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## Abstract

Inefficiencies in fiscal and monetary systems of the Ottoman Empire led to higher debt burden over time and the bankruptcy for the Ottoman state in 1875. To deal with these inefficiencies, reforms were implemented, as supervisory organizations were established during the default period. We ask how investors traded at the İstanbul bourse evaluated the outcomes of these reforms and organizations. We manually collect data on price of the General Debt bond from 1873 to 1883. Using the GARCH methodology, we examine the volatility jumps in return of the bond due to the reforms and supervisory organization in the Ottoman Empire. The volatility changes are indicators for risk perceptions of the investors. Our empirical results support that investors positively responded to foundation of the Ottoman Public Debt Administration and the acceptance of gold standard, heralding the persistent decrease in the risk premia over time. The Ottoman case is instructive for the understanding of today's economic situation in emerging markets such as Greece, while we could argue that long-lived and comprehensive measures with foreign creditors' supervision on fiscal and monetary systems matter more for investors' perceptions. No empirical research studies the impacts of the reforms and supervisory organizations on the İstanbul bourse, as this large dataset has never been used before.

JEL classification: G1, N25, N45

Keywords: Reforms, Financial control organizations, Moratorium, the İstanbul bourse, Crises, GARCH.

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## 1. Introduction

In the last couple of decades, high debt burdens in emerging economies have put them at risk of financial crises. For example, the low growth rate during the 2008 financial crisis created a default problem for Greece. By mid-July 2015, a bailout package was announced in Brussels to improve the ability of Greece to pay its debts and facilitate borrowing abroad. The package proposed institutional changes and establishment of an entity under control of other Euro-zone members to supervise the repayment of Greek debts. These reforms could be interpreted as the wakening of a ghost in the old continent. They echoed reforms in the Ottoman Empire and the establishment of the Ottoman Public Debt Administration (*Düyun-u Umumiye*) (OPDA) during the nineteenth century (Ertem, 15 July, 2015). Moreover, a recent study compares the European Monetary Union with the classical gold-standard of the late nineteenth and addresses the similarities between them (Eichengreen & Temin, 2010). These discussions motivate our paper. We examine how reforms such as the adoption of the gold-standard and creation of supervisory organizations in the Ottoman Empire during the nineteenth century were perceived at the İstanbul bourse.

There is an extensive literature connecting outcomes in bond markets to government reforms. The large literature on reforms of rich countries provides conflicting results for the effects of reforms, even when looking at just one country. For example, North and Weingast (1989) indicate a positive relationship between the British reforms replacing arbitrary policies in the seventeenth century and the redemption likelihood of debts. Clark (1996) does not find strong effects of reforms on financial market outcomes in the UK from 1540 to 1800. By comparing interest rates for government debts between the UK and several other European countries between 1690 and 1790, Sussman and Yafeh (2006) fail to provide evidence on lower interest rates for the British debts after the adoption of reforms. And recently, looking at a later period, Dasgupta and Ziblatt (2015) show that British political reforms and

democratization in the nineteenth century were correlated with higher volatility in British bond yield at the London Stock Exchange due to unrests which increased risk assessments concerning the redemption of the debts.

Stasavage (2016) examines a broader range of European countries adopting reforms from 1200 to 1913. His results point out a relationship between the redemption likelihood of debts and reforms which supported creditors' privileges on decision making.

Some evidence suggests adopting the gold standard reduced risk. Bordo and Rockoff (1996) and Obstfeld and Taylor (2003) show lower risk on the repayment of debts for European and American countries due to the adoption of the gold standard from 1870 to 1914. Similarly, using yields of Japanese government bonds traded at the London Stock Exchange for the period 1870–1914, Sussman and Yafeh (2000) find lower bond yields due to the adoption of the gold standard, identifying increasing redemption likelihood of debts.[1] Ferguson and Schularick (2004), Flandreau and Zumer (2004), Alquist and Chabot (2011), and Mitchener and Weidenmier (2015), however, do not indicate decreasing risk on the repayment of bonds for various countries from 1870 to 1913 because of the gold standard.

Other works look at bond markets in multiple developing countries, with samples that include the Ottoman Empire. The results of these studies are mixed. Mitchener and Weidenmier (2010) show a decrease in yield spreads of several countries' (including the Ottoman Empire) government bonds traded at the London Stock Exchange between 1870 and 1913 because of the introduction of financial control organizations and the gold standard. This implies a higher redemption likelihood with supervisory organizations and the gold standard. This finding accords with historical accounts of the specific case of the Ottoman Empire. Birdal

[1] Looking at other events in Japan, Sussman and Yafeh (2000) show that military events and economic regulations had larger impacts than those of other reforms, the effects of which are not statistically different from zero.

(2010, pp. 85–86, 173) points out that the establishment of the OPDA was positively correlated with the reimbursement likelihood of Ottoman debts, implying lower nominal interest rates on Ottoman government bonds traded at European financial markets. Birdal (2010) argues that this result arose from the coordination among foreign creditors and an efficient monitoring system on tax collection after the OPDA.

In contrast, Mauro et al. (2006) use data on yields of government bonds of several emerging markets, again including the Ottoman Empire, traded at the London Stock Exchange between 1870 and 1914. They identify statistically insignificant effects of changes in tax laws, constitutions, and the adoption of the gold standard on bond yields. This means that the reforms did not have persistent effects on risk assessments related to the repayment of debts. Mauro et al. (2006) argue that the intensity of war threats limited the impacts of the reforms on the redemption likelihood. All of these studies, however, are based on data for the Ottoman bonds traded at the London Stock Exchange between 1870 and 1914. Historical research does not include detailed empirical information for the effects of reforms and financial control organizations on the İstanbul bourse during the default period. The only research to use data on the İstanbul bourse to provide empirical evidence for negative impacts of war-related news on the redemption likelihood of Ottoman debts is for the later period of 1910 and 1925 (Hanedar, Torun, & Hanedar, 2015; Hanedar, Hanedar, & Torun, 2016; Hanedar, Hanedar, Torun, & Ertuğrul, 2017).

