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Observing bailout expectations during a total eclipse of the sun

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JEL Classifications: F33, F34, G1, N24.

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Observing bailout expectations during a total eclipse of the sun

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Abstract

The literature has not reached a consensus yet regarding the existence of sovereign creditor moral hazard. Exploiting an exceptional historical example, this paper proposes an original method to address this issue. As the corona which are observable only during a total eclipse of the sun, market-specific prices of repudiated bonds are observable only when extreme conditions (a war, in this instance) segment the markets. Such events are very rare but insightful as they allow for isolating pure country-specific bailout expectations. The paper shows that bailouts do create creditor moral hazard. Based on an impulse response analysis, the econometric results further emphasize the influence of bailout expectations in sovereign bonds valuation.

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Observing bailout expectations during a total eclipse of the sun

1. Introduction

Bailouts have been accused to foster a double-sided moral hazard[1]. On the one hand, by bailing out a country, International Financial Institutions provide incentives to sovereign debtors to default instead of initiating politically costly macroeconomic reforms. On the other hand, creditor moral hazard arises when bondholders lend too favorably to risky borrowers because they expect a third party to bail them out. Even though a large literature has discussed the theoretical impacts of bailouts, empirical evidence is hard to assess (Rogoff, 2002).

Dreher (2004) reviews the stylized facts which could relate IMF interventions and moral hazard. Testable consequences of such link proposed in the literature include bond spreads decrease in level (Eichengreen and Mody, 2000; Lane and Philips, 2000; Kamin, 2004; Noy, 2004; Dell'Ariccia et al., 2006) or in variability (Dell'Ariccia et al., 2006), longer term and/or cheaper funds flow to emerging markets (Mina and Martinez-Vasquez, 2002; Kamin, 2004), slower bond reaction to changes in fundamentals (Kamin, 2004, Dell'Ariccia et al., 2006, Lee and Shin, 2008).

Unfortunately, empirical results heavily rest upon the econometric approach adopted and no consensus has been reached so far by the profession on the existence of a moral hazard effect. Lane and Phillips (2000) analyze bond spread reactions to events which should drive bailout

[1] This accusation can be traced back at least to the beginning of the 1980's. For a recent review of the literature regarding bailouts and moral hazard see IMF (2007).

expectations and find very little signs of creditor moral hazard. Only in one case do they detect a significant effect: the 1998 Russian default. According to Kamin (2004), prior to 1995 the nature of the IMF interventions could not lead to creditor moral hazard, and afterwards evidence is scarce.

Other authors, however, argue in favor of a strong creditor moral hazard effect. Dell'Ariccia *et al.* (2006) analyze bond spreads across emerging countries. According to their view, the non-intervention in Russia in 1998 represented a notable change in the IMF policy which influenced significantly bailout expectations. Empirical evidence is provided through a larger dispersion in the spread series to be attributed to a reduction in bailout expectations associated to the fundamentals becoming more relevant in bond valuation. Dell'Ariccia et al. (2006) conclude in favour of the existence of creditor moral hazard prior to 1998. In the same spirit, Lee and Shin (2008) show that when bailout probabilities differ across countries, expectations of the IMF lending lowers the relationship between fundamentals and bond spreads. This effect, attributed to moral hazard, is observed even after the 1998 Russian non bailout.

As a matter of fact, the empirical studies face a serious identification problem. Indeed, in bond prices series, bailout expectations interact with several other influences and no satisfactory method has been put forward yet for disentangling them. In other words, researchers lack clear-cut counterfactual situations. Eichengreen and Mody (2000) point out methodological problems: A decrease in bond spreads following an IMF intervention could either signal creditor moral hazard or reflect expectations that the defaulting country would commit itself to follow IMF-suggested reforms.

Ideally, one would compare simultaneous reactions of a given bond with and without bailout expectations in a context excluding the imposition of macroeconomic reforms. This could happen only if an explicit discriminatory policy were in place making the bail out possible in a given country and impossible in another one. In such case, any difference between the bond prices could be attributed with no doubt to bailout expectations, up to measurement errors. This ideal setting is as rare as a total eclipse of the sun. However, history provides a unique opportunity to observe such a remarkable episode[2].

Russian bonds had been traded in Paris and London during the end of the 19th century. In 1918, the Bolsheviks repudiated the Russian debt. The bonds continued nonetheless to be traded in both cities but capital controls due to WWI segmented the markets by preventing international arbitrage. Soon, the French government signaled that it would consider bailing out the Russian bonds, whereas the British only briefly considered such a move. Prices of Russian bonds in Paris and London started to diverge, reflecting the different bailout expectations on each market.

This very special episode resulted from the conjunction of two events: the impossibility of international arbitrage due to war restrictions and the repudiation of a sovereign bond by its issuer. Our empirical analysis based on impulse reaction functions provides two main insights on bond price reactions in presence of a bailout. First, bailout expectations have a significant impact on bond prices. Second, they alter the whole dynamic of price formation: bonds subject to bailout expectations show different market dynamics than bond not expected to be rescued. The analysis suggests that bailout expectation become central in bond valuation. As a

[2] Actually this historical exception is virtually impossible nowadays. Indeed, it is unlikely that an International financial institution would bail out say, an Argentinean bond traded in London, and not the same bond traded in Paris. Furthermore, even if it did happen, international arbitrage would quickly reduce any difference attributable to the bailout.

consequence, the correlation between the cross-listed returns of the same bond falls dramatically when investors from one market only, do expect to be bailed out. Furthermore, the interaction between the segmented markets tends to disappear, each one reacting mostly to local innovations.

