arbulu's (1998) stock market index for the Paris market in Figure 3, where I have set January 1870 as the base month. At the end of December 1879, this market index, which stood at 156, began its ascent. By the end of the next year, it had reached 184, and peaked in December 1881 at 222, a height it would not see again until July 1896, fifteen years later. Among the leading speculative issues was Union Générale, rising from 500 francs a share in 1879 to over 3000 francs at its apogee.

In the booming market for new securities, investors jumped into the forward market. Speculators borrowed on credit, renewing their forward contracts from one settlement to the next, hoping for steadily rising prices. Banks and new intermediaries provided the funds for the *reports*. Flandreau and Sisic (2003) found that the four largest banks roughly doubled the share of their assets invested in *reports* to 20% during the boom. Specialized intermediaries, *caisses de reports* accepted deposits, which were invested in *reports*, returning a high yield to the depositors. The Banque de Lyon et de la Loire was very active in this market, investing heavily in *reports*; and it founded its own *caisse de reports*, the Caisse Lyonnaise, to channel more funds to this business.

[25] See Bouvier, (1960, p. 120). Mahou became deeply involved and failed in the crash (Archives de la Bourse, dossier Mahou).

Figure 3
Price Index of Shares Traded on the Paris Bourse

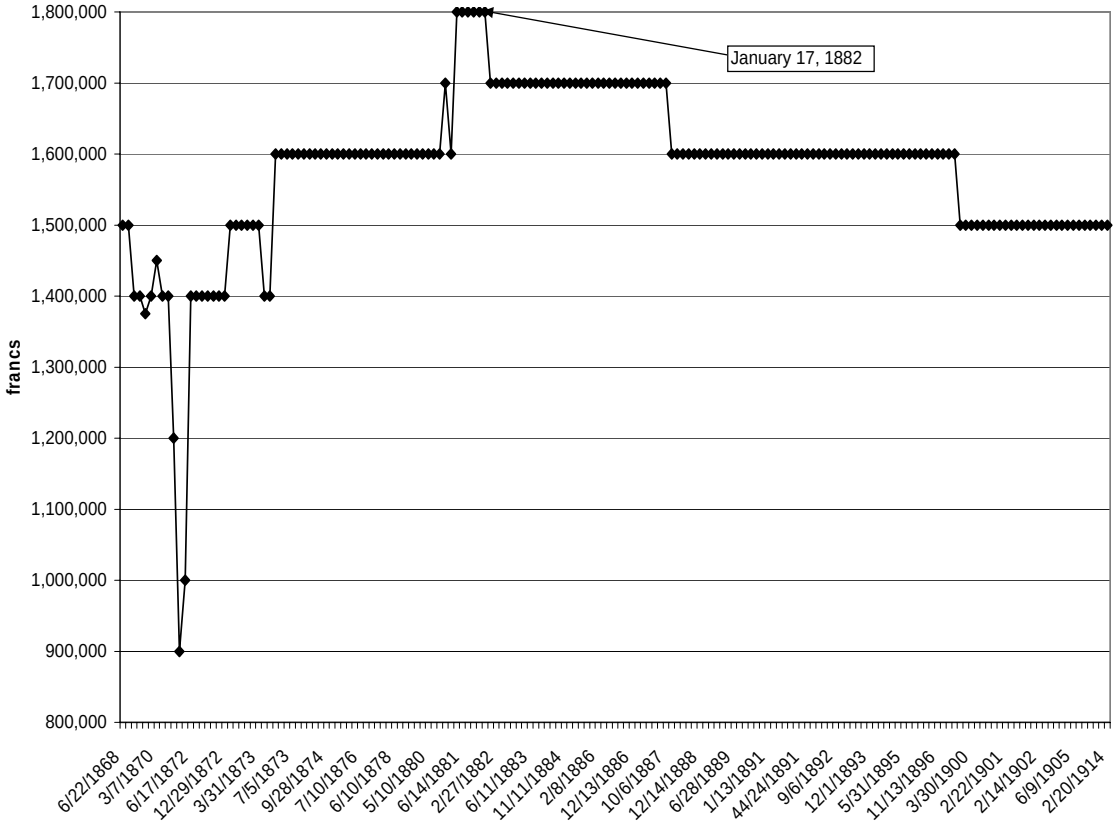


Source: Arbulu (1998)

The brokers found the market extremely profitable. Not only did they benefit from increased volume that yielded more brokerage fees, but they also profited from the *reports*. The rising value of their offices is seen in Figure 4. Unlike the free market for New York Stock Exchange seats, the market for "seats" on the Paris exchange was influenced by the *chambre syndicale*, which gave out prices in response to inquiries by brokers interested in selling their offices and carefully vetted new brokers. However, the *chamber syndicale* did respond to market pressure; and prices moved steadily upwards from 1.4 to 1.8 million francs from 1873 to 1881.[26]

[26] After the long period of depressed seat prices following the crash, the Ministry of Finance took over the market and set a price of 1.5 million francs.