Our paper makes several important contributions to the existing literature. We manually collected historical data on the price of one Ottoman government bond, the General Debt bond, traded at the İstanbul bourse from 1873 to 1883 from volumes of daily Ottoman newspapers, i.e., *Basiret, Ceride-i Havadis*, and *Vakit*. This bond was the most actively traded one at the İstanbul bourse in 1881, during the foundation of the OPDA. It was a long term liquid

bond with no idiosyncratic risk, unlike other Ottoman government bonds whose prices are provided by the data sources (e.g., the the Rumelia Railway bond). Our paper is the first to measure in econometrically sophisticated manner investors' beliefs at the İstanbul bourse in reference to the reforms and financial control organizations. The history of the reforms and supervisory organizations in the Ottoman Empire could shed light on similar experiments in today's emerging markets.

Our methodology is to analyse the variance of returns. According to Inclan and Tiao's (1994) research, perceived changes in financial instabilities and risks are closely correlated with sudden changes of variances or volatilities in financial outcomes. In our case, investors could have perceived lower risk of debt repayment if they believed that the reforms and new financial control organizations improved the economic and fiscal system in the Ottoman Empire. This could have created lower volatility for Ottoman government bond returns after the dates of such events. We focus on the volatility of the return on the General Debt bond at the İstanbul bourse between 1873 and 1883. To model volatility, we estimate a GARCH model with dummy variables for reforms and financial control organizations. This framework makes it possible to examine impacts of such exogenous events with control variables, instead of identifying structural breaks endogenously following, for example, Inclan and Tiao's (1994) or Bai and Perron's (1998, 2003) method.

Our empirical results indicate a permanent decrease in volatility after the establishment of the OPDA and the gold standard. The foundation of a locally controlled finance commission in 1874 was correlated with a lower volatility level at the date of the event, but increased volatility in the long term. The findings imply that only long-running and comprehensive reforms and supervisory organizations with foreign involvement were seen by investors as promising to improve the probability of debt redemption. Investor beliefs that the other

reforms and supervisory organizations were ineffective could be due to several factors such as lack of measures to limit public expenditures.

The remainder of this paper is organized as follows. Section 2 provides information on reforms and supervisory organizations in the Ottoman Empire. Sections 3 and 4 present details on the İstanbul bourse and the General Debt bond, while Section 5 describes the empirical method we use to deal with the research question of the paper. Section 6 provides empirical results and discussion. Section 7 concludes.

## 2. A brief history of the reforms and supervisory organizations in the Ottoman Empire

On 7 October 1875, a widely read Ottoman newspaper, *Vakit*, reported the Ottoman state's declaration of default (*Vakit*, 7 October, 1875, p. 1).[2] The moratorium caused a recessionary period for the İstanbul bourse, which was related to higher losses for investors of Ottoman government bonds (Fertekligil, 2000, p. 46; Al & Akar, 2014, pp. 183–185). This was not surprising, as the foreign debt reached to 200 million British pounds by 1875 after 17 loan contracts with foreign creditors (Kıray, 1995, p. 145; Clay, 2000, pp. 568–569). There was a downward trend in the share of issuing prices of bonds over the nominal prices for several debt contracts between 1854 and 1874. It decreased 40 percent in 1874 from 80 percent in 1854 (Eldem, 1994, p. 183; Tuncer, 2015, p. 59). This suggests that investors lost their confidence and demanded a premium prior to the moratorium. In line with this trend, Pamuk (1978, pp. 95–104; 1984, p. 54) points out extraordinary high interest rates for foreign borrowing by 1875. He attributes this to the inefficient fiscal system.

In 1862, the foreign debt of the Ottoman state was ten percent of its total revenues. This share increased to thirty percent in 1874 (Güran, 2003, pp. 54–88). The higher foreign debt

[2] On 6 October 1875, the Ottoman state announced that half of each instalment was paid during the five years, as the other instalments were paid by issuing bonds with 5 percent interest rate.

burden was attributed to increasing war expenditures, famines, and rebellions in the Rumelia.[3] Another important reason was the unproductive use of the borrowed money (Pamuk, 1984, p. 55; Kıray, 1995, p. 146; Birdal, 2010, p. 39). By 1875, only 17 percent of the money borrowed abroad was used in infrastructure investments (Suvla, 1999, p. 287). In addition to domestic factors, the financial crisis of 1873 in Europe and North America would have prepared the way to the default of many emerging market economies, like the Ottoman state, because of decreasing capital inflows (Koloğlu, 1987, p. 107; Pamuk, 2000, p. 213). Pamuk (1984, pp. 57, 163) shows the existence of lower foreign borrowing of the Ottoman state after 1873.

Under these conditions, foreign creditors demanded reorganization of the Ottoman fiscal system to increase the ability of the state to pay foreign debts (Kıray, 1995, pp. 147–148; Koloğlu, 1987, p. 71). On 20 January 1874, the Ottoman state established a local commission to supervise the budget of 1874–5. It was governed by prominent bankers in İstanbul and government officers (*The Times*, 7 February, 1874, p. 6). On 31 March 1874, a commentary of *The Times* stated that the commission would establish an efficient tax collection mechanism and a central bank to set regulations in the money market (*The Times*, 31 March, 1874, p. 11). On 2 February 1874, a commentary in *Basiret* announced that fluctuations in the prices of Ottoman government bonds traded at the İstanbul bourse would disappear with new regulations on the fiscal system (*Basiret*, 2 February, 1874, p. 1). Many months after the establishment of the finance commission, a commentary in *The Times* argued that the Ottoman state was successful in obtaining new loans thanks to the measures of the committee, which increased the Ottoman state's income (*The Times*, 15 October, 1874, p. 10).