This paper is organized as follows. Section 2 describes the markets organization during WWI leading to the arbitrage impossibility. Section 3 presents the original database and tests for the difference between the Russian bond prices in Paris and in London, first on the complete no-arbitrage period, then on the two sub-periods lying respectively before and after the repudiation announcement. Section 4 presents the impact of bailout expectations on the bond price dynamics. Section 5 concludes.

2. The French and British bourses during WWI

The no-arbitrage argument is a pillar of financial valuation techniques. According to this principle, cross-listed bonds should have the same value on all markets, ignoring market microstructure distortions and transaction costs. Up to the outbreak of WWI, international arbitrage took regularly place between exchanges and prices from one financial market were closely followed on the others. WWI had a dramatic impact on the functioning of the stock exchanges both in France and in Great-Britain. In order to avoid panic, the regulatory authorities first suspended stock exchanges' activities and the London Stock Exchange closed on July 31, 1914 followed by the Paris Bourse on September 3, 1914. However, since both countries needed to launch new state loans to cover war expenses, different legislative steps were soon undertaken to reopen the London stock exchange and the Paris Bourse. They respectively resumed trading on January 4, 1915 and on December 7, 1914.

In order to prevent the collapse of the British financial system, the reopening of the London market was accompanied by a temporary moratorium on loans and the imposition of minimal prices on shares and bonds[3]. The trade with Germany was suspended and forward transactions and arbitrage were forbidden, not only to prevent large variations in the pound exchange rates, but also to avoid enemy trading. By December 1914, all foreigners were prohibited to sell securities in London. According to a contemporaneous *Financial Times*[4] article, the London stock exchange became "a more insular institution". As stated by Michie (1999, p. 157), "as the war progressed the Treasury's restrictions and activities, along with the ban on arbitrage, gradually destroyed much of the Stock Exchange's international business". During the war, minimal price restrictions on various assets were progressively lifted and finally abolished on July 3, 1916. However, several restrictions survived the war, and dealings in securities held outside the country would not resume before August 1919, whereas arbitrage possibilities came back only in September 1919 (Michie, 1999).

In France, the authorities reacted similarly to the war outbreak. The Paris Bourse remained closed from September 8, until December, 7, 1914. When it reopened, only 50 securities out of 1330 were readmitted. Forward trades were banned and would only reappear in January, 1920. A law passed on September, 20, 1915, forbade the introduction of foreign sovereign bonds on the French soil. After January 8, 1916, trading bonds and stocks belonging to foreigners or to French living abroad became impossible unless these bonds had been bought after August 1, 1914.

[3] On January 4, 1915 a list of fixed minimum prices for 52 foreign government bonds was published. Only those having an international market, and in which therefore, attempts might be made to effect sales on behalf of enemy holders were concerned (*Financial Times* January 4, 1915). It seems however that the 1909 Russian bond, on which this study focuses, was not concerned by this measure, probably because it was traded only on Allied (Paris) and on neutral (Amsterdam) stock markets.

[4] *Financial Times* January 4, 1915

In summary, international arbitrage between France and the UK was impossible during a period ranging from January 8, 1916 to August 31, 1919. Bonds traded on one market could no longer be transferred to another one. As a consequence, prices of internationally traded bonds stopped reflecting an average international consensus. In segmented markets, prices became mainly affected by national expectations. In particular, sovereign bond prices in Paris and London could react independently to divergent local repayment expectations.

3. Data series and historical background

During the 19th and early 20th centuries, the Russian tsarist bonds were spread over several European financial bourses. By the beginning of the 20th century, in view of the amounts issued, Russia had become one of the largest borrowers in the world (Ukhov, 2003). Liquid and convertible in various currencies, Russian bonds were present in many investors' portfolios. During the war, Russian bonds located in France or Great-Britain had been serviced by the French and British government, respectively. This measure had been taken to help an Ally country in its war effort and to avoid shipping bullion which could have been seized by enemy forces. As a consequence, Russian bond prices were still traded at a fairly high value at the outbreak of the February revolution. Following the political unrest, bond prices experienced nonetheless a progressive decline. The October revolution, which brought to power the Bolsheviks, led to the denunciation of the tsarist debts. However, the effective repudiation by the Soviets in early 1918[5], did not alter much the bond prices, probably because it was already incorporated in the agents' expectations. In fact, compared to a

[5] Rumours of repudiation were already present end December 1917. The repudiation decree was passed on January 21 (February 3) 1918 and published in *The Pravda* on January 26 (February 8) 1918. Up to February 1918, Russia followed the Justinian calendar. The first date mentioned here is the Justinian date, the one in parentheses the Western date. Since most of the topics discussed here revolve around matters related to London or Paris, the later is the one used in the absence of any contradictory mention.

standard case of default, Russian bond prices remained fairly high up till 1919 (Landon-Lane and Oosterlinck, 2006; Oosterlinck and Ureche-Rangau, 2005).