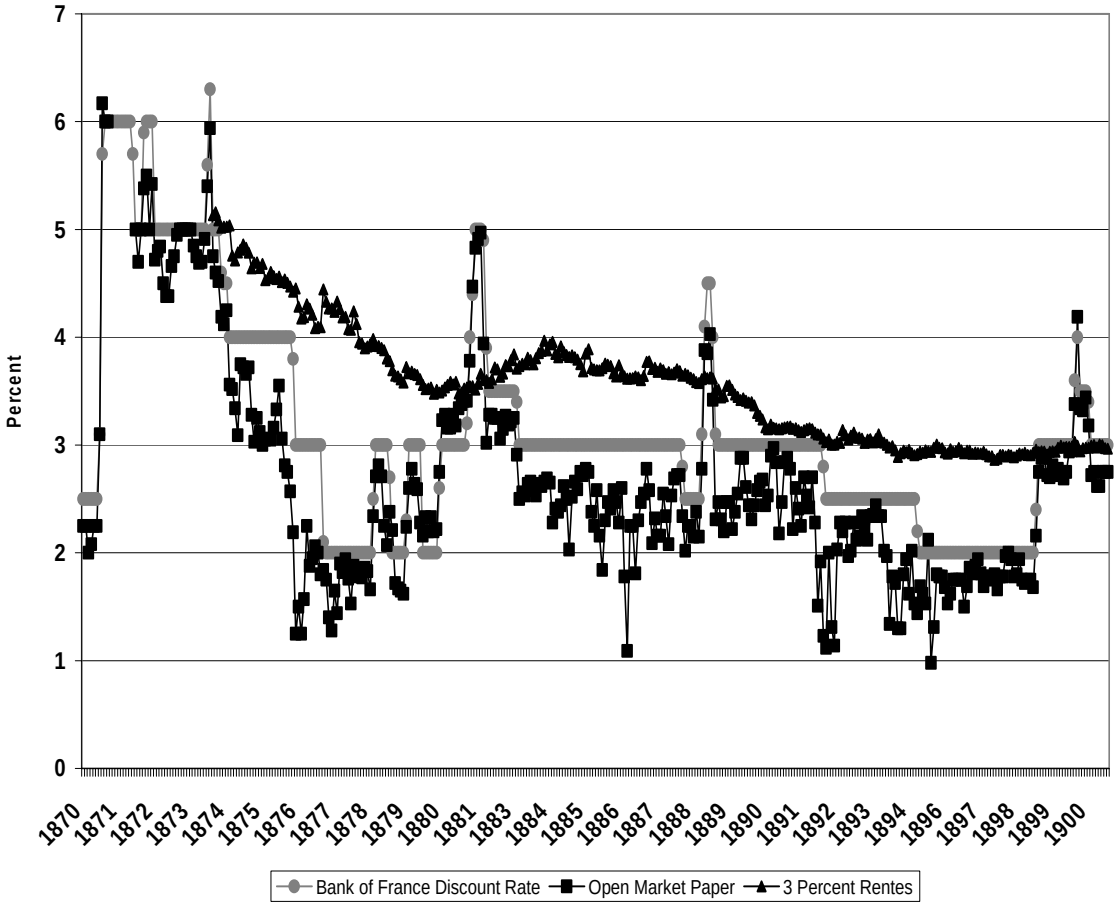
Figure 4
Price of a Broker's Office on the Paris Bourse
1868-1914



Source: Chambre Syndicale de la Compagnie des Agents de Change, *Séances*, Vols. 22-36.

Yet, in spite of their prosperity, many brokers became concerned. The *syndic* was alarmed when the exchange was overwhelmed on the settlement days, with increasingly long nights and long delays in clearing trades (*Compte rendu*, 1881, p. 1-2). In his 1882 annual report, the *syndic*, with some benefit of hindsight, described the madness that overcame with market, claiming that he had been appalled by the rise in speculation and had counseled prudence. He wrote, "It sufficed to announce a new company, sell it shares and launch a new one." He blamed the press and bankers for inflaming the appetites of investors and compared the fever that hit Lyon with the madness of Mississippi Bubble.

Figure 5
Yields on French Securities
1870-1900



Source: NBER, www.nber.org, Macro history database, Series 11021, 13013, and 13017

But as the market reached new heights, interest rates began to rise. In this favorable market, the French Treasury had issued a billion francs of 3% notes in July 1881. It attempted to market the issue directly to the public by permitting installment payments, but this feature enabled leverage speculation using the *reports* (Say, 1886). Then, a refinancing of the Italian debt produced a capital flow to Italy. When the Bank of England raised its discount rate, the Bank of France followed and increased its lending rate to 4% on August 25 1881, and 5% on October 20, 1881. The Bank of France's discount rate and the yields on the *rentes* and open market paper (used for international trade) are shown in Figure 5. Open market paper had hovered at just over 3% for nearly a year when the discount rate was 3%, now they both jumped to 5%. During the boom

years, the yield on the *rentes* had steadily declined; yet the yield curve, implicit in the difference between the yields on the *rentes* and open market paper, remained upward sloping. Now, the yield curve quickly flattened in late 1881, suggesting the imminence of a recession.

As the boom continued, the *reports* became very expensive, although they varied depending on the security and the lender. According the Bouvier (1960), the *reports* for blue chip stocks cost 4 to 5% at the end of 1880, 8 to 10% in the Spring of 1881, then 10 to 12% in late 1881. Flandreau and Sicsic (2003) find that rates for the securities of the major financial institutions were above 10% with the cost for carrying stock of the Banque de Paris et Pays-Bas at 15% and for the Union Générale at 29%. These high rates and especially those for more speculative stocks strongly suggest that lenders were demanding a premium as the market moved higher, sensing a collapse was imminent. These developments resemble those in the American call loan market at the peak of the 1929 boom. Rappoport and White (1994) showed that the rising interest rate premia and climbing margin on these loans collateralized by stock indicated that the crash was anticipated. Savvy French contemporary observers recognized that at these rates sustaining a bull market was impossible (Say, 1886).