Despite these positive expectations, conditions deteriorated. The Ottoman state declared default in 1875 and imposed new taxes in Rumelia. These additional taxes created

[3] The European part of the Ottoman Empire.

rebellions among the Christians. After a short time, the rebellions became an international problem, as Russia demanded more autonomy for the Christians in Rumelia to provide a solution for tensions. The major European powers- the UK, Russia, France, Germany, Italy, and Austria-Hungary- held the Shipyard Conference in İstanbul on 23 December 1876 (Danişmend, 1972, pp. 299–303). The Constitution of 1876 was proclaimed. On 18 January 1877, the Ottoman state rejected the Russian demand for the autonomy of Balkan nations (*Vakit*, 19 January, 1877, p. 1). Instead, the new constitution gave additional rights to non-Muslims to make them equal citizens with Muslims (Erdoğan, 2008, pp. 35–39). Arbitrary measurements of the Ottoman state on financial obligations were abolished and the tax burden was equally distributed among all citizens (Danişmend, 1972, pp. 303–305). Like the Ottoman Reform Edict of 1856 (*Islahat Fermanı*), the Constitution of 1876 would have led to improved protection for creditors through the establishment of modern jurisdiction and public security service (*The Times*, 31 March, 1874, p. 11; Mauro et al., 2006, p. 58). Also, a constitutional government would have restricted the arbitrary power of government officers and the Sultan (Hanioğlu, 2008, p. 112). Despite these reforms, the unrest in the Rumelia led to outbreak of a war with Russia on 24 April 1877, and the Constitution of 1876 was abolished (Danişmend, 1972, pp. 303–305).

During the war, it was completely impossible to get new foreign loans. The Ottoman state financed the war expenditures by borrowing from local money lenders and the Imperial Ottoman Bank (Suvla, 1999, p. 275). The war ended on 31 January 1878 and the Treaty of San Stefano was signed on 3 March 1878. The Ottoman state agreed to pay war compensation to Russia. The Major European powers were worried about the Russian extension in Rumelia after the Ottoman Empire had lost its lands. Furthermore, the war compensation and expenditures decreased the redemption likelihood of the debts provided by foreign creditors.

To deal with the solvency problem and hostilities with Russia, the Congress of Berlin was organized on 13 June 1878 (Yeniay, 1964, pp. 60–61; Hanioğlu, 2008, p. 121).

On 11 June 1878, a commentary in *Vakit* disseminated the news that the Congress of Berlin would lead to the establishment of an international organization to ensure the creditworthiness of the Ottoman state (*Vakit*, 11 June, 1878, p. 2). The foreign creditors demanded arrangements for the redemption of the Ottoman debts and war compensation. To this end, there were several propositions to make the Ottoman debt payable, which were named the Hammond Project and the Tocqueville Project (Kazgan, Ateş, Tekin, Koraltürk, Soyak, Eroğlu, & Kaban, 2000, pp. 328–329; Clay, 2000). The Congress of Berlin ended with the Treaty of Berlin on 13 July 1878. The foundation of an organization for international control was not initially accepted by the Ottoman state (Yeniay, 1964, p. 61; Geyikdağı, 2011, p. 41). The debts would be allocated to countries that were independent from the Ottoman Empire since the early nineteenth century such as Bulgaria and Greece (Yeniay, 1964, p. 60). The collaterals for the debts could not be used by the Ottoman state to finance any other government expenditures (Kazgan, 1995, p. 84). Moreover, the amount of war compensation decreased. There could not have been a blockade for the repayment of debts anymore (Danişmend, 1972, pp. 303–305; Clay, 2000, p. 383).

After the Russo-Turkish War of 1877–78, the repayment of debts to the local money lenders became an important problem. On 22 November 1879, the Administration of Six Indirect Revenues (*Rüsum-u Sitte*) (ASIR) was established by the Ottoman state and *Vakit* disseminated news on the new regulations and collaterals to guarantee the repayment of the debts (*Vakit*, 23 November 1879, p. 1). The ASIR gave rights to the local money lenders to supervise tax collection and the reimbursement of their receivables for ten years. The ASIR was governed by local money lenders and government officers. It is argued that the foundation of ASIR was correlated with an increase in bond prices within a short time (Kazgan, 1995, pp. 84–

87; Clay, 2000, p. 459; Kazgan et al., 2000, pp. 328–329). A commentary in *The Times* reported that the ASIR was an efficient reform, which was correlated with increasing tax collection capacity of the Ottoman state (*The Times*, 7 September, 1880, p. 4). The ASIR gained successes in the governing of the Ottoman state's resources. There was an active role for local money lenders. For this reason, the foreign creditors demanded its transformation to a new organization under their control. Demonstrations were organized in London and Paris to make an arrangement for the redemption of foreign debts. They argued that the Congress of Berlin had provided priority to repayment of foreign loans (Kömürcan, 1948, p. 58; Kazgan, 1995, p. 87; Clay, 2000, p. 462; Kazgan et al., 2000, p. 329).

Because of increasing pressures by foreign creditors, on 23 October 1880, the Ottoman state announced a project to solve the solvency problem and invited representatives of the Ottoman bondholders (Yeniay, 1964, p. 62; Clay, 2000, p. 480). The government announced it would begin the redemption of the bonds by using several revenue streams, such as those of the Rumelia Railway (Yeniay, 1964, pp. 61–64). On 25 October 1880, *Vakit* announced that the Ottoman state would pay outstanding debts via a representative bank which was under the control of the ASIR (*Vakit*, 25 October, 1880, p. 1). On 26 October 1880, a commentary in *The Times* reported that this project was a manipulation of a bankrupt government to find new sources (*The Times*, 26 October, 1880, p. 9). On 17 November 1880, *The Times* argued that the project would not cause an important change in the risk perceptions of the investors concerning the financial situation of the Ottoman state. The commentary proposed the establishment of an effective control of the Major European powers via a commission to decrease the risk, as suggested in the Congress of Berlin (*The Times*, 17 November, 1880, p. 9).