The data (Figure 1) consists of the daily price series (expressed with respect to the par), on the Paris and London Stock Exchanges[6], of a Russian long-term (40 years) bond issued in 1909 and supposed to pay a yearly 4.5% coupon[7]. This very liquid bond had a total nominal value of 1.4 billion francs at issuance, with 74% traded in Paris and the remaining in London[8] and Amsterdam (Freymond, 1995). Bondholders could get reimbursed at their will in Berlin, Brussels or Geneva at a fixed parity stipulated on the bonds[9]. The data series have been collected in the *Bulletin de la Cote de la Compagnie des Agents de Change de Paris*[10] and the *Financial Times*[11] from January 8, 1916 to August 31, 1919, that is, for the period during which arbitrages were materially unfeasible.

Table 1 provides descriptive statistics for the bond prices on the French and English markets over the entire observation period. Unfortunately, the closing episodes and some microstructure problems, mainly attributable to the troubled times, imply missing data. For example, the Paris Bourse experienced periods of very low activity, notably at the end of 1917, in March 1918, following German bombings, and in June 1918, when the evacuation of the Bourse was considered in view of the German advance towards Paris. The analyzed series thus concern the 665 dates for which both Paris and London provide quotations for the 1909

[6] For the London data, mid-quote prices are used.
[7] Coupons were paid twice a year on January, 15, and July, 15.
[8] The nominal total value traded in London in January 1917 was estimated at 55,580,000 £ (Corporation of foreign bondholders, 1919).
[9] The parity was: 500 francs = 19 £ 17 shillings = 239 Dutch guilders = 187 rubles 50 kopeks = 404 Reich marks.
[10] The authors thank M. G. Gallais-Hamonno and Ms S. Bodilsen for their help when collecting the data respectively at the Université d'Orléans and at Euronext Paris.
[11] The authors thank the staff of the British Library (Newspapers section at Colindale) for their help during the data collection.

Russian bond. Not surprisingly, the French and English prices lie under the nominal value during the complete period, the maximal price being, respectively, 81.5 and 83.5. Nevertheless, despite the repudiation, both prices remain extremely high for such low-quality bonds with standard coupon rates. Landon-Lane and Oosterlinck (2006) explain this seemingly strange observation within a Peso-problem framework. French bondholders could indeed reasonably expect at least one among the following scenarios: 1) Soviet Russia's reconsideration of debt repudiation; 2) White or Allied armies victory; 3) French national bail out; 4) partial reimbursement by a successor state (created on basis of former Russian territories). None of these events eventually materialized but *ex ante* investors incorporated their positive probabilities in bond valuation.

The data has been split into two sub-samples: the pre-repudiation observations (from January 6, 1916 to February 8, 1918[12]) and the post-repudiation ones (from February 9, 1918 to August 31, 1919). Table 2 provides the sub-period descriptive statistics for the two price series and their difference (Paris price minus London price). Zero mean tests on the differences confirm the presence of a break at the repudiation date. On the first sub-period the Paris and London mean prices are not significantly different. Despite market segmentation, before the repudiation, French and British bondholders were processing the same information in a same way, leading to similar bond values. On the opposite, a statistically significant difference is noticed after the repudiation announcement. The price of the bond remained globally higher in Paris than in London. The average price difference is about 3% of par value, and 6% of bond value. As time went by, the excess value observed in Paris with respect to London on *a priori* identical bonds exhibit a growing trend.

[12] Since rumors regarding the repudiation were circulating before the official announcement; this date might reveal posterior to the beginning of divergences between the French and British investors' views. Nevertheless, taking any earlier date might look quite arbitrary and would reinforce the empirical conclusion.

Since the bonds are in all similar, macroeconomic fundamentals are automatically ruled out for explaining the diverging reactions of Paris and London to the Soviet repudiation. Several other factors could be evoked. First, higher prices in Paris could be attributed to a volume effect since the bond was more liquid on the French market. Second, some pieces of information may not have reached both bourses simultaneously. To hold, these two elements should be observed on the entire no-arbitrage period, which is not the case. Moreover, no historical source indicates that, following the repudiation, either the French or the British investors benefited from better or faster news from Russia. Furthermore, the observed divergence lasted long after the repudiation announcement, a fact which is inconsistent with a short-living informational gap. The price difference can also hardly be attributed to market microstructures, since these effects would have shown up before the repudiation

A more appealing explanation relates to the currency issue. As a consequence of the war, many countries abandoned the gold standard and let their currency float. The price differential could then come from exchange rate expectations. However, according to the bond features, reimbursement was possible in any of the stipulated currency and holders could thus opt for the most valuable one, making them insensitive to changes in exchange rates[13].

Bailout expectations remain the only credible explanation for the price difference between Paris and London, suggesting that the French bondholders had higher hopes to be bailed out than the British ones. Indeed, the absence of arbitrage leading to the segmentation of the two markets made it possible for governments to favor their homeland investors. In a way, the

[13] However, a few years later (out of our sample period), in view of the protracted negotiations, some bondholders lowered their claim making it clear that even a reimbursement in depreciated roubles would be accepted (*Le Rentier*, December 17, 1923).

same Russian repudiated bonds held by French or by English investors became distinct non transferable assets.

