

Feeling the blues

Moral hazard and debt dilution in Eurobonds before 1914

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1. Introduction

The recent debate on European sovereign debt crisis has attracted different proposals in policy fora. The alternatives include not only unpopular solutions such as structural reforms towards stronger fiscal and political unification of Europe, but also more practical ones as the issuance of collectively guaranteed bonds by European governments (Eurobonds). Having appeared under different labels and guises, the Eurobonds proposal, in essence, recommends the governments of the EU countries to guarantee all or a certain portion of their members' debt. This would presumably reduce the borrowing cost for that part of the debt (typically up to 60 per cent of the GDP), and induce much needed stability to the European sovereign debt market. This proposal has found some support, since Eurobonds would serve as a mechanism to decrease the cost of borrowing for heavily indebted members. Although this has been considered helpful to enhance fiscal discipline, critiques of the proposal underlined potential negative impacts, more particularly the risk of moral hazard and the dilution of current outstanding debt.

Compared to other tried solutions for fiscal crises, such as debt restructuring or default, inflation and devaluation, possibly combined with liquidity assistance and stabilization plans from multilaterals, there is precious little evidence on the effectiveness of the Eurobonds proposal. The debate has therefore been mainly informed by untested hypotheses about the behaviour of financial markets and sovereigns after the issue of Eurobonds.

This paper aims at contributing to this debate by drawing parallels with the guaranteed bonds issued by the governments of several countries between 1832 and 1914. Although the history of such loans can be extended further into the future, our focus here is limited to the nineteenth and early twentieth century, starting with the Greek guaranteed loan of 1832, which can arguably be considered the first Eurobond in history. The guaranteed issues in which we concentrate differed from colonial issues, in that they were not priced entirely on the fiat of the colonial power. Colonial issues were more than guaranteed by the coloniser, as the latter reserved complete control over colonial finances (Accominotti et al. 2010). A different category of bonds were those issued under the financial (and sometimes political) control of foreign creditors, where the latter controlled the domestic sources of revenue set aside to service the interest and repayment charges on the loans (Mitchener and Weidenmier 2010).

The guaranteed bonds we study here were issued with the guaranty of another sovereign, usually one or a combination of the Great Powers of the time, i.e. Britain, France, Germany and Russia. Lastly, guaranteed bonds were priced in the secondary market differently from other issues of the debtor government, not only because of the value of the guaranty itself, but also because of the

externality that their issue imparted on previous bonds, either through explicit seniority clauses, specially assigned revenues, or simple debt dilution effects.

In this paper, we concentrate on investigating two main questions – how the introduction of guaranteed bonds impacted existing creditors and how guaranteed debt was priced by financial markets. The first question focuses on the short-time horizon around the announcement and actual flotation of guaranteed bonds. By using a primary dataset of secondary market prices, we investigate the direct dilution of previous claims on the sovereign, which depended on the relative shares of ‘blue’ and ‘red’ bonds, seniority dispositions, possible write-downs of existing debts, liquidity of the new issues, and, when included, the benefit of foreign intervention in terms of fiscal discipline.

The second question has to be addressed over longer time horizons, for which we use data mostly previously compiled by other authors, but now used in the way we employ it for this paper. In this part of the paper we quantify the reduction in spreads of guaranteed bonds relative to other non-guaranteed domestic bonds, and we investigate the relation between the yields guaranteed bonds, their non-guaranteed cousins, and their avuncular guarantors.

The next section describes and compares the current proposals for the issuance of Eurobonds with the corresponding debate in the nineteenth century, emphasising the similarities between the two. Section 3 provides a simple framework to think about the relation between debt dilution and fiscal discipline in terms of their impact on sovereign spreads. Section 4 provides historical detail on the five cases of guaranteed bonds studied in this paper. Section 5 contains the empirical analysis split into two parts. In a first part we use structural breakpoint methods to identify the short-run impact of the introduction of guaranteed bonds on the other bonds of the borrower. In the second part we investigate the pricing relations between guaranteed and non-guaranteed bonds with the help of factor analysis and dynamic panel VARs. A conclusion follows.

2. The policy debate

2.1 Today: Eurobonds

Although the idea of increased coordination of public debt issue in Europe had been floated around the introduction of the Euro, it did not get much mileage at the time. The report of the Giovannini Group (2000) was mostly sceptical about the purported benefits, apart from the direct advantages of greater harmonisation of technical details of the 11 separate debt offices. The proposal re-emerged, in the very different context of the Euro crisis that opened up with the fiscal difficulties of some Eurozone members and continued with the widening of sovereign spreads. Whereas the Giovannini group had concentrated on the long-term or steady-state costs and benefits, the new debate focused more on stabilising the European market for sovereign debt and the financial system, as sovereigns banks were caught in the ‘diabolic loop’ created by the severe home bias of banks’ debt portfolios (Brunnermeier et al. 2011, Angeloni and Wolff 2012).

Between September 2008 and September 2011 a half-dozen alternative plans to implement some sort of Eurobonds emerged in the literature from academics, trade associations and official organisations. All of them aim to fulfil several of the following four objectives: manage the current

crisis, reinforce financial stability and facilitate the transmission of monetary policy in the Euro area, improve market efficiency, and enhance the international role of the Euro. Despite the commonality of objectives the several plans diverge on several levels. Among the main differences are the questions of coverage and guaranties.

The majority of plans recommend that Eurobonds cover only partially the funding requirements of member countries, with the exception of Dübel (2011) and Beck, Wagner and Uhlig (2011). The latter favour the issue of 'synthetic Eurobonds' to swap for all the sovereign debt stock in banking portfolios (including the ECB). Similarly, Brunnermeier et al. (2011) propose to swap of the entirety of existing sovereign debt into two tranches of joint bonds, but only the first senior one (ESBies) virtually safe from default, whereas the second tranche of junior bonds (EJBs) would take any losses first. A related question is whether Eurobonds should be issued only in the primary market or also to swap for existing debt. In the first case, only the marginal cost of funding would be affected for participating countries, whereas the in the second option, the average cost would also fall, if yields on Eurobonds were lower, as expected. Even with an initial issue only in the primary market, the swap of the intended tranche of national debt by Eurobonds would be accomplished after a number of years, up to 15-20 (Barclays Capital 2011, Boonstra 2010).

The most salient proposals for the partial issue of Eurobonds are the 'blue/red bonds' of Delpla and von Weizsäcker (2010), the 'safe bonds' of Bofinger et al. (2011) and the Eurobills proposal of Hellwig and Philippon (2011). This was also one of the possible approaches considered for the 'stability bonds' envisaged by the European Commission's Green Paper (2011). The first two have diametrically opposed approaches. Blue bonds, jointly issued, should be capped at a fraction of GDP (possibly 60% as in the Maastricht criteria), whereas any excess debt would remain the responsibility of individual countries that continue to issue their own 'red' bonds. Bofinger et al. (2011) only mutualise the excess debt above 60% GDP, though coupling it with a redemption plan to extinguish it over the medium-term.

A related choice is the attachment of guaranties to the common bonds. First of all, some proposals require joint responsibility for the common bonds, despite its likely violation of the no-bailout clause of the European treaties (Delpla and von Weizsäcker 2010, Jones 2010, Barclays Capital 2011, Favero and Missale 2011). Precisely because of this, other authors consider that several guaranties, where each country is only responsible for the service of its share of the common bonds would be enough (De Grauwe and Moesen 2009, Brunnermeier et al. 2011). Secondly, some authors provision for further guaranties in the form of seniority clauses over pre-existing or national debt, or credit enhancements, such as collateral (cash or gold reserves) or shock-absorbing collateral – particularly with a view to ensure that the new Eurobonds would be rated AAA by credit ratings agencies.¹

Given the breadth of these proposals it is not surprising that the expected impacts of their undertaking also vary considerably, namely when compared with the four objectives listed at the beginning of this section. The most obvious beneficiaries are supposed to be the 'weak countries' currently rationed out of access to financial markets.² Either through pooling, diversification,

¹ Practically all proposals favour seniority, with the exception of Dübel(2011) and Favero and Missale (2011).

² Nevertheless, all proposals exclude the programme countries, currently undergoing bailout arrangements with the 'troika' (ECB, EC, and IMF), at least until these programmes are completed.

seniority or credit enhancements, the new Eurobonds are expected to be sold for lower yields than most national debts, allowing countries a cheaper access to funds. This is especially important during financial crises, when markets can no longer price risk efficiently and may spread financial trouble through contagion.³ Back in 1989, the Delors report already alerted for this problem:

“experience suggests that market perceptions do not necessarily provide strong and compelling signals and that access to a large capital market may for some time even facilitate the financing of economic imbalances. Rather than leading to a gradual adaptation of borrowing costs, market views about the creditworthiness of official borrowers tend to change abruptly and result in the closure of access to market financing. The constraints imposed by market forces might either be too slow and weak or too sudden and disruptive.”⁴

Furthermore, the yields effectively paid by participating countries could be adjusted relative to the cost of funding of the Eurobonds-issuing agency so as to incentivise fiscal consolidation. Several proposals include rules to calculate funding margins connected to fiscal criteria (such as debt/ GDP or deficit), national credit ratings or spreads on national debt (Bonstra 2010, Dübel 2011, Muellbauer 2011, European Commission 2011). Countries pursuing ‘bad fiscal policies’ would face an increasing schedule of funding costs, whilst others would be compensated for their fiscal efforts. This would also help prevent the build-up of unsustainable debt problems, similar to what happened after the introduction of the Euro when markets were not able to screen sovereign risk adequately. Even in case of sovereign default, the seniority mechanisms included in most proposals would form a natural framework for restructuring unsustainable debts. Junior tranches would be the only ones subject to haircuts, allegedly dispensing with costly renegotiation with creditors ex-post, as currently.⁵ This represents an advance on past collegial or ex-post fiscal enforcement, which in the case of the SGP were proved time-inconsistent.

‘Strong countries’ with normal access to wholesale markets are also censured to benefit indirectly, and perhaps directly too, from the creation of Eurobonds. The main indirect benefits are financial stability and greater efficiency in monetary policy transmission within the Eurozone, once the home bias in banking portfolios of sovereign debt is replaced with a the issue of a safe(r) asset on which the whole financial system can base itself. More pointedly, Jones (2010), Brunnermeier et al. (2011) and Varoufakis and Holland (2011) consider that Eurobonds would be an efficient way of recycling surpluses within the Eurozone without destabilising current accounts, and allowing countries such as Germany to continue pursuing its export-led growth. The direct benefits to strong countries would come in the way of greater liquidity (and hence, lower cost of funding) as well as a greater international role for the Euro. The two are related in the sense that the role of the Euro as reserve currency is censured to be hampered by the fragmented issue of sovereign bonds in Europe, which did not allow for the creation of a benchmark asset comparable in liquidity to the US T bonds. On top of the liquidity discount, T bonds are also sought after as ‘safe haven’ which gives them an extra yield advantage over German Bunds. Interestingly, although mentioned by all proposals, the liquidity gains are expected to be very limited, ranging from 30 to 70 basis points in the more optimistic

³ Favero and Missale (2011) use a time series methodology to identify contagion effects in the Euro sovereign crisis.

⁴ Delors (1989: 20).

⁵ It is however unclear, how tranching would relate to bond covenants, such as collective action clauses (CAC).

assessments to close to nothing in the more conservative estimates of the European Commission (2011) Green Paper and Favero and Missale (2011).⁶

This raises the question of how to motivate the participation of stronger countries in the Eurobonds issuance, as the liquidity gains might not compensate for the increase in funding costs from pooling risk with weaker nations. Several proposals address this issue by including explicit mechanisms to redistribute a share of the gains to the stronger nations, such that all participants benefit from the system (De Grauwe and Moesen 2009, Boonstra 2010, NATIXIS 2011). Although theoretically and algebraically conceivable, these redistribution rules raise practical implementation questions. First, in order to be time-consistent, rules have to be fixed at the beginning, even though they may not be optimal ex-post. Second, these rules would be based on the same fiscal and market criteria used to adjust the cost of funding to the several participant countries, such that some countries got a discount on the funding cost of the Euro-wide debt agency. In principle, it should always be possible to devise a balanced-budget redistribution rule, but it is not clear whether it would be consistent with the promotion of fiscal stabilisation within the Eurozone. The weights placed on the several criteria which would be necessary to guarantee that all countries benefited might conflict with fiscal sustainability. For instance, the current weaker economies tend to small in terms of GDP and debt stocks, but with have large deficits and debt/GDP ratios. Consequently, in order for the margins paid by these countries to balance the discounts to larger and more stable countries, the weights would have to disproportionately penalise their fiscal ratios forcing an excessively rapid consolidation. Finally, some redistribution rules include market variables, such as ratings or spreads on domestic debt, but these would be affected by the existence of Eurobonds itself (namely the degree of risk pooling and cross-subsidiarisation from stronger economies), and would therefore be poor indicators of the objective fiscal condition of individual countries.⁷

Moreover, there is also considerable scepticism in the literature about the net advantages of the several Eurobonds proposals, not to mention about the political feasibility of the idea currently in Europe. Starting with tranching and seniority, several studies point out that a Modigliani-Miller effect may apply with negative consequences for nations' ability to roll over their stocks of 'red debt.' By virtue of the issue of Eurobonds nothing is changed in the underlying fiscal position of individual countries, consequently if a tranche of 'blue', 'safe', or 'synthetic' bonds is carved out of their debt stocks with seniority and enhanced guaranties, the remaining debt stock will have to bear the brunt of greater illiquidity and risk premia (Kopf 2011, Brunnermeier et al. 2011, Claessens et al. 2012). For some countries this would mean an effective credit rationing or even default. The obvious way of avoiding this would be to swap the full stock of 'legacy debt' for Eurobonds, but that raises obvious concerns about moral hazard. Moreover, the maintenance of stocks of national debt is seen as a way of distinguishing between liquidity and risk premia, the former reduced through Eurobonds and the latter would continue to be priced by the markets.⁸ An intermediate solution requires a

⁶ However, this latter figure may be contaminated by the fact that the German Bunds and the bonds of other AAA Euro-members have already benefited from a 'safe haven' status since 2009.

⁷ In other words, markets might start pricing-in bailout expectations, as since 1999, even if formal rules about seniority and tranching explicitly rule it out ex-ante.

⁸ Dübel (2011) has a different solution to this cliff-edge problem for 'red bonds.' He proposes that all debt (present and future) be swapped against Eurobonds, but that nations pay individual insurance premia to cover *partly* their credit risk. Although differentiated premia are similar to the redistribution rules alluded above, they would apply to the whole stock of Eurobonds, which would have a dormant junior tranche, activated only

careful calibration of the relative size of multilateral and national bonds. The share of ‘blue bonds’ has to be large enough to improve fiscal sustainability ratios, but small enough to allow countries to maintain access to the markets at affordable interest rates (Gros 2010).

Moral hazard concerns loom large among the critics of Eurobonds, particularly since the recent experience of the SGP seems to imply that even ex-ante firm rules are time inconsistent in the context of a financial crisis, and all the more because the high level of cross-border integration in the EU (see Gros 2011 and Favero and Missale 2011, among many). Kopf refers to this as “an illusion of seniority that cannot be enforced in times of crisis. In the end, member countries that wish to remain current on their own obligations may end up having to pay for Portuguese, Greek or Irish sovereign debt.”⁹ The arguments about the unfairness of forcing the taxpayers of fiscally-responsible countries to bail-out profligate countries and not being able to prevent it from happening again in the future are well known. Drawing on an analogy with the banking system, Otmar Issing comments:

“So-called solidarity via common European bonds would perhaps in the short-term increase the re-election chances of those governments that created the fiscal mess – a situation that would be ironically similar to the large short-term bonuses paid to bankers who took excessive risks – as the costs of this “support” would have to be borne by the citizens of other countries.”¹⁰

This incentive problem might completely negate the purported liquidity gains of a common Eurobond benchmark issue. In a survey conducted in 2008, primary market dealers and credit rating agencies were uniformly averse to joint guaranties of Eurobonds, as well as to insurance mechanisms that pool risk between strong and weak nations (EPDA 2008). The latter were seen a new incarnation of the structured products which were behind the financial crisis of 2008, so it is possible that the practitioners’ opinion might have been biased by the closeness of the crisis. However, Eurobonds with several guaranties are not immune from problems either, as credit rating agencies such as Standard & Poor’s have warned that their rating may not be above (as desired), or at least at the level of the average ratings of the participating nations, but in fact below, and possibly as lower as the lowest individual rating. This has a counterpart in the convexity of risk premia, which may rise more than proportionally than underlying risk factors, such that the average risk premium of a portfolio of bonds may be higher than the premium charged to an individual country with the same risk as the average. We will turn to these considerations in the next section.

2.2 Back then: guaranteed bonds

Although the discussion over Eurobonds has taken place with very limited historical reference, the sovereign debt market before 1914 had several striking parallels as regards to the proposals listed above. The emergence of an international bond market and the boom in foreign securities during 1820s marked an important milestone in terms of the evolution of sovereign debt. This was also the

in case of a credit event. In other words, all bondholders would be equally affected by a restructuring, but only on the uninsured fraction of their Eurobonds. Bofinger et al. (2011) address this concern precisely by recommending the issue of safe bonds only for the stocks of excessive debt, so as to directly decrease the marginal cost of funding. However, this raises questions about the risk profile of the new bonds, excessively skewed toward high-risk debts. Although the authors embed the debt swap within a stringent plan for full redemption over the medium-term, it is not self-evident that the plan can be enforced.

⁹ Kopf (2011: 9).

¹⁰ Issing (2009: 3).

case after the debt crises of 1870s, which led to new ways of dealing with breaches of sovereign debt contracts.¹¹ One common way of ensuring repayment of government bonds was to link each issue with a form of security. These security clauses served the interest of creditors, as they safeguarded the interest and capital payments of a loan in the absence of an enforcement mechanism. Similarly, borrower governments had positive incentives to provide such securities given that the quality and extent of them could be an important determinant of the conditions and costs of the bond issue.