The foundation of such an organization would constitute an important interference in the Ottoman state's internal affairs. Thus, the Ottoman state did not support the establishment of this kind of organization (Kömürcan, 1948, pp. 59–60; Velay, 1978, p. 223). On 20 December

1881, the discussions with foreign creditors finally heralded the establishment of the OPDA with the Muharrem Decree. The OPDA had the right to control several of the Ottoman revenue streams, such as customs on tobacco, to service the foreign debts. The OPDA was governed by representatives of foreign creditors and the Ottoman state (Yeniay, 1964, pp. 73–75; Eldem, 1994, p. 184). It established an efficient tax collection mechanism and decreased smuggling. Successful cooperation of different creditors against the Ottoman state and efficient control for the financial accounts of the OPDA were negatively related to the uncertainty on the redemption of the foreign debts (Birdal, 2010, p. 173), and thus the OPDA assured lower capital outflow through decreasing risk (Blaisdell, 1929, p. 153).

Shortly after the foundation of the OPDA, a commentary in *The Times* pointed out the bondholders' pessimism on the OPDA's activities because of serious problems in the Ottoman fiscal system. After several meetings by the OPDA, foreign creditors realized that the control of the Major European powers on the OPDA would be positively related to the redemption likelihood of the debts (*The Times*, 21 January, 1882, p. 10). The OPDA gradually acquired extensive control over the Ottoman fiscal system, leading to an increase in revenues and the amount of the debts paid out. For this reason, the OPDA decreased risk perceptions of foreign creditors on the repayment of the debts (Birdal, 2010, pp. 144, 174; Tuncer, 2015, p. 194), leading to higher prices for Ottoman government bonds traded at the İstanbul bourse (Kazgan, 1995, p. 91; Al & Akar, 2014, pp. 225–227). The effective interest rate paid for new Ottoman issues fell to 5 percent on average, as compared to around 10 percent before the 1880s, while the amount received by the Ottoman state increased through issuing new bonds (Pamuk, 1978, p. 100; Tuncer, 2015, pp. 55–67). In the share of the amount received by the Ottoman state over the nominal amount in each issue, there was a strong increasing trend after the establishment of the OPDA. It reached to 100 percent with the first borrowing in 1886, on

average (Suvla, 1999, pp. 275, 285–284; Tuncer, 2015, pp. 65–66). This was positively correlated with investors' confidence on the redemption of the debts.

In addition to political and fiscal problems, there was inefficiency in the Ottoman monetary system. In the early nineteenth century, the Ottoman state adopted the silver standard and often debased the national currency to finance budget deficits, resulting in higher inflation and a larger debt burden (Pamuk, 2000, pp. 190–221). Suvla (1999, pp. 256–257) argues that the Ottoman monetary system should have been reorganized to increase its ability for borrowing abroad. After 1844, the monetary system was changed to bimetallism: silver and gold were used together. Additionally, the Ottoman state abandoned the debasement and began to borrow abroad. On the other hand, by the 1880s, the value of silver gradually decreased, since there were inflows of silver when new deposits were discovered. As a result, many European countries operated on gold. This created higher risks for foreign creditors of the Ottoman Empire as well because it led to unstable exchange rates and prices. The Ottoman state left bimetallism with a decree issued on 13 December 1879 and the Imperial Ottoman Bank became the central bank of issue. After 13 March 1880, the government used gold to collect government revenues and for repayment of debts (Kuyucak, 1947, pp. 197–198, 212–214; Pamuk, 2000, pp. 216–221; Hanedar, 2015).

This new system was called a limping gold standard (*Topal Mikyas*). The supply of silver was limited and silver exchanged for gold at a fixed rate, as using silver for foreign borrowing and repayment of debts had caused fluctuations in the debt burden of the Ottoman state. The exchange rates of the Turkish lira against the currencies of the other gold standard countries were now fairly stable. For instance, the value of the British sterling only changed 4 percent between 1880 and 1914. Although the gold was mainly used in international transactions and silver was dominant in domestic ones, there was not instability in the price level anymore. These changes would have created lower risk premia, as a large share of the debt was

denominated in gold (Pamuk, 1998; 2000, pp. 216–221; 2004, pp. 451–468; Tuncer & Pamuk, 2014, pp. 182–183).

## 3. The İstanbul bourse and trading activities

The İstanbul bourse was established in 1866 by the Ottoman state. It was known as the İstanbul Bond Market (*Dersaadet Tahvilat Borsası*). The Ottoman state's primary aim was to supervise the informal trading activities of bonds and stocks in the Ottoman Empire through the foundation of such an institution (Borsa Rehberi-1928, 1990, pp. 15–16; Kazgan et al., 2000, pp. 371–375; Fertekligil, 2000, pp. 15, 23). At the beginning, eight financial assets were traded at the İstanbul bourse (Kazgan et al., 2000, pp. 371–375; Fertekligil, 2000, p. 344). By 1914, the number of trading bonds and stocks were 104, while foreigners, bankers, government officers, and even ordinary people were important investors (Kazgan, 1995, p. 95; Kazgan et al., 2000, pp. 344, 375, 406; Fertekligil, 2000, pp. 44–45, 82, 89–90, 102–103). The İstanbul bourse was regulated in 1871 and 1873 to be in line with the European bourses. A committee of 20 traders (*Mubayaacıs*) governed the bourse, which was under the control of the Ministry of Finance (Borsa Rehberi-1928, 1990, pp. 112–118; Kazgan, 1995, pp. 67–68; Fertekligil, 2000, pp. 32–36). Open auctions of traders were conducted by brokers (*Dellals*) and middlemen (*Simsars*) (Toprak, 2008, p. 151).