Why were the bailout expectations different in the two countries? Regarding defaults, the British investors were less used than the French ones to receive national support. As stated by Eichengreen and Portes (1989, p. 13), "French and German government officials were less committed to a stance of neutrality than their British counterparts". In the Russian case, French bondholders quickly referred to a precedent which had been set at the end of the 19th century. In 1868, the French government had indeed bailed out the French holders of Mexican bonds. Following the debt repudiation by Juarez, the French government had agreed to reimburse approximately 50% of the bonds value (Landon-Lane and Oosterlinck, 2006). At the time, it had been argued that the government had a moral duty to intervene since it had, for political reasons, strongly suggested to invest in these securities.

As a matter of fact, the French government had been even more active in persuading investors to buy Russian securities[14], leading to a wide diffusion of Russian bonds among the French public: a 1919 census found that 1.6 million Frenchmen had at least one of these bonds. As a consequence, the reimbursement of the Russian bonds became a major political issue, as testified by many interventions in the French Parliament during 1918 and 1919. On January 31st, 1918, Louis-Lucien Klotz, the French Finance Minister, declared that the government would pay the February coupons[15]. However, he insisted on the temporary nature of this

[14] Admissions on the exchange were subject to the authorization of the French finance minister and before WWI, the French government had strongly recommended that banks and businessmen financially support their Russian ally.
[15] Quoted in *Le Rentier*, February 27, 1918.

decision, as discussions were held in order to achieve a common allied policy. Meanwhile, voices claimed that France had a "moral duty" regarding the reimbursement[16].

Part of the French financial press exhorted the investors to ask for a reimbursement[17] and during August 1918, many were expecting payment of the second semester coupons[18]. Rumors on the Paris stock exchange went in the same direction. On September 19th, 1918 the government passed a law allowing French investors to subscribe up to 50% of the new French Liberation loan by paying with the Russian coupons due from April to December 1918[19]. As late as May 30th 1919, in a speech at the Senate, the French Finance Minister suggested to reiterate the September 1918 operation; a proposal eventually rejected by the rest of the government. Debates would continue to rage up till the middle of the 1920's.

In Great-Britain, Russian debts had a very different nature: they consisted mainly in war advances from the British government to its Russian Ally. Once Soviet Russia signed a separate peace with Germany (Brest-Litovsk Treaty), in March 1918, Great-Britain stopped advancing the coupons. Even though Russian bonds were held by British investors, their number was minute in comparison to the French. Consequently, the reimbursement issue had much less political appeal. This argument, together with the British historical reluctance to intervene on behalf of its bondholders, leads us to the assumption that the London market was expecting no rescue package.

[16] Association Nationale des Porteurs Français de valeurs mobilières (1921).
[17] *Le Rentier*, February 27, 1918 and May 27, 1918.
[18] *Le Rentier*, August 27, 1918.
[19] This idea had already been mentioned in the September 14, 1918 issue of the *Revue des Valeurs Russes*. At the time, it competed with another proposition: a general buyback of the Russian bonds and shares by the French government, which as sole remaining bondholder, would then have to convince the Soviet to repay. The total amount subscribed through this way reached almost 265 millions francs (*Le Rentier*, June 17, 1919).

4. Bailout expectations and bond prices dynamics

The mean test results (Table 2) indicate that market segmentation at work on the whole observation period does not suffice to explain the differences in Paris and London bond prices. That is, prices only began to diverge *after* the repudiation. The importance of creditor moral hazard is however not constant over time.

Table 3 reports the correlations between the French and British price series for the two sub-periods. The correlation is rather high before and after the repudiation (0.97 and 0.89, respectively). Nevertheless, traditional ADF and KPSS tests indicate that the prices series are non-stationary. Therefore, these correlations may be spurious. To cope with this issue, we consider daily returns (which are stationary) computed as follows: $R_t = 100 \times \frac{P_t - P_{t-1}}{P_{t-1}}$, where R_t is the daily return and P_t is the bond price. Returns are also useful since they are less sticky than raw prices. Therefore, they better reflect how the valuation process reacts to shocks or innovations affecting markets. Returns are plotted in figure 3 and Table 4 provides their descriptive statistics. Before the repudiation returns in Paris and London are almost the same. For this period, Russian bonds exhibit more volatility as well as more extreme minimum and maximum values on the French market. After the repudiation however, the returns on the French market are higher than those in London. The maximum return is still observed in Paris but the minimum return is now to be found in London.

Correlations between Paris and London returns are found to be of 0.56 and 0.12, before and after the repudiation respectively. After the repudiation, the correlation is not statistically different from zero, suggesting that the French and London markets acted independently from one another. This significant drop in the correlation is confirmed by a simple t-test, which

rejects, at the 1% level of confidence, the null hypothesis that both sub-periods prices returns correlations are equal[20]. Overall, the examination of correlations provides interesting evidence that the series dynamics was significantly altered by the repudiation and, more specifically, that series joint movements became less pronounced.