Some major institutions, like Credit Lyonnais began to curtail their lending and promotion of new issues (Bouvier, 1960). When the Marseilles branch of the bank experienced a run in October 1881, Henri Germain, the head of the bank, ordered a reduction of *reports* on the Lyon and Paris exchanges, though they were allowed to finance the bank's own stock (Bouvier, 1968). The French Treasury, worried about the falling price of its new issue put 53 million francs into *reports* in early January (Say, 1886).

The collapse began when the Austrian government refused to give the Banque de Lyon et de la Loire a concession for the creation of a Banque Maritime de Trieste (Bouvier, 1860). The bank's shares fell from 1400 francs on January 4, 1882 to 540 francs on the January 13. Investors in the forward market who had purchased shares for the mid-January settlement at 1800 francs faced huge losses. At the same time, the price of a share in the Suez Company, a leading issue, fell from 3,440 francs on January 7 to 2,900 francs on January 14.

In this gathering storm, the price of Union Générale began to collapse. Although its true condition only became clear later, it was compromised by serious financial irregularities. The bank had not succeeded in selling all its capital and gave fictitious subscriptions to bolster demand for its successive capital increases. In the final issue of 50 million francs in 1881, the bank held back 31,389 shares out of 100,000. Not only did Union Générale have less capital than it had reported, but it was also heavily trading in its own stock. In addition, the bank falsified its quarterly report of September 1881, showing a fictitious profit of 34 million francs. On January 5, the first cash price of a share was 3040 francs, with the forward price hovering between 3020 and 3060 for the upcoming settlement. The cumulative bad news brought both prices down to 2800 francs by January 14.

A crisis loomed for the upcoming settlement on January 15, 1882 on the smaller Lyon Bourse where many of the new intermediaries had opened. The structure of the 20 broker Lyon Bourse was similar to the much larger Paris exchange, where a common fund also guarded against counterparty risk. Given that the promotion of many new speculative issues financing development in the Balkans was centered in Lyon, numerous clients in the forward market were trapped by the fall in share prices. Unable to settle the contracts of ruined investors, brokers' liabilities mounted, and the Lyon *chamber syndicale* decided that the exchange should cease operations on the evening of January 19; the agents closed their books on the twentieth and sought out assistance in Paris.

V. Crisis on the Paris Bourse

The crisis gained speed after the mid-January 1882 settlement. When, on January 18, the Banque de Lyon was hit by a run and closed its doors, the cash and forward prices of Union Générale, which had drifted down to 2390 and 2400 francs, collapsed to 1400 and 1300. Although Bontoux desperately tried to save the bank with an infusion of new capital, it was shut down on January 30. On that day, the cash and forward prices of Union Générale stood at 500 and 600 francs on the Paris bourse. In February 1882,

Union Générale went into bankruptcy.[27] The whole market was convulsed by the news of its falling share prices. Overall, the Paris market, as represented by the index in Figure 3, fell 7.3 percent from December 1881 to the end of January 1882.

Many of the speculators in the forward market for Union Générale and other securities were unable or unwilling to cover their rapidly growing losses as the end-of-January settlement approached.[28] Vidal (1910) reported that "many persons occupying a certain social standing did not hesitate to refuse to meet their obligations" as the law permitted a plea of gambling to avoid payment of a forward contract. As the exchange and its brokers were obliged to carry out the orders placed with them, a wider crisis loomed.

The key question that beset both the Paris and Lyon exchanges was what would be the end-of-month settlement price. Typically, this rate was set by the *chambre syndicale* on the first day of settlement, using the cash price on the first day of the month. It was the mandated price for *reports* and exchanges between agents, permitting clearance without the transfer of money and certificates. The settlement price was passionately discussed. Would the settlement price be the price of securities before or after the collapse of the market? The *reporteurs*, the bankers, and the bears demanded that the use of the February 2 price. The *reportés* and the bulls wanted to use the prices on January 19 when the Lyon brokers shut down their market. The higher the price, the smaller the loss they faced---and the differences were staggering. A purchaser of a forward contract of Union Générale on January 17 promised to pay 2400 francs a share at the end of the month. The prospect of reselling at the January 19 cash price of 1300

[27] Although he had engaged in fraud, Bontoux's enterprises were grounded in the development of the Balkan railroads; in bankruptcy, his enterprises eventually paid out over 80 percent of their liabilities After the crash, the Comptoir d'Escompte de Paris picked up the pieces, and the Vienna-Constantinople line via Belgrade opened in 1888. (Bouvier (1960), p. 104, p. 229). In March 1883, the Cour d'Appel de Paris condemned Bontoux to five years in prison for fraud. While on appeal, Bontoux fled France. (Bouvier, (1960), pp. 214-218). Bontoux claimed that the Jewish and Freemason bankers wanted to see him fail. His defenders claimed that he was a victim of a "*syndicat à la baisse*" a bear pool run by the Jewish bankers, Crédit Lyonnais, and the Banque de Paris et des Pays-Bas. The press on the right took up Bontoux's claim that Jewish finance and freemasons in the government had conspired to bring down Union Générale. This idea gained wide currency. See Emile Zola's novel *L'Argent* (1890) and Ferguson (1999, pp. *262*-263.).