Effective government control was settled in 1873 after the Ottoman state issued a comprehensive bond market law. Despite these regulations, small investors carried on informal trading activities out of the İstanbul bourse. In addition, forward sales led to speculative activities, by which large investors, local money lenders, and foreign investors often manipulated the exchange (Kazgan, 1995, pp. 61–63, 67; Fertekligil, 2000, pp. 50, 70–72, 82–90, 102).

## 4. Data

To examine risk assessments at the İstanbul bourse in response to the reforms and supervisory organizations, we use closing price data for the General Debt bond. We manually collected the data from the available volumes of *Basiret, Ceride-i Havadis*, and *Vakit*. These were daily Ottoman newspapers with a column reporting financial prices. The newspapers contain data from 17 February 1873 to 9 March 1883, resulting in 2018 observations.[4] In the data sources, the price of the General Debt bond was denominated in Turkish Liras.

*Vakit* is the main data source of our paper. This newspaper was launched in 1875 and was a pro-government newspaper. In several issues, the bond price was not reported. To fill the gaps, we use data provided by *Ceride-i Havadis*. The newspaper was launched in 1840 by a British journalist to promote economic liberalism in the Ottoman Empire. It was the first private newspaper in the Ottoman Empire. As *Ceride-i Havadis* reports the morning and mid-day prices, we take the average of the two prices. For the period before 1875, we took the data from *Basiret*. A conservative newspaper, *Basiret*, first appeared in 1869 and closed in 1878.

The General Debt bonds were issued by the Ottoman state in three phases (i.e., 1865, 1873, and 1874). The money collected was to finance short-term debts and the budget deficit. The volume of total trade for the bonds was 95,917,096 Turkish Liras for the period 8–20 December 1881. By issuing the bonds, the Ottoman state collected 48,305,235 Turkish Liras. These figures were the highest, as compared to bonds issued in similar years (Borsa Rehberi-1928, 1990b, p. 90). 100,000,000 Turkish Lira bonds were sold, on average. They had face values of 11, 55, and 110 Turkish Liras with a rate of interest of 5 percent per year. The coupons would have been paid on 13 January and July of each year (Yeniay, 1964, pp. 49–50). The bonds were paid back in around 30–35 years (Akyıldız, 2001, p. 316). It is not possible to find precise information on the profile of buyers. The bonds were attractive for foreigners,

[4]There were only three observations for April, May, and September 1883 which were excluded from the analysis.

bankers, government officers, and ordinary people (Kazgan, 1995, p. 95; Kazgan et al., 2000, pp. 344, 375, 406; Fertekligil, 2000, pp. 44–45, 82, 89–90, 102–103).

## 5. Methodology

To investigate how investors at the İstanbul bourse responded to the reforms and financial control organizations, we focus on volatility changes as a measure of differences in risk perceptions. We use a GARCH (1,1) model with dummy variables to determine the impacts of specific exogenous events. Financial markets have dramatic responses to political and economic shocks, leading to fluctuations in prices of financial assets as well as time dependent or heteroscedastic variances. This can be modelled by a GARCH framework using mean and variance equations. The mean equation of the estimated GARCH (1,1) model of our paper is:

$$R_t = \mu + \varepsilon_t \text{ with } \varepsilon_t = \sqrt{h_t v_t} \quad v_t \sim N(0,1) \qquad (1)$$

where $R_t$ denotes logarithmic return of the General Debt bond price. We calculate returns of the bond as follows:

$$R_t = \ln(P_t / P_{t-1}) \qquad (2)$$

where $P_t$ is the daily price of the bond in time *t*, when the data are available in the volumes of *Basiret*, *Ceride-i Havadis*, and *Vakit*.[5] In equation (1), $v_t$ is a white noise term. $\varepsilon_t$ has a normal distribution with zero mean, and $h_t$ is the conditional variance of $R_t$.

The following variance equations with dummy variables are estimated:

$$h_t = \omega + \alpha h_{t-1} \varepsilon^2_{t-1} + \beta h_{t-1} + \delta_{short} EVENT_{short} + C_t \qquad (3)$$

$$h_t = \omega + \alpha h_{t-1} \varepsilon^2_{t-1} + \beta h_{t-1} + \delta_{long} EVENT_{long} + C_t \qquad (4)$$

[5] Following Mauro et al. (2006, p. 136), we use this definition of the bond returns due to the absence of regular coupon payments of the bond during the default period.

where the variance of the General Debt bond return at time $t$ ($h_t$) is a function of a long term average ($\omega$), information about the volatility observed in the previous period ($\varepsilon^2_{t-1}$ or the GARCH term), and the variance from last period ($h_{t-1}$ or the ARCH term). $EVENT_{short}$ equals one at the date of the events and zero at all other dates. $EVENT_{long}$ is zero at all times prior to events and takes the value one from the time of the events onwards. If at the date of reforms and the establishment of financial control organizations investors believed that such events would be effective in dealing with fiscal and monetary problems in the Ottoman Empire, then this implies a negative $\delta_{short}$. A negative $\delta_{long}$ suggests that the investors positively responded to the reforms and supervisory organizations after the date of such events, leading permanently to lower premia due to improvement in the fiscal and monetary system over time.

A potential critique in GARCH (1,1) models in equations (3) and (4) is that limited liquidity during the default period could affect the volatility. The default of the Ottoman state in 1875 and the Russo-Turkish War of 1877–78 were correlated with a large fall of the liquidity of the bond (Yeniay, 1964, p. 55; Al & Akar, 2014, pp. 208–214). The low liquidity may have been responsible for higher volatility than fluctuations dictated by supply and demand. On the other hand, there is not much data on the trading volume of the bond, which makes it difficult to address this issue.