From the 1820s to 1914 there was considerable variation in methods of securing the interest and capital payment of government bonds. One approach was to use the real estate of sovereigns as a way of guaranteeing the payment. The most representative case of this was in Egypt, where the Khedive pledged his personal estates to contract the loans of 1870 and 1877. The major legal problem with this type of security was the confusion between private and public sphere in terms of liability in the case of a default. As far as the Egyptian case was concerned, in order to address this confusion between public and private sphere, in September 1875 a system of Mixed Courts was introduced. Under this system, foreign creditors were empowered to bring cases against the Khedive, if an established private right was violated by an administrative act.¹² Although the jurisdiction problem of the Khedive's loans was addressed by this solution, securing the bonds with real estate of a sovereign never became a widespread method during this period. A similar but more widespread tool was to use tangible assets and commodities such as precious metals or agricultural products.¹³

Another category still was to assign part of or the entire state revenues of the debtor as a pledge. For instance, the terms of 1823 Peruvian bond stated "all the revenues of Peru are declared to be generally mortgaged and pledged for the payment of the principal and interest of the loan". Similarly, the Greek independence loans of 1824 and 1825 were both secured by the "all revenues and the whole national property of Greece".¹⁴ Although assigning entire revenues to pay interest and capital looked like an attractive solution to increase the credibility of a sovereign, in fact it could reduce the future borrowing capacity of a country if the entire state revenues had already been pledged for the service of previous loans. This would lead to legal problems in the case of a default or debt readjustment in case seniority between bonds was not clearly assigned. Moreover, it was also common to see the pledging of part of state revenues for the purposes of securing the loan repayments instead of entire revenues. These revenues could be from any source. State monopolies, custom and railway revenues, tithes and even annuities received from tributary states could be used to secure a loan agreement.¹⁵

However, it is important to point out the enforcement problems of these practices. Despite the fact that the governments secured the payment of the loan with part or all of state revenues, this pledge, in practice, did not mean anything due to the nature of the sovereign debt—unless creditors had direct control over the specific assets or revenues pledged. In the second half of the nineteenth century these enforcement problems encouraged bondholders to establish *ad hoc* revenue

¹¹ Wynne (1951), Suter (1992), Neal (1998), Neal and Davis (2006), Flandreau and Flores (2009)

¹² Hoyle (1986), Cannon (1972).

¹³ Borchard (1951: 84-85).

¹⁴ Wynne (1951: 285); Borchard (1951: 86).

¹⁵ Wynne (1951)

administrations in Tunisia, Egypt, Ottoman Empire, Serbia and Greece among others. As a result, creditors were granted direct access to the revenues assigned for the service of the debt. In fact, given that debtor governments earmarked certain state revenues for the payment of a specific loan, this provided a legal justification for bondholders to place that revenue item outside the debtor government's reach.¹⁶

However, the strongest way of securing bonds before 1914 was by the issuance of guaranteed loans. In simple words, these bonds relied on the credit of other states rather than the debtor states. In legal terms, it was possible to see different combinations of joint and/ or several (or proportionate) international guaranties depending on the context. In historical terms, it is possible to distinguish three types of relationship within a guaranteed loan agreement. First there was the relationship between guarantors and debtors. Usually this was determined by political considerations of the guarantor states –mostly one or a combination of the Great Powers of the time, i.e. Britain, France, and Russia. The guaranteed bond issue in support of the independence war of Greece in 1833 was the first example of the involvement of the Great Powers into such an arrangement. The contemporaries were also aware of the political characteristic of the guaranteed bonds. For instance, with reference to the opposing voices in the French parliament to the involvement of France in this operation, the editor of *The Times* supported the viewpoint of Victor de Broglie, the Minister of Foreign Affairs of the time:

“Suppose, argued M. de Broglie, the Greek revolution had occurred in 1831, instead of 1821, -and suppose, as it would most likely have happened, that if unsuccessful, a large body of refugees had sought an asylum in France from the menaces of infidel persecution, would those who now agree to grant pecuniary aid to the Poles, the Italians, and the Portuguese, drive from their country, have refused a similar succour to the Greeks? If they would not then, this small annuity of £48,000, for which the government had become a guarantee, might have been expended in pensions to these persecuted Greek patriots; and is it consistent with good sense or generosity to refuse that sum, which would have been willingly contributed to relieve distress, when it can be provided that it is now necessary to consolidate order?”¹⁷

Given the political nature of the guaranteed loans, these kinds of conflicts within the parliaments of the guaranteeing states were not an exception. After the signing of the London convention of 1855, the French and British governments agreed to guarantee a loan in order to support the Ottoman Empire during the Crimean War and presented the treaty in their respective parliaments. Although the French chamber was quick to adopt the convention, this time the consent of the British parliament seemed to be hanging by a thread. After the Prime Minister Lord Palmerston presented the resolution in the House of Commons, there were serious objections for the approval of the guaranteed loan given the poor credit of the Ottoman Empire at the time and the negative memory of the Greek guaranteed loan of 1833. After the loan was approved with a majority of three votes, the editor of *The Times* this time remarked as follows:

“We are astonished at the magnitude of the danger and the narrowness of the escape, and can scarcely believe that within so short a time the alliance with France, the prospects of the war, and

¹⁶ Deville (1912), Hyde (1922), Wynne (1951: 279).

¹⁷ “The debate on the Greek loan” *Times* [London, England] 24 May 1833.

the very existence of Turkey should have been saved from the most serious risk by the narrow majority 135 to 132.”¹⁸

Given the political nature of guaranteed loan agreement, an important issue from the perspective of the guaranteeing nations was to establish the degree of infringement of the debtor’s sovereignty. This could vary from none or very weak interference to foreign financial control. For instance, the 1898 Greek guaranteed loan also introduced the Law of Control, which enabled the foundation of international financial control over certain revenues of the Greek state.¹⁹ In the case of the 1885 Egyptian guaranteed loan, however, the order of events was the other way around. This bond was issued with the extra guaranty of Britain and France, which already held the control of Egyptian finances since 1876. In response to the claims that the Egyptian guaranteed loan was issued on financial grounds, the *Economist* had the following to say:

“The idea that the Powers have been influenced by purely financial motives in pressing their services upon Egypt is really too absurd to be entertained. They have all of them quite enough to do to manage their own monetary affairs, and they are not so foolishly generous as to insist upon burdening themselves with fresh financial obligations, except in the hope and expectation of gaining some advantage thereby. And the advantage they expect to gain is sufficiently obvious. They are acting on the sound principle that financial responsibility involves financial control, and the control of the finances of necessity implies control of the Government. Disguise it as they may, Ministers must be aware that the multiple guarantee is intended to open the door to a multiple control, and that if the one I conceded, the other must follow, almost as a matter of course.”²⁰

The second relationship was between guarantor states and creditors. Here the intention of the guarantor to make the debt of the borrower his own obligation changed the relationship with the creditors. This was clearly the case with the 1855 Turkish and 1885 Egyptian guaranteed loans as they were listed among the British funds in the official list of the London stock exchange. Therefore, guaranteed bonds were priced in the secondary market differently from other issues of the debtor government, not only because of the value of the guaranty itself, but also because of the externality that their issue imparted on previous bonds, either through explicit seniority clauses, specially assigned revenues, or simple debt dilution effects.

Finally, the number of guarantor states and the relationship between them changed depending on their political motives. The usual practice was to split the liability between guaranteeing states equally or to use joint and several liability.²¹ Moreover, the relationship between the guaranteeing states was also determined by the international politics and it could lead to extensive rivalry between the powers, making the conditions of the loan more favourable for the borrower country. Prior to the issuance of the 1895 Chinese guaranteed loan, there was indeed extensive competition between Russia, France and Britain to provide a loan. As *The Economist* of the time put it:

“it is somewhat ludicrous to observe the struggle which is going on among European financiers for the privilege of supplying China with the money she requires to pay the indemnity demanded

¹⁸ Times [London, England] 21 July 1855, p.8, The Times Digital Archive, accessed on 3 Apr. 2013.

¹⁹ Andreades (1925)

²⁰ “The Proposed Egyptian Settlement”, *The Economist* (London, England), Saturday, March 21, 1885; pg. 343; Issue 2169.

²¹ Borchard (1951: 101-111).

by Japan. Indeed, the Chinese government would be more than mortal if it missed such a brilliant opportunity of getting all the assistance it requires.”²²

It is important to underline that diplomatic considerations determined the nature, conditions and timing of the guaranties in the cases we study. In fact, it would not be wrong to argue that all guaranteed bonds issued between the 1832 and 1914 were linked to some sort of political turmoil.²³ This was the case with the Greek-Turkish wars and two Greek loans of 1833 and 1898, the Crimean War and the 1855 Ottoman guaranteed loan, as well as the Sino-Japanese war and the 1895 Chinese guaranteed loan. Even in the case of the Egyptian loan of 1885, the main cause of the financial need of the country was the payment of the war expenditures and associated indemnities from the Arabi revolt. We develop this more in Section 4, where the historical context of each guaranteed bond issue is discussed more in detail.

3. Debt dilution, fiscal discipline and spreads

In this section, we lay down a simple framework to think about the consequences of the issue of guaranteed bonds for the bondholders who had invested in the previous debt stock. As mentioned, the addition of a senior tranche of guaranteed bonds may difficult the access of the sovereign to refinance by issuing its own bonds in the private market, at least for a while. However, this ‘Modigliani-Miller’ effect may be abated if domestic fiscal discipline is improved in the process, namely if access to multilateral guaranties from the ‘blue bonds’ is tied up credibly to conditionality. Of course, if the cost of credit (as measured by the secondary market) raises to prohibitive levels after the introduction of guaranteed bonds, the best policy option is not to provide multilateral funds (or not only) but to force a debt restructuring. This underscores the need to calibrate the size of the multilateral funds, in order not to discourage continued private lending.

Debt dilution is a well-studied topic in corporate finance, at least since Fama and Miller (1972), with effort concentrated on identifying the optimal seniority structure to address it (White 1980, Schwartz 1997).²⁴ Arguably the cases we deal with here violate this optimal structure by imposing a ‘reverse seniority’ clause in favour of later debts. Even though we do not discuss the ex-ante consequences of the availability of guaranteed bonds, it is possible that it could work to compound the sequential contractual externality leading to overborrowing, also identified in the context of sovereign debt (Tirole 2002).²⁵ In the closest analysis to our paper, Saravia (2010) discuss the conflict between private and official creditors in the wake of IMF programmes. Despite the theoretical attention that this subject has attracted in the sovereign debt literature, Claessens et al. (2012) consider, in their summary article on the Eurobonds debate, that there is a dearth of analytical and empirical analysis on these effects and we seek here to bring on some historical evidence to bridge that gap.

²² “The Coming Chinese Loan”, *The Economist* (London, England), Saturday, June 8, 1895; pg. 749; Issue 2702.

²³ Viner (1928), Jeze (1924).

²⁴ Hart and Moore (1995) also connect dilution to managerial incentives.

²⁵ On this see Detragiache (1994), Roubini and Setser (2004), Bolton and Jeanne (2009) and Hatchondo, Martinez and Padilla (2012), among others.

Consider a sovereign that receives multilateral aid via a guaranteed loan and let s_g be the fraction of total debt ex-post guaranteed. Also, assume that the new stock of debt is a multiple of the original $B' = (1+\delta)B$. It should be noticed that δ can be both positive and negative. If multilateral guaranteed debt is simply added to the debt stock then $\delta > 0$. If, however, the multilateral assistance is coupled with a debt write-down, it is possible that $\delta < 0$. As the new guaranteed bonds were issued with seniority and the explicit multilateral guaranty, their yield must be lower than that paid by the country on its own debt *before* the announcement of the financial assistance: $r_g < r$. A clean measure of r may be hard to get from the secondary market prices if the country was already in default prior to the financial assistance operation. Over longer horizons other considerations are likely to interfere in the pricing of guaranteed and non-guaranteed bonds. Nevertheless, we may still recover the short-run effect of the announcement of the dilution of previous debt claims by the issue of guaranteed loans. This depends on the functional form of the relation between sovereign yields and fiscal fundamentals.

We will consider two possible models – a linear and an exponential relation. The first simply assumes that yields vary proportionally with markers of fiscal sustainability. In the second, there is a more than proportional effect of fiscal deterioration in spreads. Flandreau, Le Cacheux and Zumer (1998) call this a ‘punishing model’ of spreads. We can represent the linear model by a simple relation between yields and debt stocks: $r = \alpha B$.²⁶ In that case, the new yield for the sovereign debt would be simply $r' = \alpha (1 + \delta) B = (1 + \delta) r$. Of course, this is only a shadow yield, as the increase (or decrease) of the total debt level is still influenced by the issue of guaranteed bonds. Consequently, the following relation should hold ex-post:

$$(1 + \delta)r = s_g r_g + (1 - s_g)r_o \quad (1)$$

where r_o stands for the ex-post yield on the legacy debt. This identity expresses the Modigliani-Miller effect, according to which, the composition of the new debt stock (the right-hand side) should not impact the average cost of funding, once changes in the total stock are taken into consideration (left-hand side). We can now solve (1) for the spread between the guaranteed and the non-guaranteed bonds:

$$r_o - r_g = r - r_g + \left(\frac{1}{1 - s_g} - 1 \right) (r - r_g) + \frac{\delta}{1 - s_g} \quad (2)$$

This new expression decomposes into three parts. The first term in the right-hand side is simply the ex-ante spread between the country’s own bonds and the aggregate yield on the guarantors’ debt. The second term is a pure debt dilution effect, since it does not depend on δ , but only on the share of guaranteed debt. A large s_g will place pressure on yields of legacy debt and, *ceteris paribus*, also on the cost of funding in the primary market. Finally, the third term represents the increase (decrease) in spreads due to an increase (decrease) in the total debt stock. This means, for instance, that a debt write-down that adjusts the country’s liabilities to its ability to pay could decrease ex-post yields on its bonds.

²⁶ We are aware that this is not an accurate representation of this relation, which depends in practice on fiscal ratios, such as debt/ GDP or debt service to revenue (Flandreau and Zumer 2004). However, this simplified version is sufficient to make our point.

Expression (2) is also consistent with the non-linearities identified by Mody and Saravia (2003) for the impact of IMF loans on spreads and the probability of issuing new debt by emerging economies.²⁷ Their results show that IMF loans increased spreads of countries with extreme levels of indebtedness prior to intervention, but lowered them for intermediate levels of debt. First, because the second derivative $\partial^2 r_o / \partial s_g \partial r$ is positive, the dilution effect of the guaranteed bonds increases with the pre-intervention yield and, consequently, indebtedness. Second, if r , the ex-ante yield, already priced a default, effectively blocking the access to non-senior credit to the country, the ex-post yield r_o will depend on the expectation of haircut. In that case, a negative δ (a debt write-down or haircut) *larger* than expected will reduce ex-post yields.²⁸

In the exponential or ‘punishing’ case, we can assume that yields rise exponentially with debt: $r = e^{\alpha B}$ and $r' = e^{\alpha B(1+\delta)} = r^{1+\delta}$. In this case it is easier to work with logarithms and write $\ln r' = (1+\delta) \ln r$. A similar expression to (1) then applies:

$$(1+\delta)\ln r = s_g \ln r_g + (1-s_g)\ln r_o \quad (3)$$

which implies an expression for the ex-post log spreads decomposed into equivalent three terms:

$$\ln r_o - \ln r_g = \ln r - \ln r_g + \left(\frac{1}{1-s_g} - 1 \right) (\ln r - \ln r_g) + \frac{\delta}{1-s_g} \quad (4)$$

These are, of course, not the only determinants of the yields on the two classes of bonds, but the remaining factors are likely to cancel out in the expressions for spreads (2) and (4). A way of seeing this is to decompose the yields of the several classes of bonds from first principles:

$$\begin{aligned} r_p &= r_f + \tilde{r}_{liq} + \tilde{r}_{risk} \\ r_g &= r_p + (r_{liq} - \tilde{r}_{liq}) \\ r_o &= r_f + r_{liq} + r_{risk} + r_s + r_\delta \end{aligned} \quad (5)$$

where r_p stands for the cost of funding of the guarantors, which is above the risk-free rate r_f , by their aggregate risk and liquidity premia. This is not necessarily the average of the individual premia, as markets may, for instance, discount bonds issued with several but not joint guaranties. The *Economist* used precisely this argument in condemning the guaranty of the 1885 Egyptian loan as disadvantageous to the UK: “It would be easy to show that the proposed international guaranty is unfair to us, because, if left to ourselves, we could raise the money at a lower rate than when our credit is impaired by being mingled with that of a country like Russia.”²⁹

In the second line, the yield on the guaranteed bonds is not simply given by r_p because, unlike the current proposals for the issue of Eurobonds, the guarantors did not mutualise their own debt stocks, so the gain in liquidity from the issue of guaranteed bonds was likely to be insignificant for

²⁷ For a review of the literature on the impact of IMF interventions for countries’ access to capital markets see Cotarelli and Giannini (2002).

²⁸ The condition for this is $r - r_g < -\frac{\delta}{(1-s_g)^2}$.

²⁹ Issue of 21 March 1885, p. 344.

the sovereign receiving external assistance. Finally, the ex-post yield on previous bonds depends on the same country-specific liquidity premium, the country-specific risk premium, and the two terms r_δ and r_s , which represent the effects of the change in the debt stock and dilution in expressions (2) and (4). Notice that we separate r_{risk} from the two last terms since it represents the risk assessment of the country *prior* to the changes in composition (r_s) and size (r_δ) of the total fiscal liabilities of the country. In this notation, the spread between guaranteed and non-guaranteed bonds is simply:

$$r_o - r_g = (r_{risk} - \tilde{r}_{risk}) + r_s + r_\delta = r - r_g + r_s + r_\delta \quad (6)$$

which is consistent with expressions (2) and (4). In the next section, we will seek to quantify the effects of dilution and change in debt stock from short-run price movements for legacy bonds. But another implication from (5) is that seniority and guaranties included in the guaranteed bonds should affect the long-term relationship between guaranteed and non-guaranteed bonds. In particular, whilst r_g is priced on the risk of the guarantors, r_o still reflects the country-specific credit risk. Hence, r_g should be affected by \tilde{r}_{risk} and less so by r_{risk} . We shall test these hypotheses from the time series behaviour of the various yield spreads.