This result can be evaluated in a more formal way using a standard VAR analysis (Sims, 1980). We use a VAR(1) specification for the bond prices returns, both in Paris and London[21]. VAR models are useful to examine co-movements of two or more endogenous variables. In our case, the approach is convenient to examine how French and British bond prices returns were affected by common shocks before and after the repudiation. Our two-variables VAR(1) specification takes the following form:

$$\begin{bmatrix} R_t^P \\ R_t^L \end{bmatrix} = \begin{bmatrix} B_0 \\ C_0 \end{bmatrix} + \begin{bmatrix} B_1 & B_2 \\ C_1 & C_2 \end{bmatrix} \begin{bmatrix} R_{t-1}^P \\ R_{t-1}^L \end{bmatrix} + \begin{bmatrix} \nu_t^P \\ \nu_t^L \end{bmatrix} \qquad (1)$$

where R_t^P and R_t^L are the bond prices daily returns in Paris and London, respectively. B_0 and C_0 are constant terms. B_1 and B_2 and C_1 and C_2 are the coefficients of the lagged returns in Paris and London respectively. Finally, ν_t^P and ν_t^L are two white noise processes that may be correlated but which are independent of R_{t-1}^P and R_{t-1}^L.

To determine the impact of the repudiation on the returns dynamics, we estimate model (1) for each sub-period. The impulse response functions[22], represented in Figures 3 and 4, allow assessing the impact on returns of a temporary shock (of one standard deviation magnitude) affecting either Paris or London at time $t = 1$. On each market before the repudiation, no

[20] The same conclusion is drawn from tests based on raw bond prices.
[21] Information criterions suggest that a higher order VAR is not relevant to our purpose.
[22] Impulse response functions are obtained using generalized impulses (Pesaran and Shin, 1998).

significant difference is observed between the reaction patterns to shocks impacting one market or the other. In both cases, a contemporaneous positive effect progressively disappears after 4 to 5 days. In spite of the stronger observed reaction of each market to its own shock, this result indicates a tight link between the Paris and London quotations of the Russian bonds before their repudiation.

After the repudiation, the reactions of both returns to their own innovations remain about the same as before. However, their reactions to the shocks affecting their across-the-Channel counterpart changed dramatically. The contemporaneous effect became much weaker (a shock caused a reaction of about 0.1% after the repudiation while the same shock induced a reaction of more than 0.3% before the repudiation) and the maximal effect was reached for a one-day lag. Also, the persistence of shocks slightly augmented since 5 to 6 days were required for the effect of the shock to vanish[23]. These results highlight the weaker cross-reactions of the repudiated bond returns. They support the view that markets significantly diverged after the repudiation and that the bond valuation process became mainly domestic. As a matter of fact, prices were higher in Paris, translating higher bailout expectations from the French investors.

We now turn to the variance decomposition analysis, which determines the share of the total variance of a given series explained by the other one within the VAR framework. Results are reported in Tables 5 and 6 for both sub-periods and for different time horizons. Interestingly, before the repudiation, shocks occurring on the other market consistently represent about 30% of the total variance while, after the repudiation, this share drop to less than 5%. This, again, can be interpreted as a deep modification of the underlying dynamics of the series after the repudiation.

[23] This is consistent with a preliminary GARCH analysis (not reported here for the sake of clarity) indicating that the repudiation positively impacted the overall series volatility.

Before the repudiation, returns in Paris and London tend to move in similar way: correlation is relatively high and the bond returns react strongly to innovations from the other side of the Channel. After the repudiation however, returns show a marked difference. Correlation drops to 12% and returns almost only react to shocks occurring on their home market. Co-movements from the pre-repudiation period are due to the common Russian fundamentals (macroeconomic variables, but also the civil war events). After the repudiation, co-movements are much smaller. This does not necessarily imply that bondholders where no more paying attention to fundamentals. Oosterlinck and Landon-Lane (2006) show in fact that prices of Russian bonds traded in Paris were affected by news from the Civil war and promises of repayment made by the Soviets. However, they also show the preeminent role of bailout expectations in Paris. In London, bondholders were probably following the development of the Russian civil war and knowledgeable about the Soviet promises. However, they had little or no hope to get bailed out by their government.

In relative terms, bailout expectations lower the importance of fundamentals as has been suggested by the literature on moral hazard. Far from being minor, bailout expectations radically change the pricing dynamics: in presence of bailout expectations fundamentals play a residual role. The variance decomposition shows indeed that most of changes in Paris are due to local innovations. Before the repudiation, innovations from one market explain more or less 30% of the variance of Russian bonds on the other. After the repudiation, this figure falls dramatically to represent a mere 5%.

In presence of bailout expectations, fundamentals are analyzed by the markets in a different way. In London, positive news linked to the fundamentals should be translated in a positive

return. For example a statement made by the Soviet that they would repay part of the debt should increase Russian bond prices in London. In Paris however, this need not be true because the bond value stems from two components: one linked to fundamentals, the other to bailout expectations[24]. These components could well be negatively correlated. Therefore, the same statement might increase the fundamental bond value and decrease its bailout component. Providing that bondholders believe that the likelihood of a French bailout is severely diminished whereas probabilities to get repaid by the Soviets only marginally increases, one would observe a decline on bond prices following the statement.