In 1875-6, there were ongoing rebellions in Rumelia, which led to negative effects on its fiscal system and economy as well as lower prices for the Ottoman government bonds (Kıray, 1995, pp. 145–146; Birdal, 2010, p. 39; Al & Akar, 2014, p. 199). The Russo-Turkish War of 1877–78 was an important event, creating permanent damage to the Ottoman economy and the İstanbul bourse (Al & Akar, 2014, pp. 208–214). A recent literature documents strong correlation between risks for the redemption of the bonds and war-related events.[6] Following

[6] See Ho & Li (2014), Adams (2015), Jopp (2016), Hanedar et al. (2015, 2016, 2017).

the war, the Congress of Berlin distributed the Ottoman debts to the countries that had been ruled by the Ottoman Empire before the nineteenth century, but were no longer dependencies. In addition, it was decided to decrease war compensation, which could have interrupted the reimbursement of foreign loans (Danişmend, 1972, pp. 303–305; Yeniay, 1964, pp. 60–61; Clay, 2000, p. 383; Hanioğlu, 2008, p. 121). The prices of the Ottoman government bonds traded at the İstanbul bourse and liquidity began to increase after the Congress of Berlin (Al & Akar, 2014, p. 214). Fig 2 indicates peaks in the volatility of bond prices due to the replacement of the Sultan Abdülaziz on June 1876.[7] Under the presence of data constraints, to deal with these issues, the GARCH (1,1) regressions include dummy variables ($C_t$) for the dates of the Bosnian and Bulgarian revolts in 1875-6, the replacement of the Sultan Abdülaziz, the Russo-Turkish War of 1877–78, the Congress of Berlin, and the moratorium.

## 6. Results

### 7.1 Descriptive results

Fig. 1 presents the daily closing price of the General Debt bond. There was a downward trend in the bond price from 1873 to 1881.

[7] See also footnote 9.

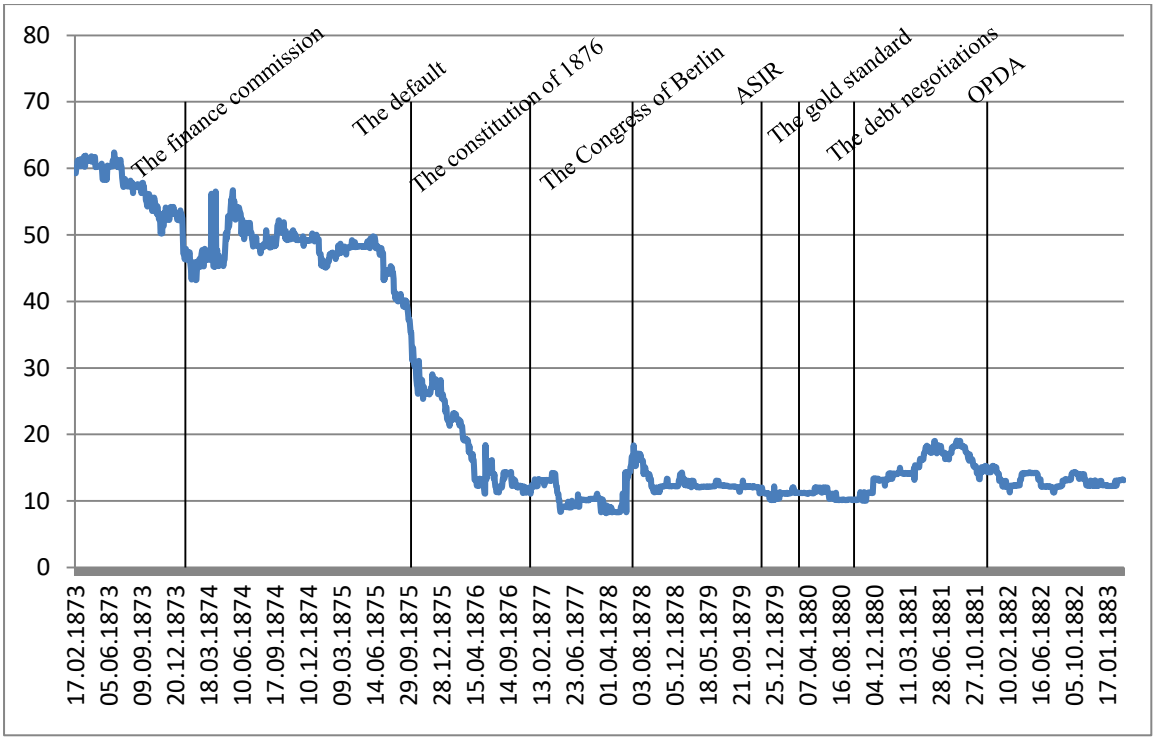
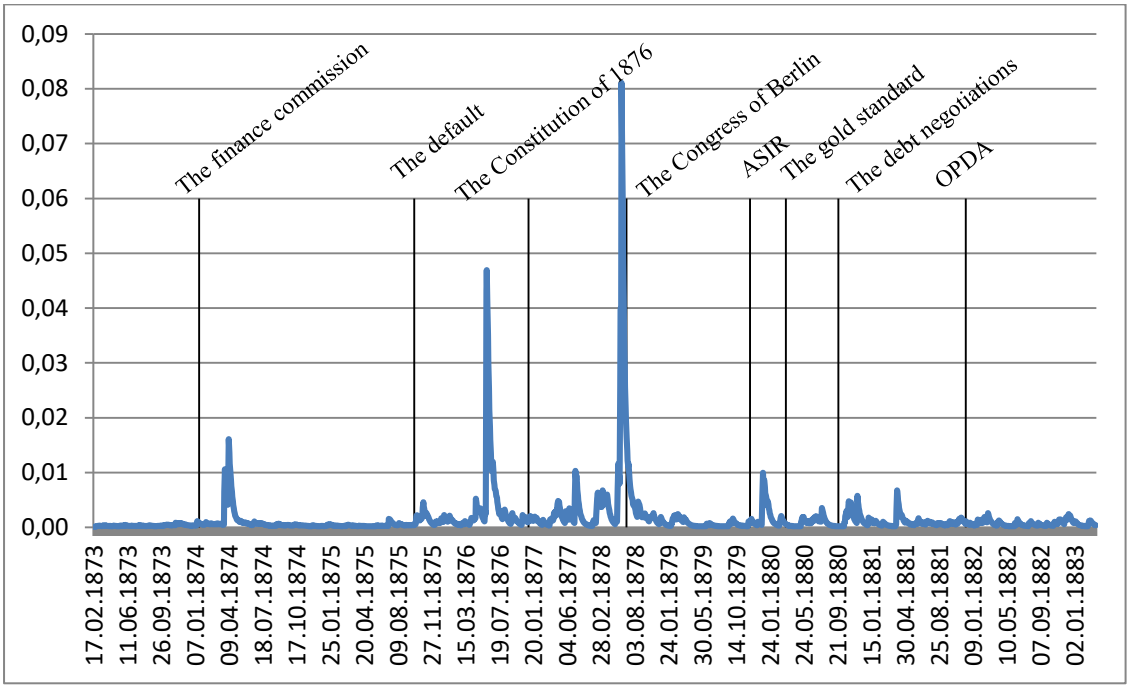