4. Guaranteed bonds before the Great War

4.1 The Greek guaranteed loan of 1833

The modern state of Greece came into existence as a result of a lengthy war against the Ottoman Empire between 1821 and 1832, and the Greek guaranteed loan of 1833 was an outcome of this conflict between the two countries. Prior to the issuance of this loan, the Greek government had already contracted two loans in the London market known as the Independence loans of 1824 and 1825, amounting together to £2,800,000, with the support of the London Philhellenic Society. However, the newly founded Greek state did not have enough resources to service the debt and very soon suspended interest payments.³⁰

In February 1830, with the intermediation of the three powers, i.e. Britain, France and Russia, the first steps towards the independence of the Greek state were taken in a conference held in London. In particular, the three protecting powers agreed to guarantee a loan of 60 million francs for Greece, which the government wanted to raise for the purpose of maintaining a military force essential to the safety of the country. This agreement was followed by a convention drafted during the London Conference in April 1832 where the three powers specifically stated the conditions under which financial assistance was to be granted. Finally these provisions were embodied in the treaty of May 1832. Accordingly Russia, Britain and France granted a loan of 60 million francs under several guaranty on the following conditions:

1. The loan was to be raised by three instalments of 20 million francs.
2. In each instalment the three guaranteeing states were to become responsible for the payment of the one third of the annual amount of the interest and sinking fund of the relevant instalment.

³⁰ Kofas (1981: 1-20), Wynne (1951: 281-283).

3. Independently of the guarantee of three states, the Greek government assigned the entire tax revenues as an additional security. The payment of annual interest and sinking fund was first secured upon the revenues of the Greek state.
4. The service of the new bond was to be senior to the independence loans of 1824 and 1825.
5. The diplomatic representatives of the three guaranteeing countries in Greece would be specifically charged with supervising the fulfilment of these conditions.³¹

After the official grant of guaranty by the three powers, a loan agreement was reached with the house of Rothschild, and the contract was signed in Paris in May 1833. The price of issue was fixed at 94 percent with 5 percent interest charge. The effective interest rate was therefore 5.3%, which was more than 100 basis points above the average cost of funding of the guarantors, as measured by the secondary market prices of their benchmark bonds. Apparently, the ‘convex scenario’ mentioned in section 2.1 applied in this case. On the other hand, Flandreau (2013) recently pointed out to the advantages to bonds from gaining a listing in London, the most liquid market in the world at the time. Despite the British government guarantee, the Greek bond was refused an official listing in London pending the resolution of the outstanding claims of the holders of the two independence loans. Consequently, the 100 basis point spread might reflect the lower liquidity of the Paris stock exchange, where it initially got listed.

Although the original agreement authorised only the first instalment, as the needs of Greece were urgent, the powers consented to the floatation of the second series at the same time. More than one third of these funds were immediately spent on the war indemnity to Turkey. In 1835 and then in 1836 the Greek government pressed for the issue of the third instalment, however due to disagreement between the three powers the advance of the remaining funds was delayed. Eventually in 1836, the third issue was approved, but the entire unissued instalment was devoted to the service of the two already issued instalments. In other words, interest and sinking fund charges of the previous instalments consumed the entire third instalment.³²

List of Greek bonds (1824-1833)

Year	Amount of issue	Price of issue	Nominal interest	Underwriter	Type of security
1824	£800,000	59%	5%		All state revenues
1825	£2,000,000	55%	5%		All state revenues
1833	40,000,000 FF	94%	5%	Rothschild	All state revenues and severally guaranteed by Britain, France and Russia

Sources: See the text.

An important point was regarding the relatively low issue price and high interest rate, despite the fact the loan was guaranteed by the three powers. In 1855, when the Turkish Loan Bill was being discussed in the House of Commons, the Chancellor of the Exchequer remembered the 1833 arrangement as follows:

“In the beginning of 1833 the English 4 per cent stock was at 102, 103; the French 5 per cents at 101, and the Russian 5 per cents at 101. This loan must, therefore, have been very advantageous

³¹ HCPP 1831-32 (007) *Protocols of conferences held in London relative to the affairs of Greece*.

³² Wynne (1951: 284).

to the contractors. In August, 1836, about which time England guaranteed the remaining third of her third, the price of 3½ per cents in London was 100; French 5 per cents 108, and Russian 5 per cents 112. Now, it is material to observe the value in the open market of the three sets of Greek bonds guaranteed by the three Powers. The price of the English guarantee is from 108 to 112, the French guarantee 99, and the Russian about 88. Those who managed this loan for the Greek Government, guaranteed by the credit of the three Powers, contrived it so that, in the contract which threw all the credits together, that joint credit was lower than the credit of any of the three guaranteeing Governments, and the Greek Government lost the advantage of the comparatively high price of the English and French funds. And that is the arrangement which my right hon. Friend holds up as a model for imitation. For myself, I can hardly conceive a financial arrangement more ruinous to the State it proposes to assist, or less calculated to obtain the benefit of the guarantee afforded by those Governments.”³³

Due to continuous fiscal difficulties, in 1836 the Greek government deferred the payment of the guaranteed loan until 1840, when the payments were resumed, but only to be suspended again in May 1843. As a response to this situation, the three guaranteeing states demanded that the Greek government scaled down all public expenditure, and assigned the custom proceeds of the port of Syra as a guaranty for the future service of the loan. Greece eventually agreed to these conditions in September 1843 but due to political turmoil the ratification of this agreement was delayed until 1845.

This situation did not change until the Crimean War, after which Britain, France and Russia appointed their diplomatic representatives in Athens to act as a financial commission to investigate Greek finances. The commission proposed an extensive fiscal reform targeting both government spending and revenues. Part of this proposal consisted of modification of the land tax and entire tax system. Moreover, the commission agreed that Greece could allocate annually a minimum sum of 900,000 francs for the purposes of servicing the guaranteed debt without hindering its public services. Although the Greek government accepted this arrangement in June 1860, the payments did not follow. Overall, the problem of 1833 loan remained unsolved since the Commission did not have any supervisory or administrative role over the finances of the Greek government.³⁴

In 1862, at last the conditions changed due to dethronement of the Greek King Otto, who was the first king of independent Greek state and had remained in reign for thirty years. Otto’s rule was characterised by fiscal difficulties, lack of financial and monetary reforms, and his “inability to dissolve nation’s foreign debt”.³⁵ The events of 1862 led to the exile of King Otto, and the second son of the King of Denmark, who was put forward as a candidate by Britain, eventually filled the vacancy. As a gesture to the new king, in 1864 the three powers agreed to abandon a total of £12,000 a year from the debt charge. This sum was equal to one third of the prescribed minimum annuity of 900,000 francs. These funds were dedicated to the service of the 1833 guaranteed loan, and its amortisation was finally completed in 1871. At that time the indebtedness of Greece to the powers

³³ HCH 1855 “Turkish Loan Bill”, Vol. 139, Commons Sitting of Friday, 27 July 1855, columns 1469-1470 url: http://gateway.proquest.com/openurl?url_ver=Z39.88-2004&res_dat=xri:hcpp&rft_dat=xri:hcpp:hansard:CDS3V0139P0-0026

³⁴ Levandis (1944: 44-51).

³⁵ Kofas (1981: 132)

for their payments on account of interest and sinking fund amounted to about 92 million francs.³⁶ Moreover, according to the terms of 1864 agreement:

1. A new 5 % bond to the value of £1,200,000 was to be issued for the conversion of each £100 of 1824 and 1825 bonds at rates of 31.6 percent and 30.5 percent.
2. For every unpaid coupons, new bonds to the amount of 11.6 percent were to be given in exchange
3. Service of the new bonds amounting to £75,000 a year was to be secured by the customs of Corfu and by a second charge on the stamp duty.

As for the independence loans an agreement was finally concluded in September 1878; by then the nominal amount of debt, including accumulated arrears had grown to about £10,000,000.³⁷

4.2 The Turkish 4% loan of 1855

Although the origins of the Ottoman Empire's attempts to contract a loan in international markets can be extended back to the 1780s, the first bond issue took place in 1854 in order to finance the Crimean War.³⁸ On this year, with the help of the banking house Palmer and Goldschmidt, the Ottoman Empire contracted a loan at 6 per cent. The underwriter initially demanded from the British government to act as a guarantor in order to issue the loan, however Palmerston was quite reluctant to provide financial help in the form a guaranty.³⁹ The payments of this bond were secured by part of Egyptian tribute. The authorised amount for this issue was £5,000,000, but the Ottoman government only raised £3,000,000. However, by 1853 the war expenditure had already reached almost 67 per cent total government spending and within a year the proceeds of the 1854 loan were exhausted and were far from covering the considerable costs of the war estimated around 14.26 million pounds sterling from 1853 to 1856.⁴⁰

On 5 April 1855 the Ottoman government officially requested the remaining £2,000,000 and asked the British and French governments to jointly guarantee the issue. By May, however, due to the collapse of the peace negotiations in Vienna and the prospects of more extensive military operations, it was decided that a bigger sum was needed. Therefore, a further loan of £5,000,000 was proposed to be jointly guaranteed by Britain and France in order to support the Ottoman Empire in the war against Russia. After lengthy discussions in the House of Commons on 20 July the financial resolution authorising the guarantee was passed by a majority of three.⁴¹ According to the convention signed between French, British and the Ottoman governments, the service of this loan was to be met by the remaining part of the Egyptian tribute together with the customs of Izmir and

³⁶ HCPP 1864 (144) *Greek loan. A bill for authorizing the relinquishment in favour of the King of the Hellenes of certain money payable in respect of the Greek loan*; HCPP 1864 [3346] *Papers relating to the arrangement concluded at Athens in June 1860 respecting the Greek loan.*

³⁷ Levandis (1944:28).

³⁸ Akar and Al (2003).

³⁹ Anderson (1964: 47-51)

⁴⁰ Badem (2010: 296)

⁴¹ Anderson (1964: 55)

Syria. Moreover, in the case of a failure, the interest and payments were guaranteed jointly and severally by the governments of Britain and France.⁴²

List of Ottoman bonds (1854-1855)

Year	Amount of issue	Price of issue	Nominal interest	Underwriter	Type of security
1854	£3,000,000	80%	6%	Palmer, Goldschmidt	Part of Egyptian tribute
1855	£5,000,000	102.6%	4%	Rothschild	Remainder of Egyptian tribute and the customs of Izmir and Syria

Sources: See the text.

This joint guaranty enabled the issue of the bond above par and at an interest rate of 4 per cent. The net interest was 3.9%, almost exactly the average cost of funding of the guarantors, which in the month prior to the issue averaged just 3 basis points below the effective rate on the Egyptian bond.

For the British government the guarantee was simply a necessary part of the war policy based on the alliance with the Ottoman Empire and France. On the other hand, these favourable terms came with several conditions. One condition of the guaranty was to use the proceedings entirely for war purposes. In order to supervise the expenditure, Lord Hobart and Marquis de Ploëuc were assigned as British and French representatives. The role of these commissioners, who were sent to Istanbul despite the opposition of the Ottoman government, was to verify the treasury accounts and ensure the funds were spent in support of the army.⁴³ However, due to the diplomatic resistance of the Ottoman Empire, the work of the commission started only in January 1856, after several army contracts were signed in order to evade its control. By September 1856 all funds were spent and the commission finished its work.⁴⁴ The commission, however, managed to monitor the spending of the proceedings entirely for military purposes. In fact, the detailed figures reveal that more than half of the net receipts were spent on the salaries of regular troops (*Nizamiye*), and the rest was split between the Imperial Ordnance Foundry (*Tophane*) and the Imperial Naval Arsenal (Tersane) for the purchase of warships from France and Britain.⁴⁵

In October 1875, when the Ottoman Empire defaulted on the interest payments on its outstanding debt of c. £200 million, the Porte also suspended the prescribed sinking fund of one per cent of the guaranteed loan. However, the sums due were regularly advanced by the Bank of England to the bondholders.⁴⁶ Moreover, unlike the Greek guaranteed loan of 1833, the 1855 loan was listed under the British funds in the stock exchange daily list. After the default of 1876, the payments of the 1855 loan were taken over by the guaranteeing powers. However, from 1878 onwards the tribute payable by Cyprus to the Turkish Government had been retained by Great Britain and applied to the service of the loan. This bond was eventually retired in 1943.⁴⁷

⁴² HCPP 1968 *Declaration exchanged between the British and French governments relative to the Turkish loan. Signed at London, July 27, 1855* and HCPP 1961 *Convention between Her Majesty, the Emperor of the French, and the Sultan, for the guarantee of a loan to be raised by the Sultan. Signed at London, June 27, 1855.*

⁴³ Kiray (1988) and Al (2007).

⁴⁴ Anderson (1964:61) and Badem (2010: 326-327)

⁴⁵ Akar and Al (2003: 44-45) and Grant (2007: 19-20)

⁴⁶ HMT 1916 "Turkey: Ottoman public debt 1854-1914: External Guaranteed Loan 1855: memoranda by S A Armitage-Smith"

⁴⁷ Wynne (1951: 393-395).

4.3 The Egyptian 3% loan of 1885

The Egyptian government contracted its first “state loan” in 1862, and from this year to 1873, the total amount of contracted loans in international financial markets reached to sum of £E68 millions.⁴⁸ In 1873, the government issued the largest external loan in its history, amounting to £E32 millions, with the Imperial Ottoman Bank, Bischoffsheim, Société Générale and other banking houses in Alexandria, Istanbul and Amsterdam. This loan was secured by all the revenues of the railways of Lower Egypt, the proceeds of the personal and indirect taxes, the salt tax, as well as annual receipts to be taken from the proceeds of the Moukabala.⁴⁹ Taken together with the previous ones, the overall guaranties corresponded to almost all the general revenues of the Egyptian government. Although the loan of 1873 was seen as a success for the government, the crises in the international markets, and the bankruptcy of the Ottoman Empire and several other states in 1876 had an immediate effect on Egyptian credit, and the government suspended the payments on outstanding debt.

A settlement was reached in the same year, whereby an institution named the “Caisse de la Dette Publique” was established, under the direction of foreign commissioners nominated by their respective governments; these commissioners were authorized to receive the revenues intended to service the debt directly from the local authorities. Taxes from several Egyptian provinces, Cairo and Alexandria, the salt and tobacco taxes along with customs revenues were assigned to the Caisse for the purpose of servicing various public loans. Moreover, the debt settlement established an Anglo-French control over the finances of Egypt. Finally, the agreement called for the unification of the entire indebtedness of the country, which at the time amounted to £91 million. Apart from its financial consequences, this settlement marked the beginning of a set of historical events, which in the end led to the military takeover of Egypt by Britain in 1882. Within a few months after the British took charge, the Anglo-French control was abolished. The British Consul-General was given overall authority and English advisers were placed in the Egyptian ministries.⁵⁰

List of Egyptian bonds (1877-1885)

Year	Amount of Issue (£)	Nominal Interest (%)	Price of Issue	Underwriter
1877 Preference	31,647,000	3.5		Bank of England, Comptoir d'Escompte
1877 Unified	60,958,240	4		Bank of England, Comptoir d'Escompte
1878 State Domain	8,500,000	4.25	73	Rothschild
1885 Guaranteed	9,424,000	3	95.5	Great Powers

Sources: Fenn (1883), Kimber (1920), CFB, Annual Reports, 1877-1914, Wynne (1951). The nominal interest rates shown in the table refer to the changes made by the Law of Liquidation (1880).

The first thing that the new British administration faced with was a budget deficit due to the costs of the military campaign. The net revenues from the Daira⁵¹ and the domains were insufficient for the amounts required to service the loans secured by these properties. In 1884 the government

⁴⁸ Crouchley (1938: 120), CFB, 1914

⁴⁹ This name was originated from the “compensation” introduced by the Egyptian government in 1871 which provided landowners the option of paying six years’ land tax in advance with a discount. McCoan (1877: 122)

⁵⁰ Holland (1985), Cromer (1908), Atkins (1974), Cain (2006), Hopkins (1986), Al-Sayyid Marsot (2007).

⁵¹ Dairas or “administrations” refer large estates of the Egyptian Khedive and his family. McCoan (1877: 146)

was in need of a new foreign loan and recognised that it had to expand state revenues to maintain a minimum level of public works and to handle the heavy expenditure on account of the war in Sudan. According to the reports of Edgar Vincent, “the financial history of the year [1884] may be summed up in the statement that it consisted in a long struggle to stave off bankruptcy”.⁵² In fact, from early 1884 the Rothschilds had already started advancing funds to the Egyptian government in order to prevent a likely default and the British government was quite keen that they carried on this procedure. In response to Rothschild’s request from the British government to guarantee an Egyptian bond issue, Lord Granville responded on 6 August 1884 “her majesty government have no authority to guarantee the repayment of any debt of the government of Egypt, nor can they determine of present the precise amount of the influence to be exercised by them with regard to the financial engagement of that country”. On the other hand in order to carry on the advances made by Rothschilds, Lord Granville ensured that “we do not entertain any doubt that the advance of your house ought to be and will be repaid”.⁵³ From early 1884 to July 1885 until the loan agreement was finalised, Rothschilds agreed to renew their advances to the Egyptian government upon the requests of British government.⁵⁴

To obtain the required agreement among the signatory powers (Germany, Britain, Austria, Russia, France and the Ottoman Empire), the British government, in April 1884 invited them to a conference in London. After prolonged negotiations regarding the nature of the guaranty, an agreement was signed by the six powers in March 1885, according to which the Egyptian government was authorized to take out a new loan not exceeding £9 million and at a rate not to exceed 3.5 per cent. This loan was jointly and severally guaranteed by the governments of Germany, Great Britain, Austria-Hungary, Russia, France and Italy.⁵⁵ The effective interest rate at launch was a very moderate 3.1%, which compares favourably with the average cost of funding of the guaranteeing powers, which in the month prior to the issue of the Egyptian bond stood at 4.2%.⁵⁶ Even the average of just the yields of Britain and France was 3.4% in the same month. Despite the concerns of the editor of the *Economist*, the loan was floated but 13 basis points above the yield of consols at the time.

The 1885 regulation also introduced a few other adjustments on the financial position of Egypt. During the negotiations Britain had advocated a permanent reduction of interest on the old debt while France had opposed any reduction. As a compromise, the convention in 1885 provided a

⁵² FO 1885 “Reports on the State of Egypt and the Progress of Administrative Reforms”, Egypt, No.15 [C. 4421.] p.51-52

⁵³ RA 1884 “Egyptian loan 1884- 1885 private correspondence Nathaniel de Rothschild and Lord Granville and Egyptian Finance Minister” XI/111/16

⁵⁴ FO 1885 “Reports on the State of Egypt and the Progress of Administrative Reforms”, Egypt, No.15 [C. 4421.] p.51-52, pp.85.

⁵⁵ HCPP [C.4341] Egypt. No. 7 (1885). Convention between the governments of Great Britain, Germany, Austria-Hungary, France, Italy, Russia, and Turkey, relative to the finances of Egypt. Signed at London, March 18, 1885.