[28] The financial community denounced investors who walked away from their contracts; and on February 8, 1882, the Paris Chambre de Commerce passed a resolution calling for the government to change the law. (Vidal, 1910, pp. 211-214).

francs was painful, but it would be worse if the February 2 cash price of 400 francs was the settlement price. Although the bulls lobbied hard for high prices, neither François Allain-Targé, the Finance Minister nor his successor, Léon Say, supported them; and the Paris Bourse chose the February 2 price of 400 francs for its settlement price (Bouvier, 1960). At the same time, the Treasury was unable to withdraw its 53 million francs in the *reports* without precipitating further collapse and so raised its stake to 65 million francs by the end of January, which was then increased to 165 million francs for the February settlement.[29]

Meanwhile, the question of how to finance the upcoming settlement loomed. Many customers and certainly some brokers would not be able to honor their commitments, upsetting an orderly settlement. The common fund could not cope with systemic risk. The crash of 1882 was a shock so large that it exhausted the fund's capital and immediate additional assessments would have been insufficient to permit the market to continue to function.[30] To meet this crisis, the Compagnie held an emergency General Meeting on January 25 and gave the *syndic* the power to contract an 80 million franc loan. With the approval of the government, the Bourse obtained credit from the Bank of France, intermediated by private bankers and financial institutions because the Bank could only provide a loan upon collateral of bankable paper that the brokers did not possess. The *chambre syndicale* created 160 ten-year bonds of 500,000 francs carrying 5 percent interest. In turn, the bankers would receive these bonds and issue three-name, three-month paper that could be discounted at the Bank of France. The solution was for the Bank of France to manage the systemic risk by becoming the "insurer of last resort" (Bernanke, 1990).

On January 30, 1882, this operation was carried out and the Compagnie des Agents de Change borrowed 80 million francs to ensure that its members' obligations were honored, thereby preventing "an immense disaster that could upset all of Europe's

[29] Given his free market principles, Finance Minister Say (1886) went to great lengths to justify his actions. By March, the Treasury was able to cut its funding of *reports* by half, finally ending this operation in July 1882.

[30] Unlike private insurers, the Bourse could not exclude systemic shocks by setting some limit on the common fund's guarantee because falling prices might provoke a more rapid collapse when the market approached the limit.

financial equilibrium."[31] On the first day of the end-of-month January settlement, 14 agents asked for assistance. All totaled 66,800,000 francs were requested, leaving 12,000,000 left from the loan. Combined with the remaining 7 million from the Common Fund, there were only 19 million francs left for the second day of the settlement. This sum did not suffice and the *syndic* obtained a second 18 million loan from the Rothschilds. Once the liquidity crisis was overcome, this loan and 50 million francs of the 80 million were quickly repaid.[32] The *syndic*, Ferdinand Louis Moreau expressed his hopes that the remaining eight indebted brokers would soon be able to repay the advances they had received (*Compte rendu*, 1882). In a letter of July 28, 1882, he reported that the debt now stood at 29,250,000 francs. Moreau found this indebtedness humiliating and begged the members to consider raising 350,000 francs each for the common fund from their own pockets and those of their partners.

While the Paris stock brokers were bailed out, no such aid was forthcoming for Lyon and many *coulissiers* suspended operations. A delegation of Lyon's financial elite pleaded for relief with the Bank of France, the Minister of Finance, leading bankers, and the President of the Republic. But, they were told that the government would not "intervene in private calamities" (Bouvier, 1960, p. 193). This hesitancy probably reflected the political leanings of the center-left government, which had little interest in assisting the conservatives of Lyon. Furthermore, although Lyon's collapse had been precipitated by the same events, Paris, the center of the nation's financial markets, could be aided independently of Lyon. The situation of the Lyon brokers was desperate; there were enormous inter-broker debts and debts between brokers and their clients. The net debt of the brokers was 63.7 million francs alone; the combined total reached 191

[31]The bankers consortium contributed the 80 million francs accordingly: the Rothschilds 10 million and 2 million each from Heine, Gunzburg, Stern, Hensels, Camonds Vernes, Cohen, De Machy et Silliere, Gillet, Hottinguer, Marnard , and Mallet frères. One million francs was provided each by Hannadex, Péreire frères, Mirabad, and Donon, Alberti. Five million were provided by Crédit Foncier, the Comptoir d'Escompte, the Banque de Paris et des Pays Bas, Société Générale, Crédit Lyonnais, and the Banque d'Escompte; 3 million from the Société de Crédit, 2.5 million from the Société de Depots et Comptes Courants, and 1 million each from the Banque Hypothecaire, Crédit Mobilier, Crédit Moblier Espagnol, the Banque Ottomane, the Banque Franco-Egyptienne, Crédit General Francais, and the Banque de Constantinople (*Compte rendu*, 1882). The curb market in Paris was also provided with aid from the leading banks of approximately 20 million in advances to the leading firms. According to Bouvier (1960), a total of 175 million francs was required in Paris (including the loans to the brokers of the Bourse and the Coulisse) in order to finance the reports.

[32] *Compte rendu* (1882).

million. In the absence of any aid, the Tribunal de Commerce announced the liquidation of the exchange on January 28. Nine of the twenty brokers on the Lyon bourse proved to be insolvent. A new Lyon *chambre syndicale* was created with a new *syndic* on May 13, 1882, but by July 6, only 16 brokers had joined the revived exchange.[33]

VI. Why Paris? Why 1882?

Why did the Paris Bourse nearly fail in 1882 and not in other stock market crashes? Why did the contemporary New York and London stock markets not experience similar calamities? A definitive answer to these questions is not yet feasible, but a few comparisons provide some useful insights for these questions. There are five possible contributing factors: (1) the absence of legal standing for time contracts, (2) the importance of the forward markets, (3) the size of the crash, (4) the concentration of trading among brokers, and (5) moral hazard, arising from the operation of the common fund.