Since bond prices react to local innovations, one could argue that fundamentals play a lesser role in presence of creditor moral hazard. This idea had already been suggested by Kamin (2004), Dell'Ariccia et al., (2006) and Lee and Shin (2008). This paper provides additional insights in the mechanism at play. One could argue that fundamentals are still central for bond valuation but that the existence of bailout opportunities leads bondholders to analyze fundamentals in a different way. More precisely, the interaction between fundamentals and bailout expectations becomes central: the probability of a reimbursement by the issuer and the probability to be bailed out are indeed linked. Bond prices are in fact influenced by the correlation between these probabilities.

5. Conclusion

IMF bailouts have been accused to create moral hazard. Despite a large literature related to creditors' moral hazard, there is no consensus regarding its existence, let alone its importance. Based on a unique historical episode, this paper compares the prices of the same defaulted

[24] Oosterlinck and Urecher-Rangau (2008) show that the valuation of the Russian bonds traded in Paris may be viewed as diversified portfolio because of the existence of multiple potential payers.

bond traded on two segmented markets (Paris and London, during WWI). In Paris, bondholders were expecting a bail out while in London no such hope was ever mentioned. The market segmentation, imposed by the war, guarantees that all observed price differences are due to bail out expectations.

Our analysis confirms that the French bailout expectations played a major role in the bond valuation. On average, these expectations lead the prices of a similar bond to exhibit a 6% relative difference between the two markets after repudiation. However, this mean effect hides deeper changes in the dynamics of the series, as captured by the impulse response functions which exhibit a sharp fall of the mutual influences. Empirical results point in favor of the theory proposed by Kamin (2004), Dell'Ariccia et al., (2006) and Lee and Shin (2008) according to which bailout expectations modify the investors' perception of the fundamentals.

The paper provides additional insights in the way changes in perception affect bond prices. When bailout is expected, the bondholders hold a virtual portfolio made of two different securities: one bond reacting to fundamentals and a (derivative) asset representing bailout opportunities. This portfolio value depends on the correlation of these two securities. In other words, not only does the existence of a potential bailout play a role, but also the interplay between probabilities of being bailed out and changes in fundamentals.

Even though the data used in this paper come from a time where the IMF did not exist, the message they bring is topical: bailout do create creditors' moral hazard. In fact, studying bailout expectations before the IMF and its macroeconomic restructuring plans make it easier isolating the effects of creditor moral hazard. The potential bailouts considered in this paper were motivated by the investors' government political agenda, not by any international

concern. Whether such behavior could take place again in our modern economic world is questionable. At best, its occurrence should require the conjunction of political circumstances as least as rare as a total eclipse of the sun.