⁵⁶ The bonds used were the 3% British consols (yield of 3%), the 3% French *Rentes* (3.7%), the 4% Russian Nicholas Railway (5%), the 4% Prussian consolidated (3.9%), the 4% Austrian Gold *Rentes* (4.9%) and the 5% Italian *Rendita* (4.6%).

temporary tax of 5 per cent on the coupons of the Preference and Unified debts due in 1885 and in 1886 to supplement the funds available to the Egyptian government.⁵⁷

From 1885 onwards, Egyptian finances started to improve. By 1890 the budget yielded a surplus. During the period 1885-1903, the Egyptian government contracted another four foreign loans with an average effective interest rate of 4 per cent. The final major event of the period was the agreement between Britain and France in April 1904. On the eve of this agreement, four separate debts remained: the Guaranteed Debt created of 1885; the Privileged Debt, bearing interest (since the conversion of 1890) at 3 per cent; the Unified Debt, bearing interest at 4 per cent and finally the Daira and Domains Loans. The agreement maintained the existing structure and only changed the revenues assigned for the service of these debts, hence the interest service was pledged by the net revenue of the property tax alone.⁵⁸

4.4 The Chinese 4% (French-Russian) loan of 1895

As different from the other cases, the history of public borrowing in China relied on domestic funds more than the international financial markets. Prior to 1895 the majority of Chinese external bonds were small sums issued by the provinces and secured by the corresponding receipts of the Chinese Maritime Customs. A significant part of these external loans were contracted in order to pay indemnities and to finance war, especially with Japan.

In 1895, following the defeat in another war with Japan, China needed funds to meet the first instalment of the war indemnity of 200,000,000 kuping taels. According to the Shimonoseki Treaty signed on 17 April, China was required to pay the half of the war indemnity in one year, and the rest in 7 years with an interest rate of 5 per cent.⁵⁹ However, even with this clause, China did not have the necessary funds to meet the requirements of the treaty.

Chinese bonds (1895)

Year	Amount of Issue	Nominal Interest	Price of Issue	Maturity	Underwriter
1895 Guaranteed	400,000,000 francs	4%	96.5	36	The Russian Imperial Government
1895 Cassel	£1,000,000	6%	106	20	Chartered Bank of India
1895 Nanking	£1,000,000	6%	104.5	20	Arnhold, Karberg and Co.
1895 Anglo-German Loan	£16,000,000	5%	99	36	Hong Kong and Shanghai Banking Corporation and the Deutsch-Asiatische Bank

Sources: See the text.

After the imposition of the war indemnity as a result of the peace treaty, Chinese government considered the issuance of a loan, and contemplated the appointment of the British diplomatic representative in China, Sir Robert Hart to take charge of the financial arrangements. However, this proposal was met with strong resistance from the Russian government, which was keen on providing

⁵⁷ Wynne (1951: 621) and RA 1885 "Egyptian Guaranteed Loan Contract – 3% £9,424,000 24/8/85-23/4/87", 000/401D/7

⁵⁸ Crouchley (1938: 169-171); Feis (1972: 393); Brunyate (1906).

⁵⁹ FO 1895 Miscellaneous Papers, Vol. 48, p.160

a loan to China through a joint French-Russian consortium. Consequently a loan amounting to 400 million francs was issued at 96.5 per cent and carrying an interest of 4 per cent. The effective interest of 4.15% stood about 27 basis points to the contemporary yields of Russian bonds. Maturity was 36 years and it was secured by the revenues of the Maritime Customs of China, with priority over all subsequent loans.⁶⁰ According to the agreement, the loan was exempt from any taxes and was guaranteed by the receipts of the Imperial Maritime Customs and by the deposit of custom bonds (*Bonds de Douanes*). Moreover, in the event that the service of the loan was delayed or suspended, the Imperial Russian Government guaranteed to pay any amount due. In order to ensure the timely payment of the loan the Chinese government also committed not to use the receipts of the Chinese Maritime Customs for the issue of another loan until the payment of 1895 loan was to be completed. Finally, in return for the guarantee Chinese government declared “its resolution not to grant to any foreign power any right or privilege under any name whatsoever concerning the supervision or administration of any of the revenues of the Chinese Empire. But in case the Chinese government should grant to any one power rights of this character...they should be extended to the Russian government”.⁶¹

This agreement did not favour the British interests in China. Therefore, as a response to the growing financial difficulties of the Chinese government, the British representative with the help of its German counterpart acted as an intermediary for the issuance of two new loans. The two parties had attempted to cooperate prior to the signing of the Russia-Chinese loan by offering an Anglo-German loan arranged by German banks and the Rothschild, however this effort had not succeeded.⁶² This time the Anglo-German cooperation seemed to work, given that the Chinese government was also receptive because of the political nature of Russian and French demands.⁶³ The first was the British (Cassel) loan of 1895, which was contracted with the British Chartered Bank of India. This bond was also secured by the revenues of the Maritime Customs of China. With a nominal value of £1,000,000, it was issued at 106 and carried an interest of 6 per cent. The second loan was the German (Nanking) loan of 1895 again with a nominal value of £1,000,000. The Nanking loan was also secured by the revenues of the salt tax in addition to revenues of the Maritime Customs of China and had 6 per cent interest rate and was issued at 104.5. Finally, a much larger Anglo-German loan was issued in the same year underwritten by the Hong Kong and Shanghai Banking Corporation and the Deutsch-Asiatische Bank. This bond was issued at 99 per cent, for the amount of £16,000,000 and bore an interest of 5 per cent. Similar to the previous issues, the payments were also secured by the revenues of the Maritime Customs of China with priority over any subsequent loans but subject to the charge in favour of the 4 per cent loan of 1895.⁶⁴

The fact that all issues were secured by the proceeds of the Maritime Customs raised concerns among the contemporary investors:

“Pledging the maritime customs the Chinese government is alienating a source of revenue upon which it will probably find it very difficult to get on without... The broad fact is, that the one really good security which China has to offer has already been

⁶⁰ Viner (1928), Feng-Hua (1919: 27), Kimber, (1920: 362).

⁶¹ FO 1895 Miscellaneous Papers, Vol. 48, p.336 and MacMurray (1921: 40-41)

⁶² McLean (1973)

⁶³ Otte (2010: 83)

⁶⁴ Kimber (1920: 363), Denby (1916: 58)

charged pretty heavily, and the idea which seems to prevail at present that she may safely be trusted to almost any extent is utterly fallacious.”⁶⁵

Contrary to the expectations, however, the problem with 1895 issue was not China or Maritime Customs administration but Russia, which was not in a favourable fiscal condition. Unlike other cases, the yields of Chinese guaranteed bonds performed better than the loans of its guarantor state Russia during the Russo-Japanese War 1904-1906.

4.5 The Greek guaranteed loan of 1898

The settlement of the independence loans in 1879 marked the reappearance of Greece in the financial markets of Europe, followed by an era of rapid debt expansion, which eventually culminated in another default in 1893.⁶⁶ Immediately after the default, in December 1893, the Corporation of Foreign Bondholders and bondholder representatives of other countries appointed a committee to start negotiations with the Greek government.⁶⁷ The formal negotiations were slow to progress given that the Greek government demanded an extensive reduction in the capital and interest of the outstanding debt.

Meanwhile, in 1897, Greece found herself in conflict with the Ottoman Empire over the Cretan Question, which led to the Greece-Turkish War of 1897 and the defeat of Greece. According to the peace terms, determined through the mediation of six powers (Austria-Hungary, France, Germany, Great Britain, Italy and Russia), Greece was condemned to pay a war indemnity, which made the financial position of the country even worse. In accordance with the preliminaries of peace, in 1898 the powers assembled a commission to investigate the existing financial situation of Greece.

On the basis of this report, Greece agreed to sign the 1898 Law of Control with the representatives of foreign powers. According to the agreement, the Greek government consented to the foundation of a financial commission. The gross proceeds of the monopolies (salt, petroleum, matches, playing cards and cigarette paper), tobacco dues, stamp dues and import dues collected by the customs house of Piraeus were assigned to the service of the gold loans. Finally, the collection of these revenues was placed in the hands of the Society registered in Greece, which would be under the absolute control of the Commission. Moreover, a new guaranteed loan would be raised for Greece to pay for the indemnity. The maximum amount of loan was fixed at £6,800,000, however the actual amount issued was £6,023,700. The convention between the guarantor governments and the Greek government provided that the coupons would be paid in gold. In order to ensure a favourable rate, the three governments agreed to make their guaranty “joint and several” -instead of only several as they did in 1833. As a result, the bonds, bearing 2.5 per cent coupons were marketed at a small premium and oversubscribed. Once more, the combination of guaranteeing powers of different credit standing did not markedly affect the effective yield on the guaranteed bonds. The average yields of the three powers were 2.9% before the floating of the new Greek bond and, in particular, British consols paid but two basis points below the Greek guaranteed bond. The authorised amount of the loan was £6.8 million but only £6 million were issued.⁶⁸ In the post-1898

⁶⁵ “Chinese Borrowing” *The Economist* (London, England), Saturday, July 13, 1895; pg. 907

⁶⁶ Levandis (1944: 58-68).

⁶⁷ CFB, 1893, Annual Report, Vol. 21, p.85.

⁶⁸ HCPP, 1898 [C.8778] Greece. No. 1 (1898). Despatch from Her Majesty's minister at Athens, inclosing the Greek law of control.

period, Greece was able to contract 8 more external loans, amounting in total to £28 million. More than half of these loans were used to finance the Balkan Wars in 1912-1913.

List of Greek bonds (1879-1898)

Year	Amount of issue (£)	Nominal interest (%)	Price of issue (%)	Underwriter
1879	2,400,000	6	78.5	Comptoir National d'Escompte (Comptoir)
1881	4,800,000	5	74	Hambro and Son of London (Hambros), Comptoir, NBG
1884	4,288,600	5	68.5	Bank of Constantinople, Bank of Epirus and Thessaly, Comptoir, Bank of Egypt, Banque de Paris et des Pays-Bas, NBG
1887	5,400,000	4	78.5	Comptoir National d'Escompte
1889	1,200,000	4	72	Hambros, Comptoir, NBG
1889	5,000,000	4	77.5	Hambros, Comptoir, NBG
1890	1,800,000	5	93	Hambros, Comptoir, NBG
1890	600,000	5	86	Hambros, Comptoir, NBG
1893	389,560	5	65	Hambros, Bank of Constantinople, NBG
1898	6,032,700	2.5	100	Guaranteed by Russia, England and France

Sources: Fenn (1869) and (1883), Kimber (1920); CFB, *Annual Reports* (1913)

In Table 1 we collect the main relevant information on the guaranteed bonds discussed in this paper, and which we shall use in the empirical section.

Table 1 here

In particular, it should be noted the scale of the guaranteed issues in comparison with the previous debt stocks. In their original proposal, Delpla and von Weizsäcker (2010) envisioned the issue of blue bonds up to 40% of pre-existing debts in the case of Greece. In 1833 Greece received guaranteed bonds worth 57% of its previous loans. Greece again in 1898 was granted guaranteed bonds corresponding to 19% of its previous debt. However, as the guaranteeing powers imposed a 61% haircut, the share of guaranteed bonds rose to close to half of the new debt stock (Esteves 2013). The fractions were even higher in the cases of Turkey in 1855 and China in 1895.

5. Empirical analysis

5.1 Data

In our empirical analysis we use 19 bond series, comprising 7 guaranteed bonds, 7 non-guaranteed domestic bonds, and 5 bonds from the guaranteeing powers (the UK, France, and Russia). We have seven series for the five guaranteed bonds because the Greek 1833 bond was quoted separately for the shares guaranteed by Britain, France, and Russia. This is a quite interesting decomposition of the effect of the guarantors' credit, which we will explore in the next sub-section.

We will conduct two empirical exercises in this section. The first focuses on the short-term dynamics of adjustment to the issue of guaranteed bonds. For that matter we use daily prices of the bonds described in Table 2. The second part of our analysis studies the long-term relation between guaranteed and non-guaranteed bonds. Because of the length of the periods considered, we revert to using monthly data, as described in Table 3.

Tables 2 and 3 here

The figures in Table 2 are expressed in simple yields (coupon/ price). We understand that this is not an accurate measure of the yield as we ignore the maturity of the bonds and do not try pricing the callable options included in many of the bonds at that time. Nevertheless, the long maturity of all the bonds considered should minimise the effects of the first bias, whereas contemporary investors probably did not take full account of the pricing of complex options for these bonds, as we argue below.

However, this option is less defensible for the monthly dataset (Table 3), which covers a long period approaching the maturity of some of the bonds used in the analysis. Consequently, we tried several definitions of market yields. The first was to simply use the Investors Monthly Manual (IMM) own estimate of the simple yields, i.e., the ration of coupon/ price.⁶⁹ The IMM was a widely-read publication at the time, and a likely port of call for contemporary investors, so that by using its yield data we will be approaching more closely the market's appreciation of the return of each bond. A second alternative was to calculate the yield-to-maturity (YTM) of the same bonds, from the prices reported in IMM and the redemption schedule included in all the bonds via their sinking funds. A final alternative was an attempt to price in the callable options implicit in the majority of the bonds by calculating their yields-to-call (YTC). As an example of the impact of these different definitions, we reproduce in Figure 1 the yields of the Egyptian guaranteed bond of 1885.

Figure 1 here

As the market price of this bond hovered above par for almost the whole period, the simple yield was systematically below the coupon (3%). The main exceptions were late 1904 as well as most of 1906-97. Although this bond had a long maturity (41 years), there will be a difference between the simple yields and the YTM.⁷⁰ Because of the pricing above par, the YTM is usually smaller than the simple yield. Finally, for the same reason, the YTC is also below the two other yields, as prices above par could conceivably lead investors to anticipate a conversion of the bond into a new loan with lower coupon. Conversely, the YTC rise above the simple yield whenever the bonds traded at a discount.

From the two problems with using simple yields –maturity differences and anticipation of calls–, we think that the first is the overriding consideration in this study for two reasons. First, there is sufficient variation in the maturities of the bonds to warrant caution in using simple yields that assume all bonds to be close to perpetuities. Non-guaranteed bonds tended to have shorter maturities than the guaranteed loans and to be priced below par most of the time. For discount bonds, the YTM decreases with maturity, such that simple yields (implying an infinite maturity) are lower than the true YTM. And since non-guaranteed bonds had shorter maturity to run than the guaranteed loans, using simple yields would bias *down* our estimates of the discount of guaranteed bonds r_o-r_g .

⁶⁹ This is not to say that the editors of the IMM were not aware of the implications of callable options for bond pricing, as they made explicit on a couple of occasions (see Mauro, Sussman and Yafeh 2006: 42).

⁷⁰ The bond came originally with a 0.3425% annual sinking fund, to which was added a supplemental sinking fund of £90,000 per annum.

We also computed the YTC of each bond and redid the analysis, but the qualitative results did not change. However, we believe that this definition of yield is less appropriate for the bonds we are considering. As mentioned, the non-guaranteed bonds usually traded at a discount, such that investors would not worry about their imminent conversion. In fact, not one of these bonds was converted and the only coupon reductions in our sample period were the outcome of the Turkish default of 1876-81. In computing $r_o - r_g$ below we will exclude the default period, as yields during defaults price the expectations of the debt write-down, rather than the differences in relative risk between domestic and guaranteed bonds. Likewise, the guaranteed bonds were never converted into lower coupon bonds, despite the fact that they traded above par for long periods. Hence, YTC would be higher than YTM for non-guaranteed bonds and lower for guaranteed bonds. The result would be a bias *up* of our estimates of $r_o - r_g$. Between the upward bias from using simple yields and the downward bias of YTC, we conservatively chose the middle option of using the YTM.

The choice of comparator bonds (non-guaranteed) was guided by two principles. First, for the non-guaranteed bonds, we sought to identify the most liquid issues outstanding at the time of the introduction of the new guaranteed bonds. In particular, we only considered external bonds regularly quoted in London or Paris. This should minimise any differences in liquidity premia between r_g and r_o but, more importantly, it should give as close a measure as possible of the marginal cost of funding for the sovereign before and after the new issue. Second, for the guaranteeing powers, we chose the benchmark issues, for similar reasons, but paying attention to avoid the effect of expected imminent conversions on the simple yields of bonds (as described in Flandreau and Zumer 2004).

The daily prices in London were extracted from Wetenhall's *Course of the Exchange*. The only exception was the Chinese 4% guaranteed loan, which was only quoted in Paris. The prices of this loan were retrieved from two French sources: the *Tableau des titres cotés à la Bourse de Paris* and the *Bulletin de la Cote*, published by the Compagnie des agents de change. Again with the exception of this Chinese loan, all monthly data (Table 3) were obtained from the tables of the IMM.

5.2 Short-term: dilution

In this section we seek to identify the reaction of pre-existing (or 'red') bonds to the introduction of the five guaranteed loans, particularly, the dilution effect from the issue of senior bonds. The validity of this exercise depends on an accurate timing of the event, namely, the dating of the period when the details of the each guaranteed loan were either rumoured for the first time, or confirmed. As we use market prices, we seek a source of public information, for which we use the British and French daily press, especially, the issues of *The Times*.

To formally identify breakpoints in the price series we resort to Bai and Perron's (1998, 2003) methodology. After establishing that at least one structural break exists from the UD and MD statistics, we select the number of breaks from the sequential procedure, stopping at the last significant $\sup F_T (I+1 | I)$ statistic. The dates and statistics of the break tests are in Table 4.

Table 4 here

In the table we also provide possible reasons for the breaks, from our reading of the contemporary daily press. We need to interpret the identification of news from the press with care for two

reasons. First, we cannot observe insider information which might be reflected in the bond prices before it became public and made it into the pages of the dailies. Nevertheless, the lag between these two events should not have been too long as to invalidate the exercise. Moreover, Bai and Perron's method also provides confidence intervals for the break point estimates, which are represented by the shaded areas in Figures 2-6.

Figures 2-6 here

In the figures the red vertical lines mark the point estimates of structural breaks, whereas the two vertical blue lines date the first day when the daily press reports the intention to issue a guaranteed bond (solid line) or the date when the loan is effectively floated in the market (dashed line).