Although French contemporaries stressed the lack of legal standing for forward contracts as an important factor contributing to the crash, the legal status of time contracts was similar in France, Britain and the United States for much of the nineteenth century. In Britain, Barnard's Act of 1734 prohibited time contracts, including options and forward contracts, imposing stiff fines on the traders and brokers (Banner, 1998). These contracts were void and denied legal recourse, but Barnard's Act did not appear to severely hinder this market. By the early nineteenth century, it was generally conceded that Barnard's Act was ineffective; and it was repealed in 1860 (Banner, 1998). In 1792, New York State adopted a law based on Barnard's Act. Contracts to sell debt or stock that one did not own at the time of the contract were declared void and unenforceable in state courts. Banner (1998) considers New York's law to have been weaker than its British model because it did not explicitly prohibit options or the settling of forward contracts by payment of price differentials, and it imposed no fines beyond refunding the money from the voided contract. Nevertheless, as in Britain and France, markets for time contracts flourished. The New York law was repealed in 1858, long after it was recognized to have had little success in suppressing time contracts. While legal status had

[33] The price of a Lyon broker's office fell from 800,000 to 60,000 francs The stockbrokers of Nice were caught in the panic and their parquet was suppressed by decree in 1889.

been granted to these contracts in Britain and New York a quarter century ahead of France, they were not a source of disaster for the Anglo-American markets hit by crashes when laws were similar to French statutes.

Although the forward market may have been more important in Paris compared to London or New York, we have few measures of the relative importance of time contracts on any exchange in the nineteenth century. Yet, the scanty evidence suggests that time contracts were a significant portion of the business on the Anglo-American exchanges. One well respected early nineteenth century observer, George Carey (1821) estimated that "time-speculations" in London exceeded cash transactions by a factor of ten. On the New York Stock and Exchange Board, Werner and Smith (1991) estimated that time contracts constituted at minimum 20% of the transactions between 1818 and 1840.

This evidence on the first two factors makes it more difficult to argue that the dominance of the forward markets and the absence of legal standing for time contracts were exceptional features of the French market and placed it at special risk. Yet, it was only in Paris, not New York or London, where the exchange felt obliged to set up a common fund when the legal regimes were similar in all countries.[34] New York and London were still concerned about the problem of counterparty risk, but used more limited regulation to manage it. A substantial part of the minutes of the General Committee of the London Stock Exchange in the nineteenth century were devoted to questions of how to discipline defaulting members. For London, higher admission standards, expulsion of defaulting members and increased security bonds appear to have been adequate remedies (Neal, 2004; Neal and Davis, 2006). Similarly, New York expelled defaulting members. Expulsion of a small number of the one or two thousand brokers from an idiosyncratic shock did not disrupt the operations of the exchange, though there would have been losses for individual brokers in the absence of insurance. Systemic shocks---stock market plunges---do not appear to have caused enough broker failures to threaten the existence of these Anglo-American exchanges. Neither New York

[34] The competitor of the Bourse de Paris, the Coulisse had counterparty risk from its use of forward contracts but no common fund. Its absence may be explained by the fact that the Coulisse in this period had no real corporate entity and the legality of its activity in the market was frequently contested, making it difficult for the *coulissiers* to organize a fund and monitor one another.

nor London felt the imperative to mutualize the risk and provide an insurance fund for their brokers.

The size of a shock could have been critical. The ability of brokers to weather a large shock depended on the margin they had demanded from their customers, their own capital and the distribution of defaulting customers. One possibility is that the French *agents de change* were caught up in a speculative bubble and failed to raise margin and capital sufficiently to cover the potential risk of a crash. The general magnitude of the shock in 1882 was large but certainly not the greatest monthly drop in the market. According to Arbulu's index of stocks on the Bourse, the January 1882 drop in the market of 7.3% was only the eleventh largest decline since 1800. If one includes the period up and including 1914, January 1882 falls to twenty-first place. The top two crashes were 48.4% in March 1848 and 13.9% in April 1859; both of which the Bourse weathered. In twentieth century U.S., there were two crashes before the establishment of the Federal Reserve (Mishkin and White, 2003). During the 1903 crash, the Dow Jones index fell 8.2% in October 1903. Then in the more severe crash of 1907, the index fell 9.7% in March, 8.2% in August and 11.3% and 10.9% in October and November of the year. The crash of 1929 sent the Dow Jones tumbling 24% in two days October 28-29, although the Federal Reserve, now in operation, intervened to ensure that banks provided assistance to brokers (White, 2000).

The size of the shock does not seem related to the number of failing brokers in this limited comparison. The seven Parisian *agents de change* who failed as a result of the crash, represented 12% of the members. On the New York Stock Exchange, insolvencies were relatively minor events, even during the worst panics. Although there are no published statistics for insolvencies during the nineteenth century, the percentage of failing NYSE members ranged between zero and 1.23% for the period 1900-1933 (NYSE Yearbooks and www.nyse.org). Thus, during the panic of 1903, when there were 1,100 members of the exchange, 10 failed in 1903 and 6 in 1904. The more severe panic of 1907-1908 brought down 8 members in 1907 and 9 members in 1908. Even the stock market crash of 1929 and extraordinarily volatile years of 1929-1933, only caused 9, 10, 16, 4, and 2 member insolvencies with 1,375 members. The American crashes of 1907 and 1929 are regarded as the end of speculative bubbles; yet broker failures were

minimal, perhaps because NYSE brokers were not sanguine about the boom (White, 2006). On the London exchange, the number of failures ranged from 10 to 49 brokers between 1879 and 1899, representing at its peak 2% of members in 1894. Additional protection to counterparties was provided by the surety bonds posted by each of three recommenders for every member. Bonds were increased from £300 to £500 in 1872 and to £750 in 1874 after the crisis of 1873, only to be lowered in 1879 (Neal and Davis, 2006), apparently containing the risk to the exchange.