*Fig. 1.* The General Debt bond price, 1873–83 (Turkish Liras). *Sources*: The data are derived from *Vakit, Ceride-i Havadis*, and *Basiret, 1873–83.*

The establishment of the supervisory commission in 1874 was positively related to the bond price for a short time. The declaration of the default in 1875 led to a decrease in the price. The price began to rise in the end of May 1876. The announcement of the constitution in 1876 led to a higher bond price for a while. There was a peak with the Congress of Berlin in 1878. The price decreased as the ASIR was founded in 1879. Price was stable around August and September 1880 during the negotiations on the redemption of foreign debts. After these negotiations, the price started to increase. The adoption of the gold standard in 1880 brought a slight decrease. The foundation of the OPDA was positively related to the price for a while.

There was a large fall in the bond price prior to the foundation of the supervisory commission in 1874. Before the declaration of moratorium in 1875, the establishment of the ASIR in 1879, and debt negotiations in 1880, the price remained low. In November 1881, the price started to increase, while the establishment of the OPDA was approaching.

Fig. 2 shows the volatility of the General Debt bond return over the sample period. It identifies which reforms and supervisory organizations were closely related to risk perceptions on the reimbursement of the debts at the İstanbul bourse. There were severe fluctuations in the volatility between the declaration of moratorium in 1875 and the Congress of Berlin in 1878.[8]




[8] There are two peak dates in the volatility of the General Debt bond return. The highest volatility is observed on 2 and 3 June 1876 after the Sultan had been deposed by a coup. On 1 June 1876, *Basiret* announced the replacement of the Sultan Abdülaziz and the celebration of accession day of new Sultan, which would be done soon (*Basiret*, 1 June, 1876, p. 1). On 3 June 1878, another large peak in the volatility is observed. A commentary in *Vakit* reported that the Major European powers were not happy due to the presence of the Russian army around İstanbul after the end of the Russo-Turkish War of 1877–78. It caused an expectation of an outbreak of new hostilities with Russia soon (*Vakit*, 3 June, 1878, p. 1). To blockade the Russian presence in the Rumelia, the Congress of Berlin would be held soon. To sum, the volatility of the bond return was closely associated with the Russo-Turkish War of 1877–78, the Congress of Berlin, and a domestic political problem.

*Fig. 2.* Volatility in the General Debt bond return, 1873–83. *Notes*: Figure illustrates daily conditional volatility, which is obtained from a standard GARCH (1,1) model in equations (3) and (4) without using dummy variables.

The volatility in the bond return was low during the foundation of the finance commission in 1874. The fluctuations began to increase with the declaration of the default in 1875. The Congress of Berlin in 1878 was correlated with a fall of the volatility. After the establishment of the ASIR, the adoption of the gold standard, and the debt negotiations between 1879 and 1880, there were again peaks in the volatility. When the OPDA was established in 1881, the sizes of peaks decreased to the end of the sample period. There was lower volatility prior to the establishment of the finance commission in 1874, the ASIR in 1879, the OPDA in 1881, the moratorium in 1875, and the adoption of the gold standard in 1880.

To sum, the results imply an increasing price after the establishment of the finance commission in 1874 and the OPDA in 1881, as there was lower volatility in the return of the bond. This means that these supervisory organizations could be statistically associated with lower premium demanded by the investors.

### 7.2 The effects of reforms and supervisory organizations

Table 1 presents the estimation results of the GARCH (1,1) equations. Columns (2) and (3) show impacts of reforms and supervisory organizations on the volatility of the General Debt bond return from 1873 to 1883 at and after the dates of the events. The equations consider the effects of control variables as well.

***Table 1.*** Volatility changes in the General Debt bond return, 1873–83.

| **Events** | $\delta_{short}$ | $\delta_{long}$ |
|---|---|---|
| Bosnian and Bulgarian revolts | -0.0003*** | 0.0001*** |
| The foundation of finance commission | -0.001*** | 0.00001*** |

| | | |
|---|---|---|
| The default | 0.002 | 0.0001*** |
| The replacement of the Sultan | 0.002*** | 0.00005 |
| The constitution of 1876 | -0.001 | -0.0001 |
| The Russo-Turkish War of 1877–78 | 0.0001 | 0.0002*** |
| The Congress of Berlin | 0.0001 | -0.0003*** |
| The foundation of ASIR | 0.001 | 0.0002*** |
| The adoption of the gold standard | -0.001* | -0.0002*** |
| The negotiations on foreign debt | -0.001 | 0.0001*** |
| The establishment of the OPDA | -0.002*** | -0.0001*** |

*Notes*: * and *** denote statistically significant coefficients at 10% and 1%.