The second caveat of this exercise has to do with the usual errors in statistical inference. On the one hand, there is a type I error problem – as we only concentrate on the dates identified by the statistical procedure, we may be ignoring other relevant pieces of public information published on dates which were not picked up by our breakpoint dating method. A clear example of this is the sudden jump in Egyptian yields shortly after the announcement of the guaranteed loan (Figure 4). In this case, the method did not pick up this date as a structural break arguably because of the quick reversal in yields, although it could still be informative of the initial market's perception of dilution. Then, there is also the question about the power of the breakpoint test, which may overidentify breaks. On visual inspection, the second break in the Chinese series (Figure 5) could be a case in point. Nevertheless, the dates identified as structural breaks have general support on the contemporary flow of public information, as described in Table 4 and the reaction of the bond prices also accords with the nature of the information published through the daily press.

A particular interest of high frequency data is the possibility of identifying the market's reaction to debt dilution effects, on account of the issue new claims on the same stream of revenue (as in the jump of Turkish yields on the 08/10/1856) and also of the seniority of the guaranteed bonds. The causes behind the issue of guaranteed bonds, as well as the nature of conditionality imposed on the borrowers seem to have been determinant in guiding the market's impact reaction.

Only on two occasions did yields rise markedly on legacy bonds: the early Greek case and the Egyptian convention of 1885. In the first case, the yields on the independence loans rose by about 29% immediately after the convention to issue a new guaranteed loan was made public. However, this initial reaction was quickly reversed, no doubt on the force of the encouraging noises coming from the several governments involved. The unusually long gap between the announcement of the convention and the actual issue of the guaranteed bond (12 months) allowed bondholders plenty of time to inform themselves of the details of the financial operation and, in particular, of its consequences for their own claims. Even though the yields on independence loans fell all the way until the issue of the new loan, in July 1833, the bondholders' expectations were quickly shattered, in October, when the Greek regency informed them it was not recognising its claims, despite the financial arrangement reached with the three protecting powers. On that date, the yield on Greek bonds rose almost exactly to the same level which it had reached a year prior, probably pricing in again the expectations of debt dilution. In fact, the level of yields reached on this occasion almost exactly matches the prediction of equation (2) for the linear case for the relation between fiscal

fundamentals and yields. The formula predicts a yield of 21.9% for the independence bonds against the 22.2% effectively priced on the market.⁷¹

Despite this interesting reversal, the prices of Greek bonds recovered quickly and generally stabilised at a level similar to that prior to the announcement of the financial guaranty from the three powers. Another interesting feature of this case is that since the guaranteed bond was issued with only several guaranty, the markets priced separately the tranches guaranteed by the three powers. Figure 2 shows that there was a fairly consistent premium of about 55 basis points between the Franco-Russian tranches and the British tranches, whilst there was no difference between the yields of the French and the Russian-guaranteed tranches. It is tempting to see this as the liquidity or 'safe-haven' discount enjoyed by Britain, which falls nicely within the range of values estimated for today, i.e. between 30 and 70 basis points. However, the press of the time explained this premium with the fact that the coupons on the 1833 bond were paid at fixed exchange rates, which were less favourable than the actual exchange of sterling against the franc. Consequently, bondholders cashing in their coupons in London, rather than in Paris had an advantage and that was reflected in the price of the bonds in the two markets.⁷²

The second case of adverse yield reaction, also short-lived, happened with the Egyptian convention of 1885, with the yields of the unified and state domain bonds rising by 15% on average between the announcement that all powers had accepted to guarantee the new Egyptian bond (on 19 March) and the end of April. This rise too was entirely reversed over the course of the rest of the year. However, the identification of the start of the 'Egyptian event' is less clear than in the early Greek case because the British government had been pressing ahead with the idea of a new loan under international guaranty since at least April 1884, when it convened the remaining powers to a conference in London to debate the state of Egyptian finances. It is therefore possible that markets priced dilution not on March-April 1885, but on April-June of the year before, when yields also increased markedly – by 20% for the unified debt and 11% for the state domain loan. In that case, the jump in yields in 1885 could be a reflection instead of the unexpected addition to the financial convention of a temporary tax on the coupons of existing bonds for two years.

By contrast with these two cases, yields seem to have reacted favourably in the other three operations to the announcement of the issue of guaranteed loans. This is especially clear in the later Greek episode and less so in the Chinese case, where the yield of the Cassel loan dropped but by a small fraction. The introduction of international financial control simultaneous with the Greek 1898 loan is certainly not immaterial to this result and the subsequent reduction in Greek yields until the end of 1899. The assurance of greater control and transparency of Greek finances surely would have reflected positively on foreign bondholders' expectations. Moreover, and unlike the 1833 operation, this time the guaranteeing powers imposed debt write-downs and interest rate reductions worth c. 15% of the previous debt stock and between a third and 60% of the pre-default interest bill. In other words, the guarantors calibrated the issue of the 'blue bonds' such as not to burden Greece with a new debt stock it could service. The parallels between the two Greek guaranteed bonds of 1833 and

⁷¹ The new guaranteed loan added one third to the total debt outstanding ($\delta = 0.33$), the fraction of 'blue' bonds was therefore a quarter ($s_g = 0.25$), the average yield on the guaranteed bond in September 1833 had been $rg = 4.8\%$ and, finally, the yields on the independence loan had averaged $r = 13.2\%$ over the same period. Applying expression (2) results in an ex-post prediction of $r_o = 21.9\%$.

⁷² The exchange rate premium of London over Paris was of c. 50 basis points (*The Times*, 28.2.1833, p.5).

1898 and today's debate on the financial effects of the two Greek bailouts since 2009 are very close – even though one may argue that the level of conditionality imposed today by the 'troika' of EC, ECB and IMF is still not equivalent to the power of the international financial commission inaugurated in 1898.

Turkish yields are harder to interpret as they also reacted to the news about the Crimean war, for the support of which the 1855 guaranteed loan had actually been raised. In that sense, the issue of the new loan could count as good news to the holders of the previous bonds inasmuch as it signified the commitment of Britain and France not to let their ally be defeated by the Russian Empire. A defeat would inevitably attract negative financial consequences which could harm bondholders more than the dilution effect of the 1855 loan.

The conclusion from this analysis must therefore be that, although present, debt dilution effects were either second-order or temporary in the cases studied in this paper. This is however not a prediction for similar operations in the future, since in all cases under study the introduction of international financial guaranty was a response to desperate financial positions by the borrowers, which is not the environment envisaged by the proponents of Eurobonds. As mentioned in section 2, many of the advocates of this solution for Europe explicitly separate it from resolution programmes for countries under financial duress, which should not be eligible to participate in Eurobond issue until after having solved their fiscal crises.

5.3 Long term pricing of guaranties

As we described in section 3, the different underlying risk structure of guaranteed and non-guaranteed bonds should have affected their long-term relationship. In this section we test the hypothesis that long after their issue, guaranteed bonds continued to be priced differently from the remaining debt of the sovereigns. In particular, we will test the assertion that guaranteed bonds were priced on the credit risk of the guarantors (\tilde{r}_{risk}), rather than on the country-own risk r_{risk} . But before that, we start by quantifying the shadow long-term yield discount from guaranteed debt as the difference between the secondary market yields of non-guaranteed and guaranteed bonds. This extends the similar comparison we did for the short-run in the previous sub-section.

Table 5 and Figure 7 represent the long-term evolution of the net yield discount of guaranteed bonds for four out of the five cases we discuss in this paper. We left the initial Greek bond out of the comparison as the 5% independence bonds were in default until 1879 and, consequently, are not a good measure of the marginal cost of funding for the Greek sovereign. Likewise, the Greek state failed to 1833 guaranteed bond itself remained in default over part of the period, until finally paid off by the guaranteeing powers in 1871.

Table 5 and Figure 7 here

We also excluded the period when Turkey went on default (10/1875 to 12/1881) as the secondary market yields of the non-guaranteed bonds were not a measure of the Ottoman marginal cost of funding, but of the expected haircut after settlement. With the exception of China, guaranteed bonds start off with a very high discount of close to 300 basis points against pre-existing bonds of

the assisted sovereign.⁷³ With time the discount converged to lower values, especially in the cases of Egypt and Greece. Interestingly, despite being issued already under the aegis of the *Caisse de la Dette*, the Egyptian 3% guaranteed loan started off with a particularly high discount, which only came down to 100 basis points 5 years later. Markets apparently took time to be persuaded of the benefits of international control in terms of the consolidation of Egyptian finances. Similarly, the inauguration of the *Dette Ottomane*, after the Turkish default, had a moderate impact on the spread between guaranteed and non-guaranteed bonds, which fell by little more than 80 basis points between the pre-default and the post-workout periods. However, it is likely that the discount before 1876 already included the expectations of imminent default, biasing up the estimate of the marginal cost of funding just before default. Consequently, the true immediate impact of the inauguration of foreign control over the Ottoman finances was likely to be lower than 80 basis points. A more significant compression in the spread between guaranteed and non-guaranteed bonds occurred after 1888. This is surely related to a further handover of fiscal sovereignty from the Ottoman government to the *Dette Ottomane*, which occurred in 1889. On that year, the government transferred to the *Dette* the collection of a number of state revenues not included in the original agreement of 1881, and that secured several bonds not managed by the *Dette* itself. The spread opened up again after 1890 in a seeming reflection of the Barings crisis.

Some of the discount series exhibit systematic changes, such as the drop in the Chinese discount after 1903, which is entirely driven by an increase in the yields of the guaranteed bonds. This was in turn caused, as we shall establish formally below, by the widening of spreads on the bonds of the guaranteeing power, Russia, with the start of the Russo-Japanese war in 1904. The Greek series also exhibits some gyrations around 1904 and 1905 and shows the effect of the same short-run adjustment to the introduction of international financial control in 1898 discussed in the previous sub-section. The longer term data, however, show that the initial drop in the spreads of non-guaranteed debt was not only quickly reversed by mid-1899 but persisted throughout the early teens. The two step jumps in the discount in October 1906 and July 1907 coincide with two increases in the effective interest served on the pre-default Greek bonds.⁷⁴ Despite this, prices fell on both occasions, raising the yield on the non-guaranteed Greek bonds, probably driven by other factors.⁷⁵ Similarly, the isolated spike in December 1905 is probably a reflection of the publication in mid-

⁷³ In the case of Turkey, the values in Figure 7 do not go back to the issue of the guaranteed bond, in 1855, though the initial spread did hover around 300 basis points (see Figure 3).

⁷⁴ The 1898 settlement had provisioned for a sharing of future increases in the yields of the dedicated revenues under the management of the International Finance Commission (Wynne 1951). 60% of these increases were to be returned to bondholders, allowing the payment of interest above the minimum interest rate, which was set in 1898 at 1.6% for the bonds of the 1881 and 1884 loan. In 1906, the effective coupon was raised from 1.9% to 2.2% and a further 0.1% in 1907. The IMM yields price these raises in October 1906 and July 1907, precisely.

⁷⁵ Trawling through the pages of the *Economist* and *The Times*, we found a few candidates: on 22 June 1907 the *Economist* referred to a report by the IFC on the unreliable Greek budget figures, which despite showing surpluses since 1898, had actually been on deficit on every year till 1905. July 1907 was also a period of intense diplomatic pressure on Greece because of the suspicions of Greek armed infiltrations in the Ottoman province of Macedonia, flaring up concerns of renewed conflict in the Balkans (*The Times* 8 July 1907, p. 8). The fall of 1906 was also a transition period for the artificial state of Crete, with the replacement of the Greek high commissioner widely seen as a prelude to a Greek takeover.

November of a damning report on the condition of Greek finances by the British representative in the International Financial Commission.⁷⁶

In analysing the long-term relation between guaranteed and non-guaranteed bonds, we follow two approaches. In the first place, we use factor analysis to identify the common factors to each country's bonds as well as those of its guarantors. We then confirm and extend our results in the context of panel VARs for the same bonds. Table 6 and Figure 8 summarise the results of factor analysis.

Table 6 and Figure 8 here

We chose the number of factors for each case from Kaiser's rule of retaining only factors with eigenvalues larger than 1.⁷⁷ We also rotated the factors by using an orthogonal rotation method (varimax) to maximise the variance of the squared loadings of each factor on to each series of spreads. Table 6 lists the numbers of factors retained, the factor loadings of each variable and its uniqueness. Uniqueness is overall low, which implies that the individual bond spreads are adequately explained by the factors retained. The factor loadings of the first factor on comparator national bonds are usually smaller than those of the guaranteed bonds or the bonds of the guaranteeing powers. The converse is true of the second factor, when retained, so that we may interpret the first factor as capturing world or exogenous cost of credit, and the second the domestic risk component.

This interpretation is also confirmed when we plot the factor loadings for the two countries for which we retained two factors. Figure 8 clearly shows the association between the guaranteed bonds and the bonds of the guaranteeing powers – Britain and France. Interestingly, there is but feeble evidence of the influence of Russian bonds on the Greek guaranteed loan of 1898. Also, the pricing of domestic bonds are plainly driven by the second factor, which is orthogonal by construction to the first. The exception is China, where the Cassel loan has a larger factor loading than the guaranteed Franco-Russian loan of 1895. This, however, is probably due to the peculiar political situation of the Chinese Empire, formally sovereign, but dependent in practice on the political inroads of a number of foreign powers. Although not guaranteed, the Cassel loan was interpreted as the German-British reaction to the Franco-Russian guaranteed bond. As will become evident from the PVAR results, the two Chinese bonds did react in tandem with the credit of the two competing European groups of powers, in a seeming financial extension of the spheres of influence being carved out by foreign nations in China at the time.

Panel VARs combine the traditional VAR approach, which treats all the variables in the system as endogenous, with the panel-data approach, which allows for unobserved individual country heterogeneity. We therefore specify a first-order VAR model as follows:

$$Y_{i,t} = \Gamma_0 + \Gamma(L)Y_{i,t} + v_i + \varepsilon_{i,t}, \quad (7)$$

⁷⁶ See *The Economist*, 11 November 1905, p. 1795.

⁷⁷ The share of variance explained by the first factor was 87% in the Turkish case, 69% in the Egyptian, 80% in the Chinese and 76% in the Greek.

where $Y_{i,t}$ is a vector of endogenous variables (bonds yields), Γ_0 is a vector of constants, $\Gamma(L)$ is a matrix polynomial in the lag operator, v_i is a matrix of country-specific fixed effects, and $\varepsilon_{i,t}$ is a vector or error terms (with zero mean and country-specific variance). The main advantages of PVARs are the increase in efficiency from using larger samples, as well the ability to control for unobserved individual heterogeneity through the fixed effects v_i .

However, the correlation between the fixed effects and the regressors due to lags of the dependent variables implies that the commonly used mean-differencing procedure creates biased coefficients (Holtz-Eaking et al. 1988). This drawback can be avoided by a two-step procedure. First, we use the ‘‘Helmert procedure’’, that is, a forward mean-differencing approach that removes only the mean of all future observations available for each country-year (Arellano and Bover 1995).⁷⁸ Second, we estimate the system by GMM and use the lags of the regressors as instruments, as the transformation keeps the orthogonality between lagged regressors and transformed variables unchanged (Arellano and Bond 1991). In our model, the number of regressors is equal to the number of instruments. Consequently, the model is ‘‘just identified’’ and the system GMM is equivalent to estimating each equation by two-stage least squares.⁷⁹

Another issue that deserves attention refers to the impulse-response functions. Given that the variance-covariance matrix of the error terms may not be diagonal, we need to decompose the residuals so that they become orthogonal. We follow the usual Choleski decomposition of variance-covariance matrix of residuals, in that after adopting a particular ordering of variables, any potential correlation between the residuals of the two elements is allocated to the variable that comes first. In all cases we ordered the bonds of guaranteeing powers first, starting with Great Britain and followed by France and Russia. Because of the nature of international guaranties, we ordered the guaranteed bonds second, and finally the non-guaranteed domestic bonds last. We also experimented with different orderings within these three groups of bonds, where possible, but the results did not differ materially. Finally, given the relatively low frequency of the data, we only ran the models with one monthly lag. The results are described in Table 7, which lists the four models horizontally, i.e. each row identifies a left-hand side variable and the coefficients of the lags of itself and the other endogenous variables (listed in the columns), as appropriate.

Table 7 here

With the exception of Greece, the models are almost diagonal. This is understandable given the low frequency of the data, which makes it harder to identify lagged effects of yield changes on to other bonds’ yields. This structure appears consistent with the ordering of the bonds, which is also confirmed by the impulse response functions (IRF) that come out of this exercise. These are

⁷⁸ That is, for bond i and time t , the Helmert transformation is given by $\tilde{y}_{it} = \left(\frac{T_i - t}{T_i - t + 1} \right)^{1/2} \left(y_{it} - \frac{\sum_{\tau=t+1}^{T_i} y_{i\tau}}{T_i - \tau} \right)$. We

also tried simply time-differencing the yields and the results were similar.

⁷⁹ We tested all transformed variables for unit roots by using a Fisher-type test that allows for large T-small N panels (Choi 2001) and could reject them for all panels.

represented in Figures 9-12 for up to six months, with 95% confidence intervals computed from Monte Carlo simulations.

Figures 9-12 here

Despite the low data frequency, the IRFs are consistent with the ordering of the variables in the PVARs in the sense that the variables ordered first do not respond to shocks to variables ordered later. For instance, British yields, arguable the world benchmark, do not react to any other yields in the systems. French yields only react to shocks to British yields, and so on. In general, a shock to British yields has positive and long-lasting effects on all other bonds, which is in accordance with the benchmark status of British consols at the time. At least, the response of all the other bonds is not reversed up to 6 months after the shock, as shown by the IRFs. The size of the effects is consistently below one, meaning that increases in the benchmark yield actually narrowed spreads, as has been found elsewhere (Eichengreen and Moody 2000). However, this is also probably driven by the monthly frequency of the data used in this section, as most of the adjustment to a shock to British bonds might happen faster than after a month.⁸⁰

Shocks to the yields of other guaranteeing powers had permanent effects on guaranteed bonds but, generally, not on other domestic bonds. Or, when the impacts are statistically significant, they are either very small in economic terms (e.g. the IRF of the two Egyptian bonds –unified and state domain- to shocks to French yields) or non-persistent, as in the reactions of the Turkish and Greek non-guaranteed bonds to shocks on French or Russian yields. The size of the reactions of yields of guaranteed bonds was also consistent with the ordering of the guaranteeing powers, being larger in the IRF to shocks to British yields than French and Russian. This then establishes a pecking order of guarantors, with British bonds clearly setting the benchmark for all other countries' yield curves. It also reinforces the conclusion we got from factor analysis, in terms of the distinction in the way markets priced guaranteed and non-guaranteed bonds. The former reacted to the cost of credit of the guaranteeing powers, whereas the latter did not – with the exception of the British benchmark. Moreover, with but one exception, the yields on guaranteed bonds also typically did not react to shocks in the domestic credit risk, as incorporated in the non-guaranteed bonds, further underscoring the separation of the two classes of bonds over the long-run.⁸¹

The same interpretation is confirmed by decomposing the variance of the individual yield series in Tables 8-11, where British yields dominate among the share of variance explained by foreign powers.