The need to control counterparty risk may have been especially high on the Paris exchange because counterparty risk is higher when a broker's trades are highly concentrated with a small number of counterparties, and brokers' activities are not fully diversified.[35] A high degree of interdependence among brokers could trigger a cascade of defaults on settlement day. The contrast between exchanges of this period is striking. While the Bourse de Paris had sixty *agents de change* in 1880, the New York Stock Exchange had 1,100 seats and the London Stock Exchange had just under 2,000 members. Although members on the London and New York exchanges were certainly less well-known to one another than their peers in Paris, creating potential monitoring problems, the magnitude of counterparty risk was apparently, relatively small. A default by one broker on the New York or London exchange would have been unlikely to bankrupt other brokers because their trades were more likely to be widely distributed. But on the Paris exchange, the failure of one *agent de change* might more easily have produced a liquidity crisis.

Perhaps, French brokers were more caught up in the boom market than their British or American counterparts. Unfortunately, we do not have data on the capital of Anglo-American brokers; but there is some evidence that the *agents de change* failed to adequately raise their capital in the course of the stock market boom. Scattered statements on brokers' capital suggest that it ranged from 1.5 to 2.5 million francs and changed little in the boom years of 1880 and especially 1881. Volume, as measured by the exchange's stamp taxes had shown little upward movement until the boom. As seen

[35] Jarrow and Yu (2001) model the pricing of counterparty risk for securities using a double poisson process with jump terms to capture the inter-firm linkages. They find that in the limit, as firms hold well-diversified credit risk portfolios, the counterparty risk part of their default intensities (the likelihood of default per unit of time) declines and disappears.

in Table 1, revenues peaked in 1872 and 1875 at 4.3 million francs (a sum only reached once before in 1860), declining to 3.1 million in 1877 and then rising to 3.8 million in 1879 and 1880. In the boom, revenues from the stamp taxes jumped to 6.2 million francs for 1881. For this fifty percent increase in the previous peak of transactions, there was no noticeable increase in brokers' capital.

Crashes are rare events, and brokers may have given careful consideration and determined that they did not need to raise their capital or they may have believed the overly-optimistic predictions for the market and were carried away by "irrational exuberance." In addition, the *caisse commune* might have given them a false sense of security since it had never failed them before. The incentives to morally hazardous behavior may have increased during the boom. The rise in the common fund's annual reimbursement from 4 million francs in 1880 to 6 million francs in 1881, as the market boomed, suggests that they perceived little increase in risk. The lure of higher returns could have induced more risk-taking by the brokers, considering only idiosyncratic rather systemic risks. Thus, brokers may not have had enough capital in their partnerships to cover potential losses from a crash. In New York or London, brokers may have been more cautious because there was no protection from counterparty risk. A concentration of trades between specific brokers, perhaps a larger forward market, a boom where capital was not increased as the risk of a crash rose, and moral hazard from a mutual guarantee fund appear to be important elements explaining why the crash of 1882 almost closed the Bourse de Paris.

VII. The Clean Up in Paris

After the end-of-January settlement, the Paris Bourse had survived but seven brokers ultimately lost their offices and the exchange was deeply in debt. Details in the archives about the factors behind of the demise of the *agents de change* are sketchy. While the personal dossiers of most brokers are generally complete, all brokers' twice yearly reports of income for the years of the crash are missing. This material appears to have been removed at the time of the crisis, as a lawsuit soon after the crisis indicated

there were no relevant documents present. The dossiers of the individual brokers who failed were apparently "cleaned up," but they still provide some evidence.

Four brokers immediately failed as a result of the crash and they formally gave up their offices on the same date, March 29, 1882. They were Paul-Edmond Mahou who had been an *agent de change* since 1854, Augustin LeGrand who started in 1868, Denis-Paul-Alfred Sucède who took office in 1873 and Albert-Marie-Henri Ramel who joined the bourse in 1865. Two additional agents gave up their office on April 24, 1882, Phillippe-Adolphe Evrard (1868) and Marie-Philippe-Adolphe Tollin (1870). These departures and that of Leon-Edouard Lehoux (1862) who left office on May 29, 1882 also appear to have failed as a consequence of the crash.

Typical of the empty dossiers is the one for Mahou. He was deeply involved in the speculative ventures that had been launched in Lyon, notably the Banque de Lyon. Unfortunately, Mahou's dossier does not allow us to reconstruct his demise as most material for the period is missing. His only income reports are for 1863. Sucède's dossier has more information about his efforts to repay his debts. Reports of income indicate that his brokerage, operated with a staff of about 18, was quite profitable up to the crash. Except for a bad second semester in 1875, brokerage fees yielded the partnership earnings of roughly 260,000 a year on a capital of 2,225,000, of which he had contributed 1,001,250 francs.[36] In his dossier, there is an undated draft of an agreement between the *syndic* and Sucède on how to resolve his debt. He owed the common fund 537,946 francs on February 1882 and proposed to extinguish this debt with a cash payment of 200,000 francs and a transfer of the ownership of 12,000 francs of 3 percent *rentes* (nominally worth 400,000 francs).[37] Yet, these and the payments of other brokers to the common fund were very slow in arriving.

By July 1882, 29.3 million of 80 million franc loan remained to be paid. If they stayed in debt, brokers feared for the future of their monopoly, which was criticized by many politicians. How could the brokers who were collectively responsible quickly pay off this debt? There was considerable disagreement because the brokers were a

[36] Two of his partners were Isacc and Eugène Péreire who contributed 333,750 and 445,000 francs, in addition to a M. Guastalla who provided 445, 000.