Figure 1: The 1909 Russian bond price in London and Paris

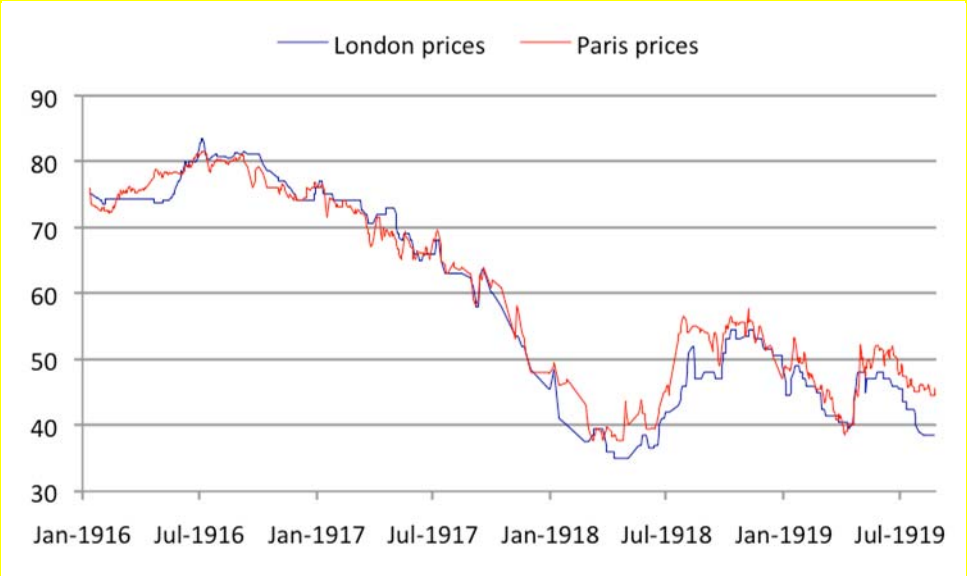

Figure 2: Daily returns in London and Paris

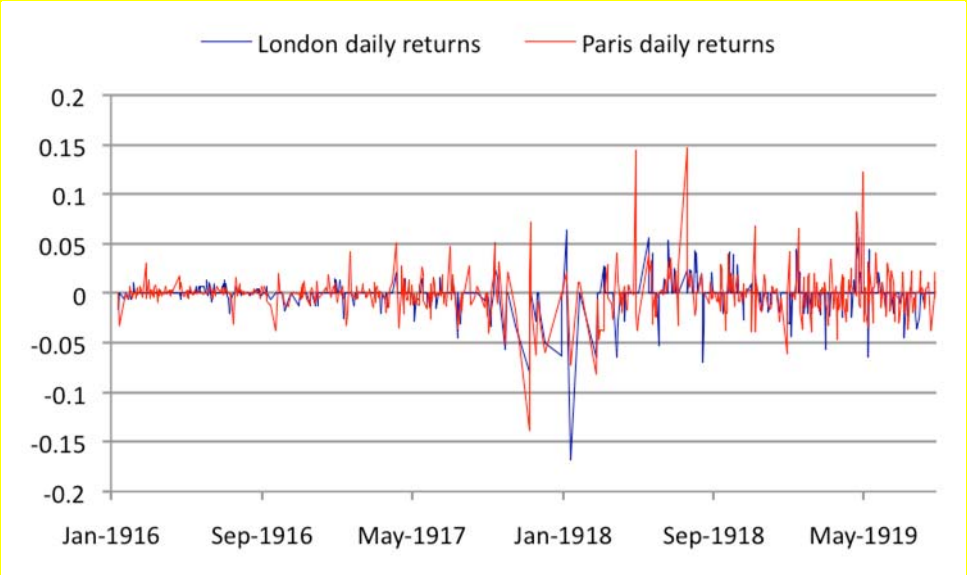

Figure 3: Impulse response functions (pre-repudiation: January 6, 1916 – February 8, 1918)

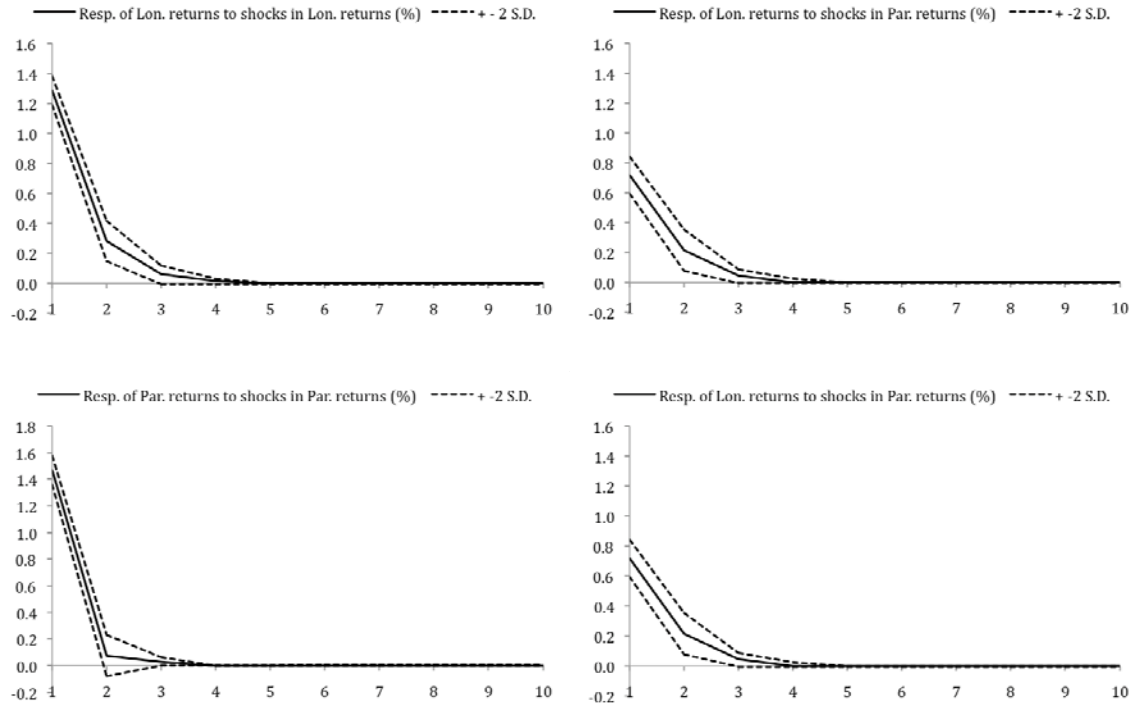

Figure 4: Impulse response functions (post-repudiation: February 9, 1918 – August 31, 1919)