Tables 8-11 here

The remaining information in the variance decomposition tables confirms the results of the IRFs and, before that, also of the factor analysis. In all four cases, the variance of the yield of guaranteed bonds reacted more to the yields of the guaranteeing powers than the yields of non-guaranteed bonds. Conversely, the variance non-guaranteed bonds is hardly explained by the behaviour of the guaranteed bonds and reacts more to domestic developments, although not escaping the impact of changes in the market benchmark, the British consols. Coming back to the Chinese case, Table 10

⁸⁰ This would also be consistent with Uribe and Yue's (2006) model of overshooting spreads.

⁸¹ The exception is the IRFs of the Egyptian 1885 guaranteed bond to the unified debt (Figure 11).

shows how the variance of the British-German Cassel loan was very dependent on British consol yields. Actually, the formally Russian-guaranteed 4% loan of 1895 was even more dependent on British yields. The Cassel bonds also reacted slightly less to Russian yields than the guaranteed bond, as expected, although the credit of the guaranteed power only explains barely 6% of the variance of both loans. This is suggestive, as mentioned previously, of the existence of financial spheres of influence as expressed in bond prices, but it also reveals the smaller relevance of a formal guaranty by a power of dubious credit standing itself.

6. Conclusions

This paper contributes to the debate on the issue of Eurobonds as a solution to the fiscal crisis in the Eurozone by providing the first empirical analysis of the closest historical parallels – the guaranteed bonds issued before World War I. We started by uncovering a nineteenth-century debate, which shares uncanny similarities with the current arguments pro and against Eurobonds. Moreover, our evidence, preliminary at this stage, yields three main implications.

First, that the fears about short-run dilution and destabilisation of the debt market of weaker participants in a joint issue of Eurobonds might be overplayed. Hardly anyone proposes the introduction of Eurobonds without concomitant moves towards greater fiscal discipline and federalism and as our historical case studies show, the latter trumped debt dilution and rationing of ‘red bonds.’ This is not because the guaranteed issues were small compared to contemporary cases. In fact, guaranteed bonds were issued in sizes similar or higher than today’s proposals for the creation of ‘blue bonds.’

Second, the combination of guarantors of different credit standing ended up not penalising the yields of the guaranteed bonds too much. Apart from the first Greek bond of 1833, which was floated with a yield more than 100 basis points above the average of the guarantors’ cost of funding, all other guaranteed bonds were floated below this average and increasingly closer to British yields, whenever the UK was involved. Hence, the worries about ‘convex scenarios’ for Eurobonds issues may also be exaggerated. In studying the yields of Italian bonds before and after the unification, Collet (2012) reaches a more pessimistic conclusion. She found that the unified bonds were initially priced more harshly than the bonds of the legacy Italian states prior to unification. The difference between the weighted average of the pre-unification yield of the legacy debts and the post-unified yield stood at 155 basis points, which the author interprets as a unification premium. However, the initial yield post-unification was actually above the maximum yield pre-unification, which would imply a ‘super-convex’ scenario. More likely, this unification premium reflected other risk considerations beyond the simple pooling of risks of the legacy debts and probably overstates the convexity of the yields. In other words, Italy was more than the sum of its parts.

Third, markets priced mutualised debt differently from own bonds persistently over very long periods. Even though the spreads between guaranteed bonds and the marginal cost of funding by borrowers varied over time they seldom fell below 100 basis points, even in the stronger cases of external control, such as Egypt or Greece. Given the relatively small size of the guaranteed issues, with respect to the debt stock of the guarantors, this is certainly due to the markets pricing the guaranteed bonds on the basis of the credit risk of the guarantors. This was not always a good thing,

as not all guarantors were equally credible. This is obvious in the transmission of the enhanced credit risks of the Russian Empire since the start of the Russo-Japanese war to the bonds guaranteed by Russia. Liquidity premia or 'safe-haven' status were less of a consideration in this period.

A question we had to leave aside for now, but to which we expect to return has to do with moral hazard. Ex post debtors could have used the good credit of their guarantors as a way of borrowing beyond their limits, as feared by many contemporary critics of Eurobonds. The amounts involved in the bonds we study were relatively marginal to the total debt stock of guarantors, such that a feedback effect from debtor moral hazard to the guaranteeing powers' credit standing was unlikely. Nevertheless, there is sufficient variation among the case studies in this paper to investigate whether guaranteed bonds actually aggravated time inconsistency problems of debtor governments, and how that was addressed by several forms of direct or indirect financial control from abroad. Another interesting source of variation here is that foreign control did not always overlap with the provision of guarantees, e.g. in the Greek 1898 bond, which was guaranteed by France, Britain and Russia and floated simultaneously with the imposition of external control under the aegis of the International Financial Commission, where not only the guaranteeing powers were represented but also Austria, Germany, and Italy. This opened up the possibility for creditor's moral hazard, not unlikely the current problems with the non-overlapping architecture of the EU and the Eurozone.

Table 1: Summary information on guaranteed bonds, 1832-1898

Loans	Cause	Guaranteeing states	Face value (£m)	Previous debt stock (£m)	Interest (%)	Issue price (%)	Cost of funding (%)	Secured by	Conditions	Redemption
1833 Greek Loan	Greek independence war	Britain, France, Russia	1.6	2.8	5	94	4.06%	Entire state revenues	Seniority clause	1871
1855 Turkish Loan	Crimean war	Britain, France	5.0	2.9	4	102.6	3.9%	Egyptian tribute, customs of Izmir and Syria	Financial commissions to supervise the expenditure of funds for war purposes	1943
1885 Egyptian Loan	British military campaign	Britain, France, Russia, Germany, Austria- Hungary, Italy	9.424	99.0	3	95.5	4.2%	Property tax	5 per cent discount on coupons of 1885 and 1886	1926
1895 Chinese Loan	Sino- Japanese war	Russia, France	16.0	3.3	4	99	4.0%	Maritime Customs	Seniority clause	1931
1898 Greek Loan	Greek- Turkish war	Britain, France, Russia	6.0327	32.0	2.5	100	2.9%	State monopolies	International financial control	1950

Table 2: Bonds used in the short-run analysis

Bond	Dates		N	Simple yields			
	Start	End		Mean	St. dev.	Max	Min
5% Greek 1833 (UK)	4/11/1833	31/12/1834	346	4.43	0.05	4.56	4.24
5% Greek 1833 (France)	19/7/1833	31/12/1834	376	4.96	0.09	5.18	4.67
5% Greek 1833 (Russia)	8/11/1833	31/12/1834	343	4.99	0.05	5.19	4.89
5% Greek 1825	17/1/1832	18/11/1834	218	16.99	2.82	25.64	11.83
4% Turkey 1855	20/08/1855	19/12/1856	337	3.97	0.11	4.19	3.74
6% Turkey 1854	23/08/1854	19/12/1856	593	6.68	0.77	8.23	5.58
3% Egypt 1885	28/08/1885	31/12/1885	57	3.09	0.02	3.12	3.04
4% Egypt unified 1880	2/1/1884	31/12/1885	490	6.24	0.28	7.05	5.79
5% Egypt State domain 1878	2/1/1884	30/12/1885	369	5.83	0.20	6.57	5.42
4% Chinese 1895	20/07/1895	31/12/1895	131	3.96	0.02	4.01	3.92
6% Chinese of 1895 (Cassel)	4/5/1895	31/12/1895	139	5.69	0.07	5.90	5.53
2.5% Greek 1898	8/11/1898	25/09/1899	39	2.49	0.03	2.62	2.46
5% Greek 1881†	3/1/1898	25/09/1899	154	3.97	0.26	4.81	3.58
5% Greek 1884†	4/1/1898	25/09/1899	106	3.98	0.27	4.78	3.57

†Interest reduced to 1.6% since 1898 and later increased till 2.2%.

Table 3: Bonds used in the long-run analysis

Bond Name	Acronym	Dates		N	Yield-to-maturity (YTM)			
		Start	End		Mean	St. dev.	Max	Min
4% Turkey 1855	y1855	1/1869	6/1894	301	3.46	0.69	4.17	0.41
6% Turkey 1854	y1854	1/1869	6/1894	303	7.80	3.92	29.43	2.48
3% Egypt 1885	y1885	3/1886	12/1907	259	2.95	0.17	3.43	2.57
4% Egypt unified 1880	yunif	3/1886	12/1907	262	4.11	0.51	5.96	3.65
5% Egypt State domain 1878	ystate	3/1886	12/1907	262	4.63	0.38	5.66	4.19
4% Chinese 1895	y1895	8/1895	12/1907	149	4.10	0.25	4.81	3.77
6% Chinese of 1895 (Cassel)	ycassel	8/1895	12/1907	147	5.71	0.21	6.48	5.31
2.5% Greek 1898	y1898	10/1898	12/1907	111	2.93	0.18	3.23	2.51
5% Greek 1881†	y1881	10/1898	12/1907	111	5.38	0.47	6.11	4.43
5% Greek 1884†	y1884	10/1898	12/1907	111	5.19	0.45	5.85	4.26
3% UK Consols	ygbr	1/1869	4/1888	229	3.10	0.12	3.35	2.90
2.75%-2.5% UK Consols	ygbr	5/1888	12/1907	236	2.60	0.24	3.09	1.95
4.5% French bond of 1852	yfra	1/1869	3/1871	18	4.47	0.30	5.63	4.30
3% French Rentes	yfra	4/1871	12/1907	438	3.63	0.74	5.85	2.78
4% Russian 1867 (Nicholas RR)	yrus	9/1895	12/1907	148	4.25	0.46	5.55	3.88

†Interest reduced to 1.6% since 1898 and later increased till 2.2%.

Table 4: Dates of structural breaks in bond yields

Case	Date	Interpretation (from press)
Greece 1833	09mar1832	
	06aug1832	Palmerston introduces the Greek convention bill in Parliament (inc guaranteed bond)
	26dec1832	Arrival to Paris of Eichthal, Bavarian banker "for the purpose of pressing the business of the Greek loan"
	19feb1833	Rothschild (Paris) is rumoured to have taken the loan contract
	26may1833	French Chamber ratifies French share of guaranty, after much opposition
	20jul1833	Floating of bond in London
	09oct1833	Greek regency refuses to recognize claims of bondholders of the two independence loans
	26jan1834	
	06feb1834	Greek regency sends Prime Minister Trikoupis to London to discuss the condition of the Greek loan
	02apr1834	Trikoupis meets with the King William IV
Turkey 1855	06nov1854	News of assaults and naval bombardment of Sebastopol by allied armies
	19dec1854	Final instalment (15%) of Turkish script paid
	27may1855	Large purchases from Paris on rumours that Turkish government would issue the remaining £2m of the 1854 loan soon
	9jul1855	Announcement of the Turkish convention (which had been signed on 27jun1855)
	15jul1855	Announcement that the guaranty of the Turkish loan would be joint
	20ago1855	Floating of bond in London
	25sep1855	Announced the payment of dividends on the Turkish bonds
	23jan1856	Final instalment on the guaranteed loan due
	08oct1856	Rumours that a new Turkish loan was being contemplated
Egypt 1885	14may1884	Announcement of the Conference of the Great Powers to be held in London to discuss the revision of Law of Liquidation
	27may1884	French proposal to extend the control over Egypt by involving other Great Powers
	22oct1884	
	24oct1884	Announcement of the report of British representative Edgar Vincent on the finances of Egypt
	19mar1885	All Powers agreed in principle to provide joint guaranty for future £9m loan
	27jul1885	Floating of bond in London
China 1895	04jun1895	
	7jun1895	<i>Le Matin</i> announces agreement for Chinese loan guaranteed by Russia

Case	Date	Interpretation (from press)
	29nov1895	Franco-Chinese convention ceding a territory to France is presented to the French parliament for ratification
	19jul1895	Floating of bond in Paris
Greece 1898	07feb1898	
	11feb1898	Regarded as practically certain that the Greek indemnity loan would have joint guaranty of the three protecting powers
	10jul1898	Floating of bond in London
	27nov1898	Representatives of the Great Powers formally announces that King of Greece nominated as High Commissioner for Crete
	01dec1898	Announcement of the details of Greek public sector reforms
	24jan1899	
	26jan1899	Kyparissia Earthquake and reports of extensive economic damage
	18jul1899	The Greek Parliament approves the military reform to be administered by British and German representatives.
	07aug1899	

Note: all information gathered from *The Times*, except when explicitly mentioned. Dates in bold were not identified as structural breaks

Table 5: Long-term discount of guaranteed bonds

Sovereign	Period	Mean	Median	St. dev.	Max	Min
Ottoman Empire†	1869-1894	315.81	328.90	85.82	502.69	95.46
Egypt	1885-1907	115.34	108.47	48.60	278.05	51.70
China	1895-1907	161.11	166.43	28.27	228.87	75.75
Greece	1898-1907	245.71	264.13	55.17	331.49	137.57

†excluding the period in default (1876-81)

Table 6: Factor loadings and uniqueness

Country	Bonds	Factor 1	Factor 2	Uniqueness
Turkey	ygbr	0.9144		0.1639
	yfra	0.6967		0.2290
	y1855	0.8190		0.2166
	y1854	0.0982		0.4447
Egypt	ygbr	0.9793	-0.0558	0.034
	yfra	0.7481	0.6224	0.0396
	y1885	0.9323	0.312	0.0267
	ystate	0.0676	0.9864	0.0146
	yunif	0.2087	0.9675	0.0127
China	ygbr	0.1478		0.0418
	yrus	0.8253		0.0387
	y1895	0.8042		0.0028
	ycassel	0.9865		0.0265
Greece	ygbr	0.9863	0.1537	0.0024
	yfra	0.9421	0.3266	0.0033
	yrus	0.5296	0.7703	0.0657
	y1898	0.9642	0.2595	0.0001
	y1881	0.1744	0.9845	0.0003
	y1884	0.2278	0.9734	0.0003

Table 7: GMM estimates of Panel VAR

		ygbr	yfra	yrus	y _g	Y _{o1}	Y _{o2}
Turkey (N=870)	ygbr	0.9696*** (0.0108)	0.0317** (0.0159)		-0.0228 (0.0165)	0.0007 (0.0012)	
	yfra	0.0214 (0.0271)	0.9864*** (0.0662)		-0.0743 (0.0736)	-0.0272 (0.0050)	0.0017
	y1855	-0.0427 (0.0533)	-0.0067 (0.1570)		1.013*** (0.1719)	0.0022 (0.0099)	
	y1854	-0.1176 (0.4806)	0.2960 (1.3632)		-0.0656 (1.5048)	0.9333*** (0.1049)	
Egypt (N=842)	ygbr	0.8852*** (0.1070)	0.0017 (0.0316)		0.1704 (0.2046)	0.0092 (0.0432)	0.0033 (0.0151)
	yfra	-0.1028 (0.1050)	0.8373*** (0.0837)		0.2221 (0.2174)	0.2685 (0.0467)	0.0163 (0.0432)
	y1885	0.0491 (0.1079)	0.0971** (0.0464)		0.958*** (0.2052)	0.0435 (0.0451)	-0.0721 (0.0234)
	ystate	-0.1360 (0.1069)	-0.0149 (0.0678)		0.1770 (0.2008)	0.9172*** (0.0651)	0.0746 (0.0520)
	yunif	0.0151 (0.1056)	0.0770 (0.0405)		0.0278 (0.2056)	0.0771 (0.0477)	0.8785*** (0.0369)
China (N=515)	ygbr	0.9883*** (0.0308)		0.0092 (0.0280)	-0.0091 (0.0378)	0.0049 (0.0783)	
	yrus	-0.0564 (0.0753)	0.9777*** (0.0463)	0.0753 (0.0568)	-0.0084 (0.0525)	-0.0147 (0.1694)	
	y1895	0.0948 (0.0624)	0.0357* (0.0225)	0.8141*** (0.0592)	0.0511 (0.0436)	0.1298* (0.0767)	
	ycassel	-0.0833 (0.1114)	-0.0208 (0.0697)	0.1679 (0.1086)	0.9213*** (0.0873)	0.7714*** (0.1294)	
Greece (N=428)	ygbr	0.9310*** (0.0690)	0.0141 (0.0592)	0.0070 (0.0204)	0.0307 (0.1226)	0.0593 (0.0936)	-0.0585 (0.0880)
	yfra	0.0306 (0.0341)	1.0145*** (0.0341)	0.0002 (0.0173)	-0.0587 (0.0550)	-0.0968 (0.0692)	0.0944 (0.0661)
	yrus	-0.1970 (0.1301)	-0.1769 (0.1370)	0.9802*** (0.0668)	0.3765 (0.2475)	-0.0965 (0.2568)	0.0938 (0.2396)
	y1898	0.1877*** (0.0447)	0.1829*** (0.0474)	0.0426*** (0.0212)	0.5506*** (0.0720)	0.0250 (0.0994)	-0.0058 (0.0968)
	y1881	0.0123 (0.1536)	-0.0696 (0.1781)	-0.0530 (0.0645)	0.1266 (0.3174)	0.3465 (0.3808)	0.6192* (0.3726)
	y1884	0.0019 (0.1527)	-0.0037 (0.1715)	-0.0049 (0.0634)	0.0110 (0.3092)	0.0220 (0.3866)	0.9550** (0.3802)

y_g represents the yields of the guaranteed bonds in each case; y_{o1} and y_{o2} stand for the first and second non-guaranteed bond in each case. Standard errors in parenthesis. ***, ** and * denote significant coefficients, respectively at the 1, 5 and 10 % confidence levels.

Table 8: Variance decomposition of Turkish bonds

	ygbr	yfra	y1855	y1854
ygbr	0.9083	0.0210	0.0695	0.0013
yfra	0.5033	0.4321	0.0602	0.0044
y1855	0.0658	0.0016	0.9296	0.0030
y1854	0.0233	0.0362	0.0047	0.9359

Decomposition for 10 periods ahead.