[37] The agreement indicated that a certain Madame Waille would continue to receive interest on the *rentes* for her lifetime. (Dossier Sucède)

heterogeneous group; some remained strong after the crash while others were nearly ruined. In the meeting of the *chambre syndicale* on October 13, 1882, the *syndic* Moreau offered several choices.[38] The Compagnie could obtain a long-term loan and slowly pay it off, but this was felt to be politically undesirable. Alternatively, the brokers would have to raise the money themselves. They argued over whether they would each have to pay an equal amount or figure out some way to allocate it proportionally. They settled on a fixed contribution of 300,000 francs for each of the sixty brokers.[39] This raised 18 million francs, which combined with the 8.7 million francs left in the common fund, just covered the repayment of the bank consortium's loan. This internal loan of 27.4 million francs appears in 1882 in Table 2 as advances to brokers; and when combined with cash, *rentes*, and *reports* of 2.3 million, yielded assets of 29.7 million francs for the common fund. The jump in the size of the *caisse commune*, seen in Figure 2, did not imply a greater level of safety for the Bourse, which is represented by the "net" common fund.

The mid-1880s were lean times for the brokers, a stunning reversal of their earlier prosperity. When the General Assembly met on the eve of the crash, on December 19, 1881, they basked in their good fortune. Revenues for the Compagnie had jumped from 5.0 to 7.5 million francs. Even though trades of government securities had declined, surging volume had raised receipts from the stamp tax and the *reports*. The brokers did take some precaution, creating a new secondary reserve to bolster the common fund. Yet, they confidently raised their rebates from a total of 3,960,000 francs in 1880 to a round 6,000,000 in 1881.

The crisis crushed the Bourse; there would be no rebates. As volume fell after the crash, revenues to the Compagnie plummeted. Even though they were offset some by the temporary increase in interest on *reports*, income was down to 6.2 million francs and expenses rose to 2.9 million francs because of interest of the its loans. The *caisse commune* had only 2.3 million to meet any new crisis. The whole of the surplus of 3.2 million francs for 1882 had to be transferred to the amortization account to begin the process of accumulating the funds needed to pay off the internal loan.

[38] Chambre syndicale, *Séances*, Vol. 26, October 13, 1882.
[39] One agent appears to have borrowed 500,000 francs from a private source to pay this sum and continue with business. Many others appear to have renegotiated their contracts with unhappy partners.

The crash also took its toll on the officers and brokers. The *syndic* Moreau retired immediately after seeing the Bourse through the crisis and was succeeded by August Fernando Hart. He had been a broker on the exchange since 1853 and the syndic for 21 years. He was careworn and died shortly thereafter.[40] The value of the Bourse as financial institution was impaired and openly questioned in Parliament. Even though, the *chambre syndicale* was resistant to allow a drop in the price of brokers' offices, it lowered the quoted price for an office from 1.8 in January 1882 to 1.7 million francs in February 1882, as seen in Figure 4.

In 1883 and 1884, the revenues of the Compagnie continued to decline as the stamp tax fell with volume, and expenses remained high because of interest costs, legal fees and publicity. In addition to lower revenues, collection of debts proved difficult. The *syndic* reported that the Compagnie was not treated the same as other debtors of Union Générale.[41] Even the welcome 1885 law, legalizing the forward market, met with complaints because it did not do so retroactively, preventing the *chambre syndicale* from going after defaulting clients.[42] In 1884, the collections of debts in addition to ordinary revenues permitted the reconstitution of the brokers' 6 million francs security bond in the common fund and the reimbursement of three million of the brokers' 18 million franc loan.[43]

By 1887, revenues had recovered to 6.6 million, producing a surplus of 4.6 million. The Common Fund reached 26.8 million francs, of which amortization accounted for 20.6 million, approaching the 22.5 million francs loans outstanding to brokers.[44] In 1888, there were no reported collections of the stamp tax in the first half of the year; however, it appears that the *chamber syndicale* decided to directly grant 50,000 francs to each agent, which would represent 3 million francs in revenue from the stamp tax. Finally in 1889, the accumulated surplus in the amortization fund permitted the repayment of the internal loan and left the common fund recapitalized with 9.5 million

[40] *Compte rendu* 1884, p. 1.
[41] *Compte rendu* 1883.
[42] *Compte rendu*, 1885.
[43] The 18 million franc loan was "added" to the bonds of the brokers, so that instead of being recorded as 6 million, they had nominally 24 million in 1883, though accounting shifted the figures to the secondary reserve in 1884, showing 15 million (*Compte rendu*, 1884).
[44] The broker Vuaflart appears to have defaulted. "L'affaire Vuaflart," Chambre syndicale, *Séances*, Vol. 27, pp. 94ff.

francs. The *syndic* Hart commented that the "this felicitous result of the complete amortization of the account for loans to brokers has allowed the rebates of the stamp taxes to begin." In a patriotic metaphor, recalling the departure of occupying troops after the Franco-Prussian war and the payment of reparations, he considered the repayment a solemn date for the Compagnie when she could celebrate the "liberation of her territory."

The annual report for 1890 showed a surplus of 3.6 million, allowing the secondary reserves of the Common Fund to rise to 10.6 million francs, well above the pre-crisis level. Rebates could begin once again after an interval of nine years. The common fund continued to modestly increase until 1893 when a decline in revenues coupled with high expenditure caused it to fall.[45] In spite of the disaster in 1882, the brokers did not allow the surplus to build up a greater cushion. In fact, from 1894 to 1897, the secondary reserve was allowed to slowly shrink. The last substantial increase in the common fund came from the security bonds of the ten new brokers, adding 10 million francs in 1899. There was no recorded discussion of these issues; however, the brokers may have resisted any increase in the tax to support the common fund as they struggled to compete with the Coulisse, and the indirect loan from the Bank of France may have created a moral hazard, reducing their concerns about counterparty risk.