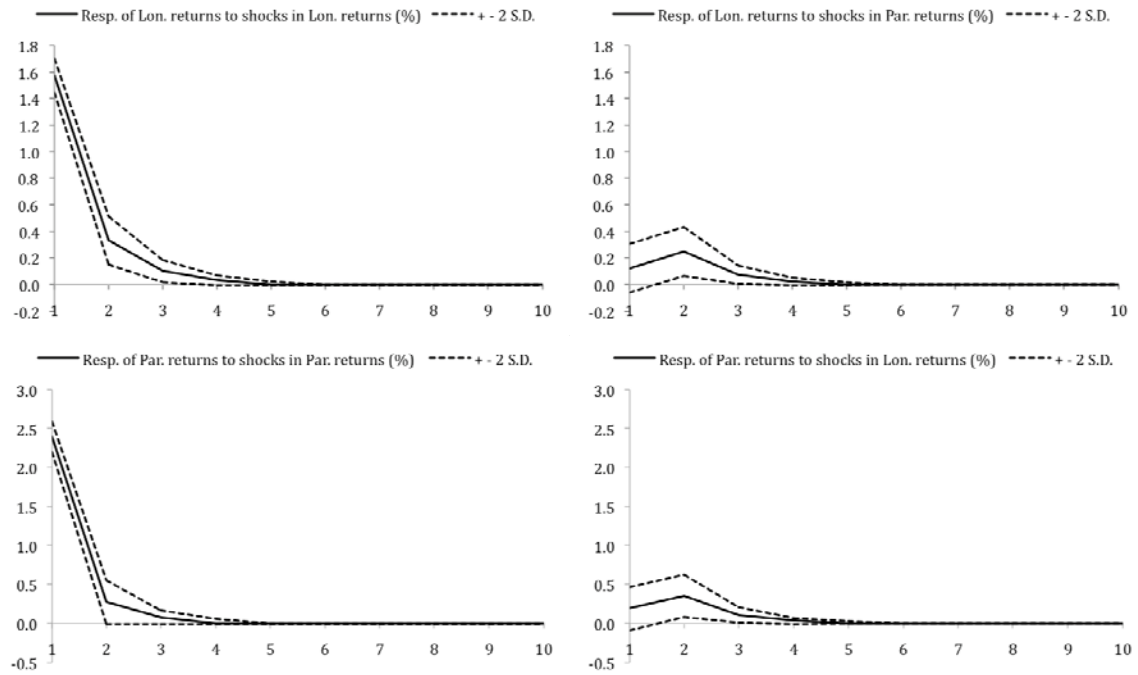

Table 1: Descriptive statistics for the bond price on the French and English markets and their difference (January 6, 1916 – August 31, 1919; N = 665)

	London bond prices	**Paris bond prices**
Mean	60.00	61.26
Standard deviation	15.37	13.93
Median	62.50	63.00
Minimum	35.00	37.7
Maximum	83.50	81.50
Skewness	-0.08	-0.08
Kurtosis	1.43	1.52

Table 2: Descriptive statistics for the bond prices on the French and English markets and their difference (two sub-periods: January 6, 1916 – February 8, 1918 and February 9, 1918 – August 31, 1919)

	Bond prices before the repudiation			**Bond prices after the repudiation**		
	London	**Paris**	**Difference**	**London**	**Paris**	**Difference**
Mean	72.56	72.45	0.12	44.80	47.73	-2.93***
	The mean difference is not statistically different from 0.			The mean difference is different from 0 at the 1% level of confidence.		
Standard deviation	7.66	7.29	0.37	5.32	5.47	-0.15
Median	74.00	74.15	-0.15	46	48.5	-2.5
Minimum	40.00	46.00	-6.00	35	37.7	-2.7
Maximum	83.50	81.50	2.00	54.5	57.75	-3.25
Skewness	-1.64	-1.36	-0.28	-0.08	-0.22	0.14
Kurtosis	6.53	5.06	1.47	2.12	1.90	0.22

Table 3: Correlation between bond prices and returns on the French and English markets and their difference (two sub-periods: January 6, 1916 – February 8, 1918 and February 9, 1918 – August 31, 1919)

	Bond prices before the repudiation		**Bond prices after the repudiation**	
	London	Paris	London	Paris
Correlation	0.97		0.89	
t-test	7.69***			
	The correlations are significantly different from each other at the 1% level of confidence			
	Returns before the repudiation		**Returns after the repudiation**	
	London	Paris	London	Paris
Correlation	0.56		0.12	
t-test	6.54***			
	The correlations are significantly different from each other at the 1% level of confidence			

Table 4: Descriptive statistics for the returns on the French and English markets and their difference (two sub-periods: January 6, 1916 – February 8, 1918 and February 9, 1918 – August 31, 1919)

	Whole period		**Bond prices before the repudiation**		**Bond prices after the repudiation**	
	London	**Paris**	**London**	**Paris**	**London**	**Paris**
Mean	-0.010	-0.0008	-0.0014	-0.0013	-0.0005	-0.0002
Standard deviation	0.0149	0.0194	0.0100	0.0145	0.0192	0.0239
Median	0.000	0.000	0.000	0.000	0.000	0.000
Minimum	-0.1680	-0.1389	-0.0808	-0.1389	-0.1680	-0.0832
Maximum	0.0639	0.1471	0.0504	0.0715	0.0639	0.1471
Skewness	-2.6637	1.0696	-3.1144	-2.3223	-2.2835	1.8104
Kurtosis	29.5806	16.9240	22.1746	26.5698	21.2737	11.0209

Table 5: Variance decomposition (pre-repudiation: January 6, 1916 – February 8, 1918)

	Percentage of the variance in London prices due to a:		**Percentage of the variance in Paris prices due to a:**	
Horizon	**Shock in London**	**Shock in Paris**	**Shock in London**	**Shock in Paris**
1	68.82%	31.18%	31.18%	68.82%
3	67.65%	32.35%	32.06%	67.94%
5	67.65%	32.35%	32.06%	67.94%
Results are consistent to different variables orderings in the Cholesky decomposition				

Table 6: Variance decomposition (post-repudiation: February 9, 1918 – August 31, 1919)

	Percentage of the variance in London prices due to a:		**Percentage of the variance in Paris prices due to a:**	
Horizon	**Shock in London**	**Shock in Paris**	**Shock in London**	**Shock in Paris**
1	99.39%	0.61%	0%	100%
3	96.86%	3.14%	2.04%	97.96%
5	96.84%	3.16%	2.06%	97.94%
Results are consistent to different variables orderings in the Cholesky decomposition				

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