Table 9: Variance decomposition of Egyptian bonds

	ygbr	yfra	y1885	ystate	yunif
ygbr	0.8804	0.0253	0.0888	0.0039	0.0016
yfra	0.6663	0.1946	0.1253	0.0131	0.0006
y1885	0.7269	0.0616	0.1975	0.0067	0.0073
ystate	0.4593	0.0556	0.1166	0.3643	0.0043
yunif	0.6791	0.1066	0.0617	0.0662	0.0865

Decomposition for 10 periods ahead.

Table 10: Variance decomposition of Chinese bonds

	ygbr	yrus	y1895	ycassel
ygbr	0.9983	0.0011	0.0001	0.0004
yrus	0.5150	0.4637	0.0212	0.0001
y1895	0.7469	0.0611	0.1664	0.0256
ycassel	0.3964	0.0601	0.0526	0.4908

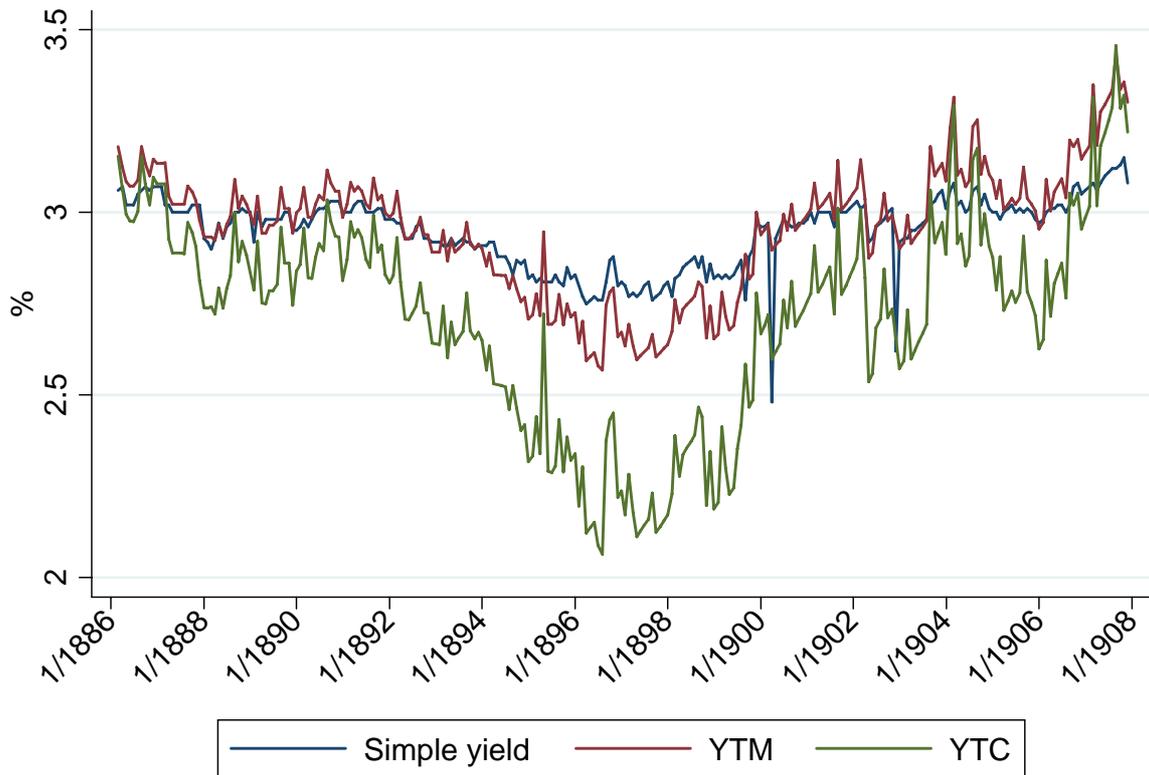
Decomposition for 10 periods ahead.

Table 11: Variance decomposition of Greek bonds

	ygbr	yfra	yrus	y1898	y1881	y1884
ygbr	0.9959	0.0029	0.0006	0.0004	0.0000	0.0002
yfra	0.8766	0.1202	0.0000	0.0014	0.0005	0.0013
yrus	0.5079	0.0490	0.4069	0.0342	0.0010	0.0010
y1898	0.9368	0.0397	0.0062	0.0163	0.0007	0.0003
y1881	0.6142	0.0003	0.0004	0.0064	0.3514	0.0272
y1884	0.6058	0.0000	0.0019	0.0061	0.3484	0.0378

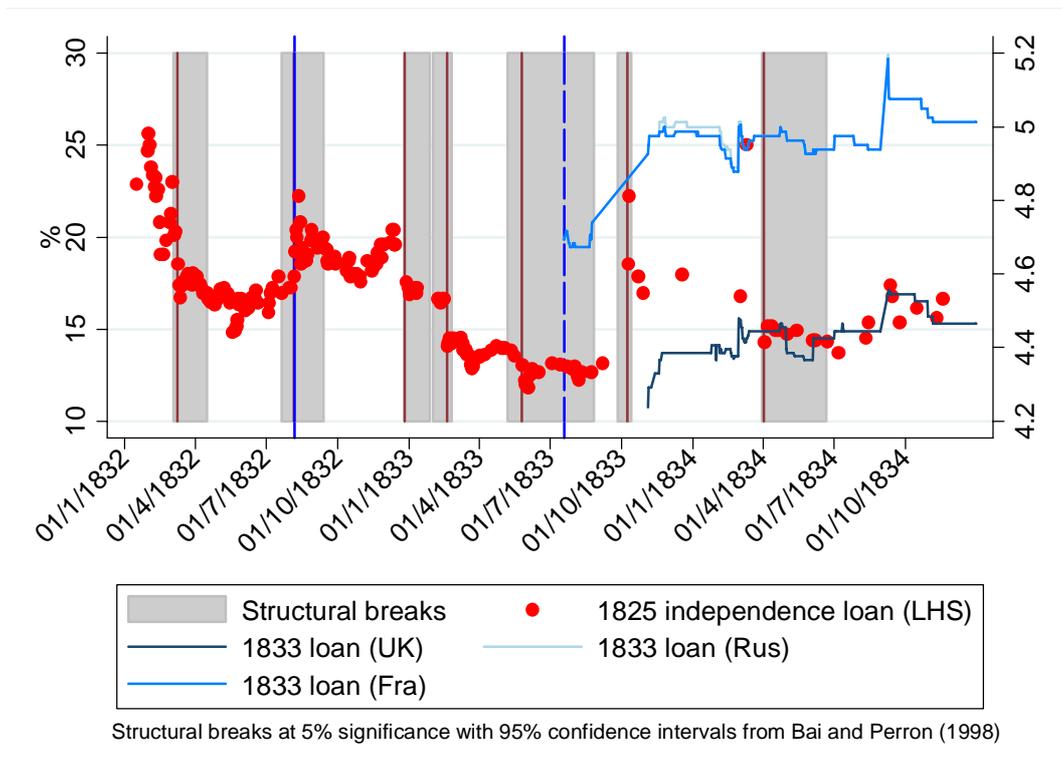
Decomposition for 10 periods ahead.

Figure 1: Alternative yields of Egyptian 3% guaranteed bond of 1885



Monthly data. Source: IMM.

Figure 2: Greek bonds, 1832-34



Structural breaks at 5% significance with 95% confidence intervals from Bai and Perron (1998)