VIII. Long-Term Consequences for the Bourse

The Bourse's near collapse in 1882 did not, however, lead to reform, in spite of political pressure for change from some radical deputies and the press and competition from the Coulisse. In February 1882, a bill was proposed to abolish the Bourse's monopoly and allow free entry into stock broking. The bill failed to gain any traction, and the only significant reform to emerge from the events of 1882 was the 1885 legalization of the forward market, which while it reduced some of the counterparty risk, did not eliminate it.

The need to repay its debt weakened the exchange in its competition with the Coulisse. Some curb brokers failed; but the survivors did not bear the burden of repaying collective debts, as did the *agents de change.* The recovery of the stock market did not restore the pre-eminence of the Bourse. The *agents de change* and their clerks were fixed

[45] The relatively modest building reserve of 200,000 francs was depleted in 1894 and 1895.

in number, requiring a network of financial institutions, bankers, and *remisiers* to transmit orders to the brokers. The Coulisse was free to expand and traded more new securities, becoming the dominant market. Comparative data on volume is not available until the introduction, in 1893, of a tax on transactions. For the years 1893-1895, the Ministry of Finance reported that the *agents de change* of Paris paid 11.8 million francs in tax, the *bourses* in other cities 1.7 million francs, and the *coulissiers* and banks 22.1 million francs.[46] The Paris Bourse's low share seems to reflect a stagnation of activity on the exchange. As measured by the stamp tax contributed to the common fund in Table 1, volume on the Bourse remained relatively low after the clean up from the crash. Thus, it is not surprising that the value of the office of an agent de change declined. The year 1882 marked the peak price for the Paris brokers, and implicitly the value of the exchange as an institution. Figure 4 shows that, although the *chambre syndicale* tried to maintain high office prices and resisted lowering them, prices only moved downwards in spite of a booming market for securities in the 1890s.

A strange twist of fate reinvigorated the unreformed Paris Bourse. The next market crash did not hit the *parquet* but the Coulisse. Beginning in 1894, a boom began in South African gold mining stocks, following their immense popularity on the London exchange. These new foreign mining shares were listed by the Coulisse. By the end of 1895, there were 66 new gold, coal and colonial exploration companies added to the Coulisse's cash market and 32 to its forward market. The boom was also facilitated by falling interest rates as seen in Figure 5. The failure in January 1896 of the Jameson raid to provoke a British takeover of the Transvaal Republic produced a crash in gold stocks. As the Bourse, whose share index declined a scant one percent, had been excluded from this market, the Coulisse, where these stocks had been vigorously promoted, was held to be responsible.[47] Unlike 1882, the Bank of France did not intervene, its discount rate remained unchanged, and *coulissiers* were allowed to fail. No general liquidity crisis, as evident in the absence of any interest rate spikes in Figure 5.[48]

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[46] *Bulletin de Statistique et de législation comparée du Ministère des Finances* (January 1898) as reported by Vidal (1910), p.233.

[47] According to Arbulu's index (1998), the maximum decline for the Bourse's stocks was 1.2 percent over the period October 1895 to March 1896.

[48] The only intervening crisis arose from the failure of the Comptoir d'Escompte in 1888. The Banque de France raised the discount rate and acted as a lender of last resort.

The crash politically undermined the Coulisse, leading to a reorganization of the securities markets, which reinforced the position of the Bourse. The Compagnie des Agents de Change deftly supported the pro-tariff and bimetallist interests and gained the government's support. The Coulisse also suffered from attacks by the anti-Dreyfus, anti-Semitic nationalist press as many of the curb brokers were not native-born Frenchmen and included many Jews. The law of April 13, 1898 established the "solidarity" of the *agents de change* and formally required the *chambre syndicale* to execute the trades of a defaulting broker. The capacity of the Bourse was increased by raising the number of brokers to 70, and the maximum number of head clerks for a broker was upped from four to six. The Coulisse was blamed for stock swindles, tax frauds, and bear raids on the French *rentes* and Russian bonds. In response, Parliament reinforced the Bourse's monopoly. Trading by the Coulisse in listed securities was proscribed, limiting the curb brokers to trading in the *rentes* and unlisted securities. Although the brokerage rates were lowered in 1898, a new law in 1901 raised them for the strengthened monopoly. Defeated, the *coulissiers* formed two *syndicats* one for the cash and the other for the forward market; and in 1901 a *modus vivendi* was established between the Compagnie and the two *syndicats*, permitting the *coulissiers* to act as *remisiers* to the parquet in addition to trading unlisted stocks and the *rentes.*[49]

The Paris Bourse just avoided a complete collapse in 1882. The general decline in the market ruined many traders and, in turn, destroyed some brokers, weakening the rest. Not only was the margin demanded of clients insufficient to cover losses from the crash, but the common fund was exhausted and no quick assessment of the solvent brokers was possible. Thus the worst case scenario for contemporary futures markets was played out on Europe's second largest exchange in 1882. Fortunately, the Bank of France recognized the danger of an expanding liquidity crisis and step in to provide credit to the market, acting appropriately as the "insurer of last resort." The Bank of France was careful to distinguish this shock as a systemic one, compared to the crash of the gold stocks, where losses did not threaten the liquidity of the financial system and hence did not require intervention. Its prompt action in 1882 may have limited contagion from the crash, explaining why it did not reverberate more strongly beyond France's borders.

[49] For details, see Boissière (1908) and Vidal (1910).

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