Figure 3: Turkish bonds, 1854-56

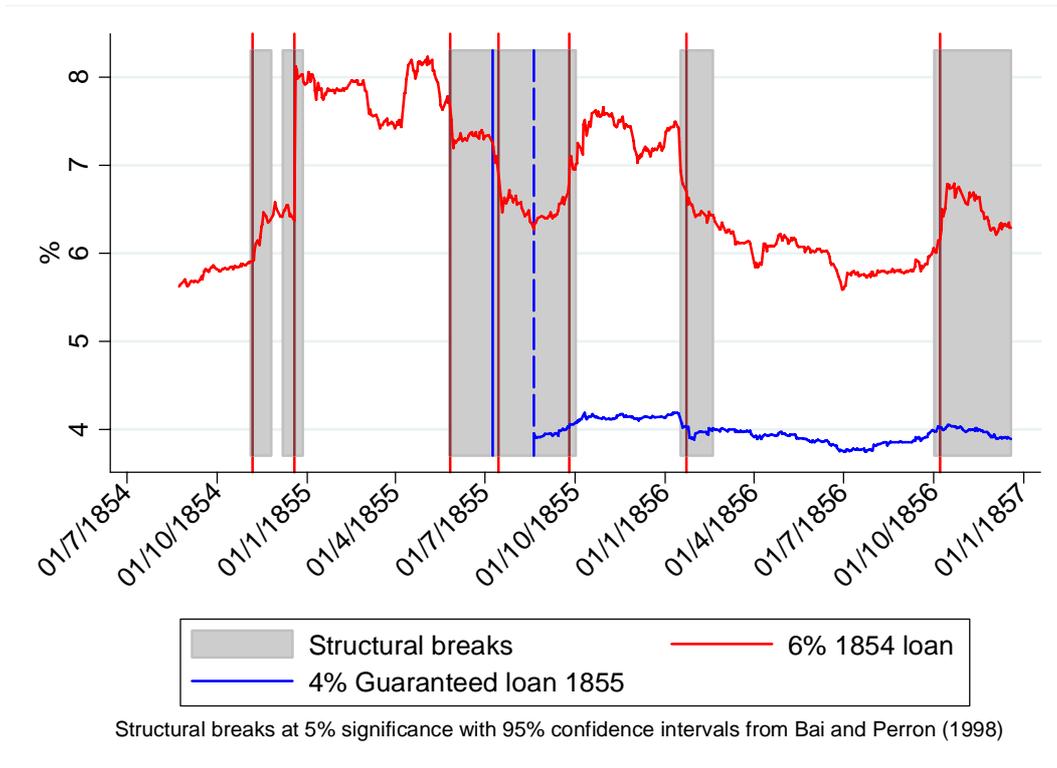


Figure 4: Egyptian bonds, 1884-85

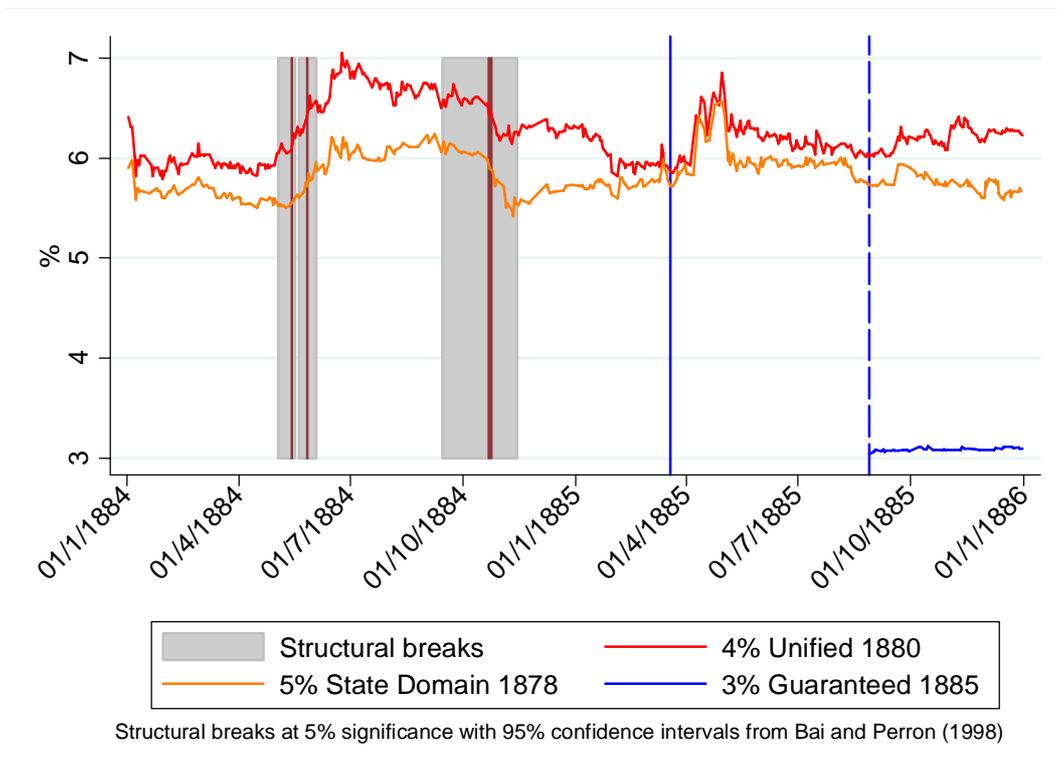


Figure 5: Chinese bonds, 1895

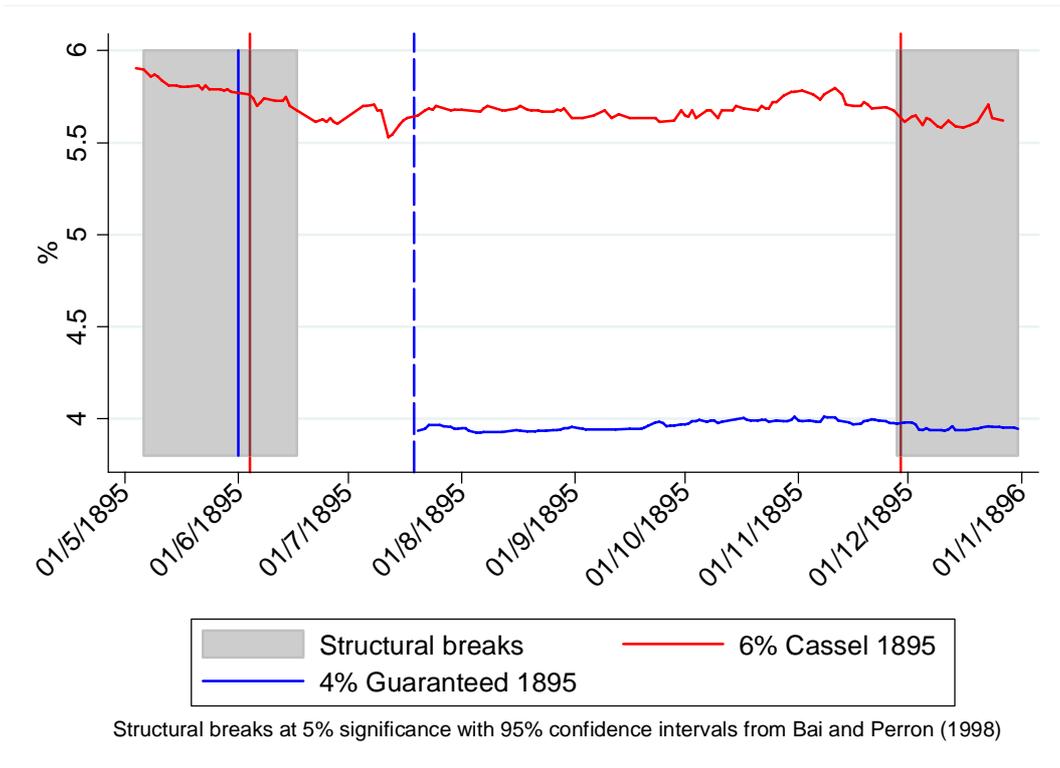


Figure 6: Greek bonds, 1898-99

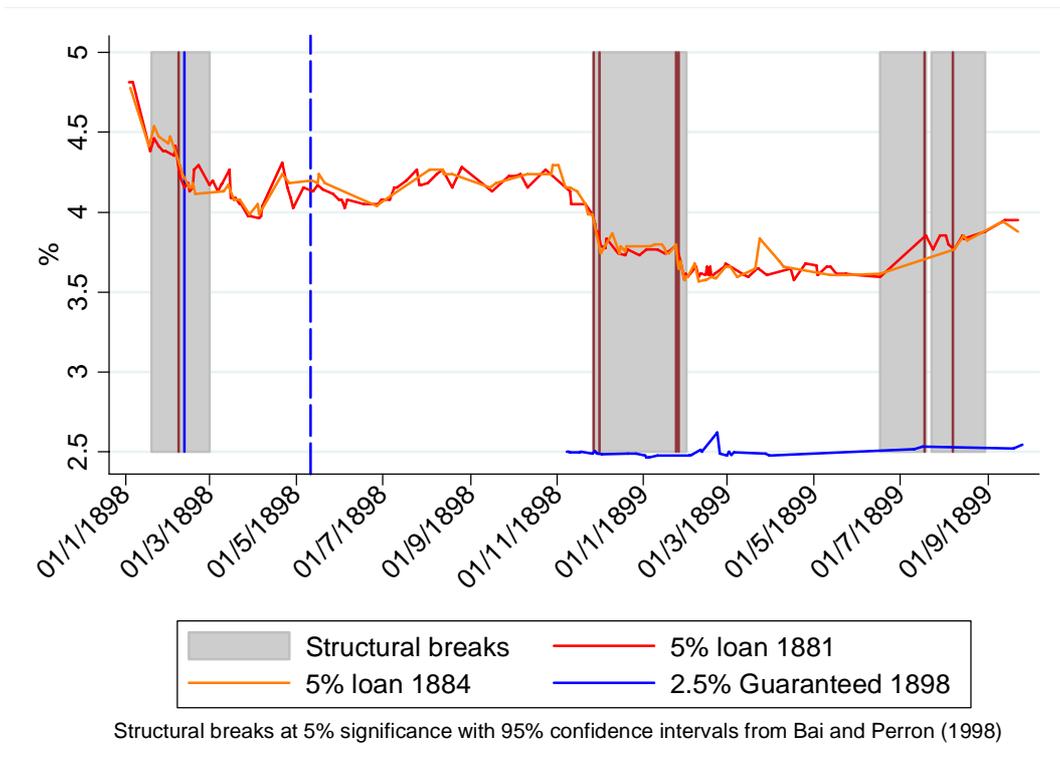


Figure 7: Long-term difference $r_o - r_g$

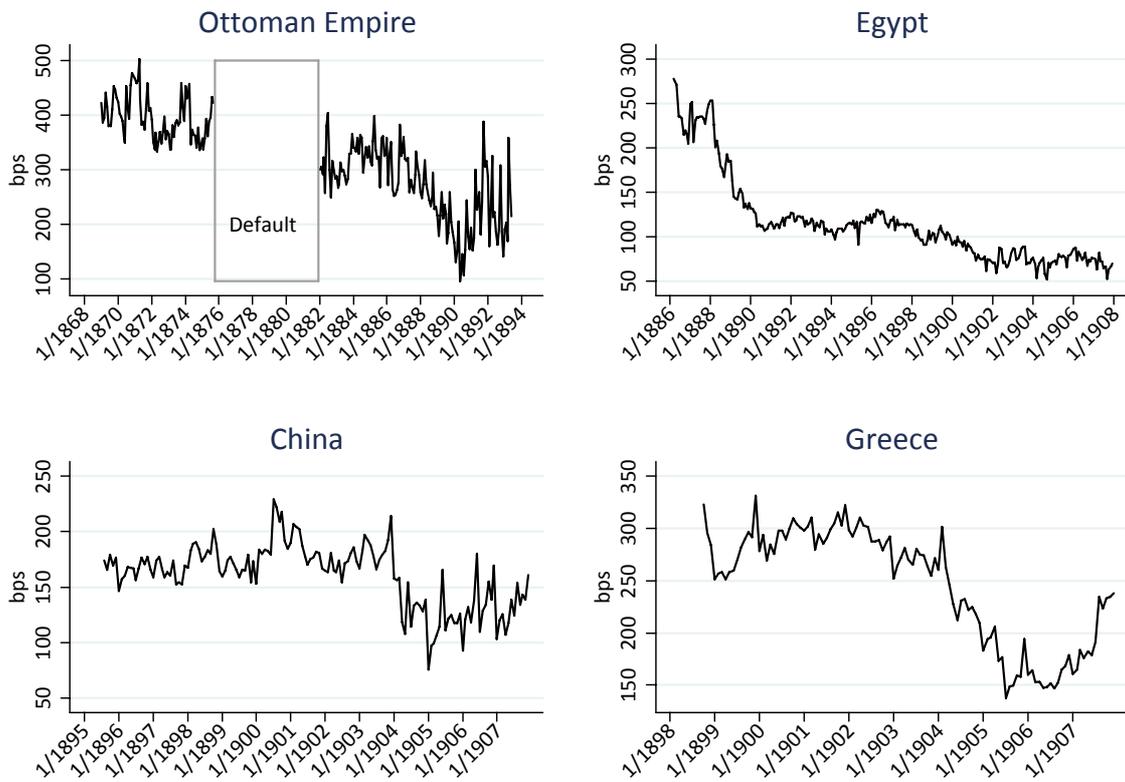
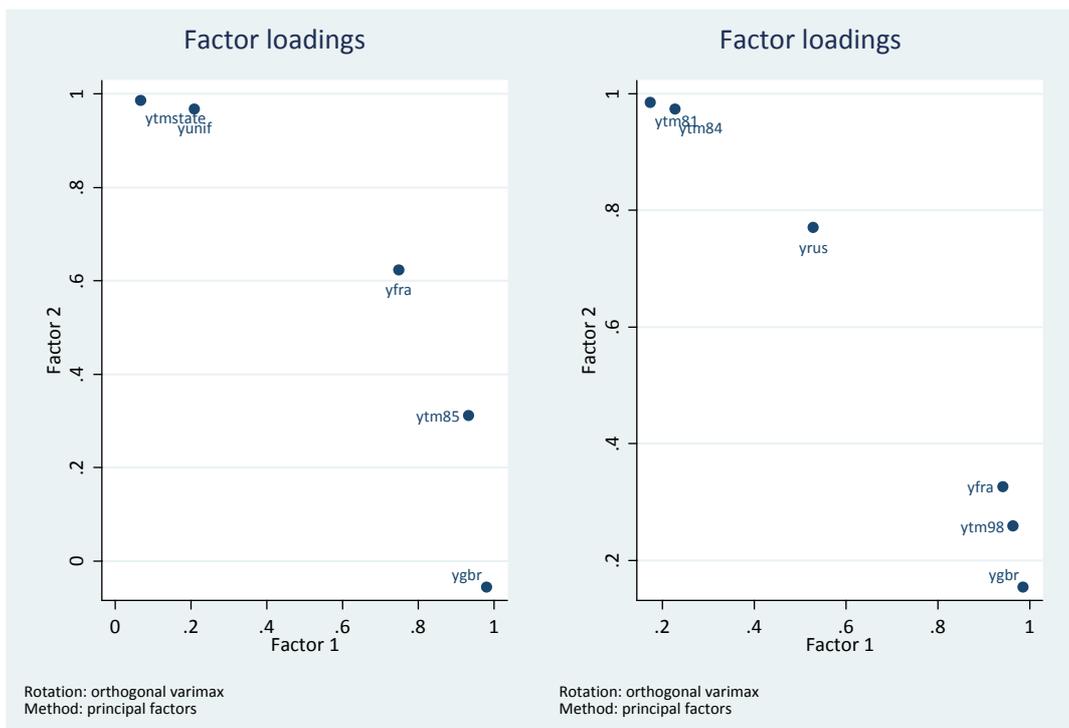


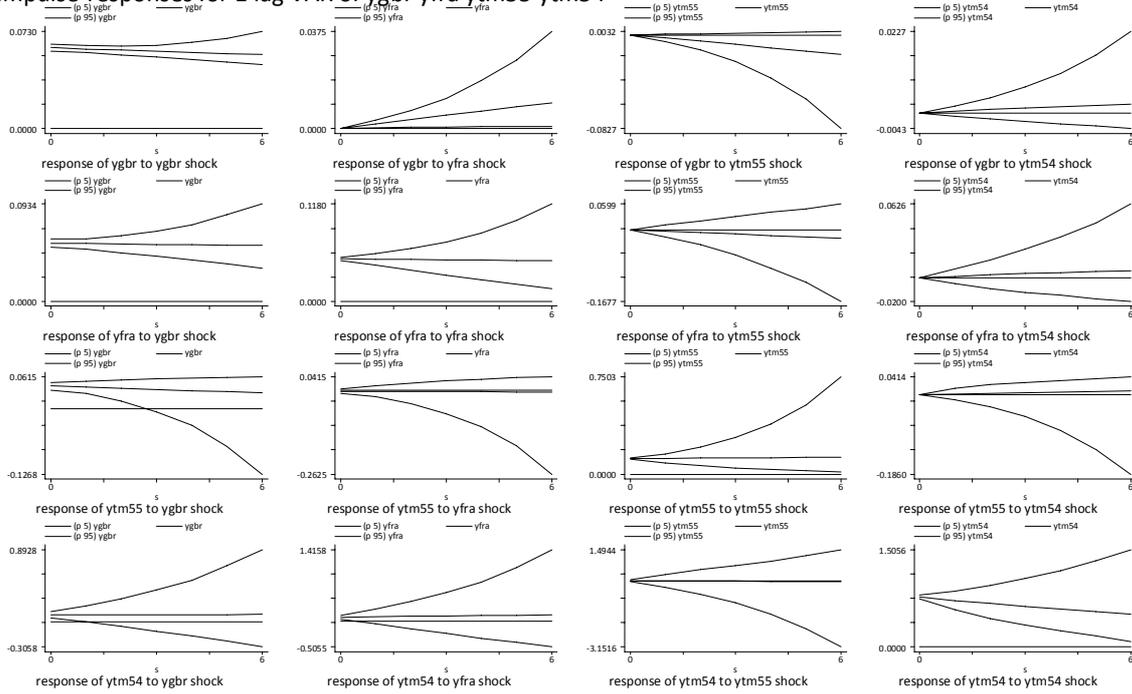
Figure 8: Factor loadings for Egypt and Greece



Left: Egypt, 1886-1907. Right: Greece, 1898-1907

Figure 9: Impulse Response Functions for Turkey 1855

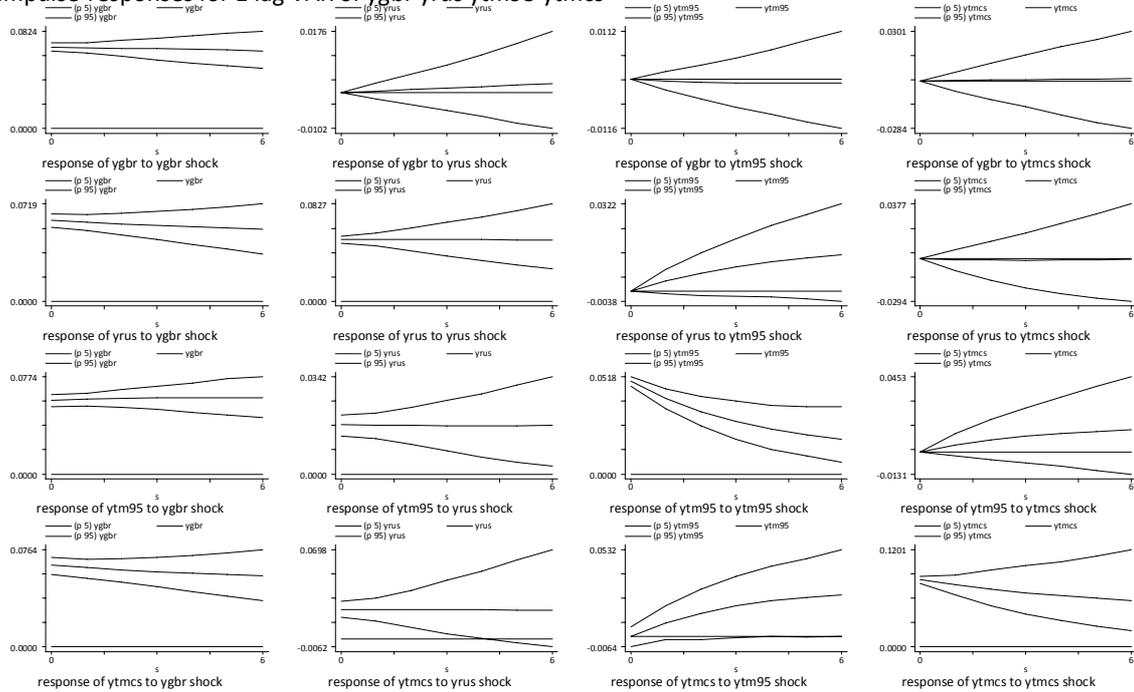
Impulse-responses for 1 lag VAR of ygbr yfra ytm55 ytm54



Errors are 5% on each side generated by Monte-Carlo with 500 reps

Figure 10: Impulse Response Functions for China 1895

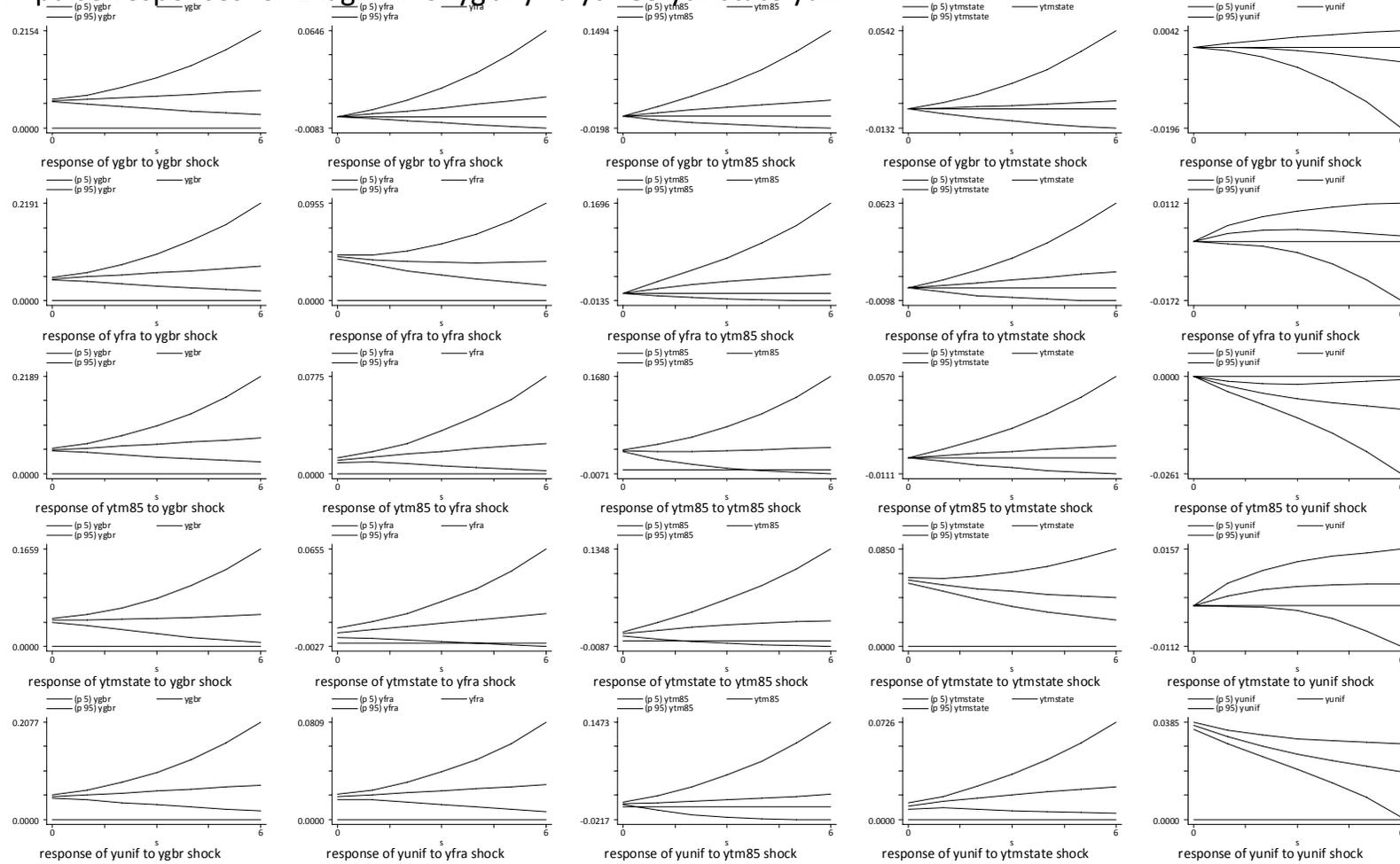
Impulse-responses for 1 lag VAR of ygbr yrus ytm95 ytmcs



Errors are 5% on each side generated by Monte-Carlo with 500 reps

Figure 11: Impulse Response Functions for Egypt 1885

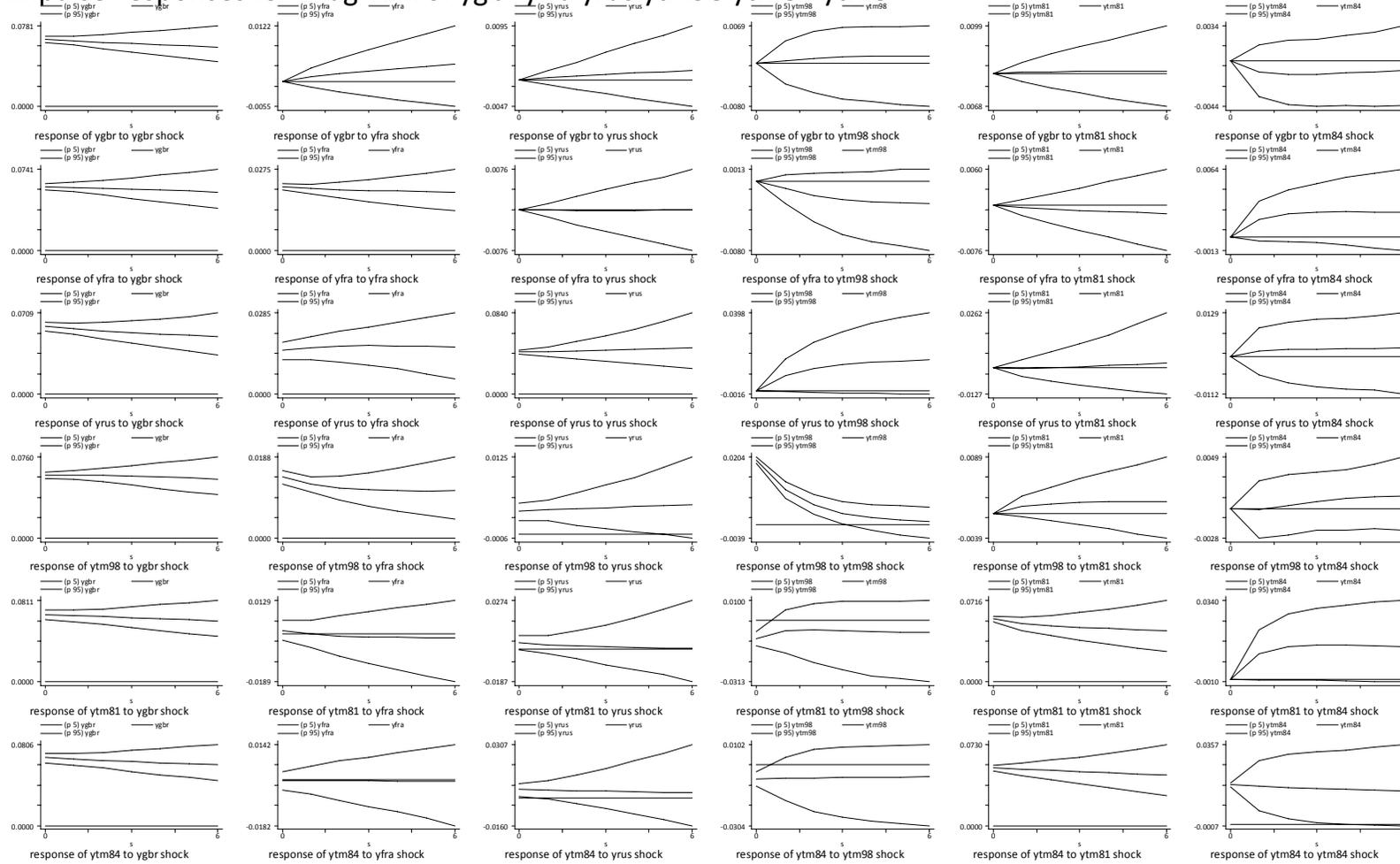
Impulse-responses for 1 lag VAR of ygbr yfra ytm85 ytmstate yunif



Errors are 5% on each side generated by Monte-Carlo with 500 reps

Figure 12: Impulse Response Functions for Greece 1898

Impulse-responses for 1 lag VAR of ygbr yfra yrus ytm98 ytm81 ytm84



Errors are 5% on each side generated by Monte-Carlo with 500 reps

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