Column (2) indicates a statistically significant fall in the volatility of the General Debt bond return at the dates of the foundation of the finance commission in 1874, the adoption of the gold standard in 1880, and the establishment of the OPDA in 1881. The largest decrease in the volatility occurs during the foundation of the OPDA. The findings give evidence that at the date of such events investors at the İstanbul bourse accepted a lower premium. This fall could be due to the presence of investor beliefs, at the time the events took place, that the events would improve the redemption of the debts and monetary system.

Column (3) indicates that the adoption of the gold standard and the foundation of OPDA led to a statistically significant permanent fall in the volatility of the bond return. There was a statistically significant increase in the volatility after the dates of many other events. The adoption of the gold standard had a larger negative impact on volatility than did the OPDA. The findings indicate that only the adoption of the gold standard and OPDA led to a long-run decrease of the premium demanded by investors at the İstanbul bourse. These events caused permanent shifts in investor expectations about the potential for the Ottoman state to pay its

debts, suggesting these events were viewed as ameliorating the inefficiencies in the economic and monetary systems.

Our findings also show that the Congress of Berlin was negatively related to the volatility in returns of bonds after the date of the event. It caused the highest estimated fall. The Russo-Turkish War of 1877–78 and the default were correlated with higher volatility of the bond return. The replacement of the Sultan led to an increase of the volatility at the date of the event. Surprisingly, there was a decrease in the volatility during the outbreak of the Bosnian and Bulgarian revolts. The Bosnian and Bulgarian revolts were positively associated with the volatility over time, meaning higher risk premia. These results imply that investors believed that the Bosnian and Bulgarian revolts, the announcement of the default, and the Russo-Turkish War of 1877–78 would lead to difficulties in the repayment of debts after the dates of such events, while there was an increase in the reimbursement likelihood after the Congress of Berlin.

### 7.3 Discussion

We find that investors in the İstanbul bourse were less concerned about the redemption of the Ottoman debts after the acceptance of the gold standard and the foundation of the OPDA. These events were associated with higher bond prices and decreasing volatility over time. This suggests a lower risk premia demanded by investors after the adoption of the gold standard, which had increased the stability of the value of the Lira as well as the price level by creating comprehensive changes in the monetary system. This result stands in contrast to previous research on the adoption of the gold standard in the Ottoman Empire, such as that of Mauro et al. (2006), which fails to show a statistically significant effect of the gold standard in a sample of several countries' bonds, including Ottoman government bonds.

It is noteworthy that although we have evidence for a decrease in risk perceptions over time after the creation of the OPDA, there is no fall of the risk premia with the original debt

negotiations. In fact, the estimated effect of these negotiations on volatility is positive. This is despite the fact that these negotiations heralded the foundation of the OPDA. The statistically significant effect of the OPDA is parallel to Birdal (2010, p. 173) and Mitchener and Weidenmier (2010), all of whom use data on Ottoman bonds traded on European markets.

No previous detailed study discusses how the establishment of the finance commission, and ASIR, created in 1874 and 1879, respectively, affected investors in Ottoman government bonds. At the date of the foundation of the finance commission, we find a decrease of the risk perceived by the investors. However, the estimated long term effect is an increase in risk perceptions after the establishment of the finance commission and ASIR. This is in line with the arguments of commentaries in different volumes of *The Times.* They reported the ineffectiveness of the finance commission and ASIR. This was related to the fact that such organizations did not propose any measures for lowering expenditures or dealing with the factors limiting tax collection capacity such as smuggling. Additionally, these institutions did not establish cooperation among the Major European powers against the Ottoman state over the redemption of the debts (*The Times*, 31 March, 1874, p. 11; 7 September, 1880, p. 4; 17 November, 1880, p. 9).

Our findings support the absence of investors' belief in the effectiveness of the Constitution of 1876 in the long-run. This could have arisen from its abolishment just after the declaration, i.e., on 28 June 1877, due to the outbreak of the Russo-Turkish War of 1877–78. The historical literature argues that the Constitution of 1876 did not have an important effect on economic and social life, as it was not possible to create comprehensive reforms and parliament in a short life span (Yayla, 1985, pp. 950–952; Ortaylı, 1986, pp. 55–57; Tanör, 1992, pp. 100–101).

The decrease in the premium demanded by investors with the organization of the Congress of Berlin is arguably due to the fact that the outbreak of international hostility was

not likely anymore. It is important to note that claims of foreign creditors for the repayment of debts were officially discussed by the Major European powers. Further, our results provide evidence that the declaration of the default was perceived as risky by investors over time. This finding is in line with Kıray (1995, p. 146) and Tuncer (2015, p. 141), which show that the Ottoman state had less favourable access to foreign funds after the declaration of the moratorium. And finally, the Russo-Turkish War of 1877–78 also created a statistically significant increase in risk perceptions. This means that the negative impacts of the war were capitalized by investors trading at the İstanbul bourse.

## 7. Conclusions

Using manually collected data from the İstanbul bourse, we examine effects of reforms and organizations for financial supervision of the Ottoman state in the nineteenth century. We identify volatility changes in the General Debt bond return at the İstanbul bourse, and interpret these as a measure of changes in risk perceptions by investors concerning the redemption of the Ottoman debts from 1873 to 1883. Our empirical findings indicate a decrease in the volatility from the time of the adoption of the gold standard and the OPDA onwards. This implies the presence of investor beliefs at the İstanbul bourse of an increasing likelihood of reimbursement thanks to sweeping changes in fiscal and monetary systems. The Ottoman Empire's move to operating on gold had a stronger effect than that of the creation of the OPDA. This result shows the intensity of uncertainties for investors due to the inefficient monetary system of the Ottoman Empire. Still, the foundation of the OPDA did appear to improve investors' trust in the redemption of debts through effective cooperation among the Major European powers and the tax collection mechanism.

Despite the lack of available historical data on the financial affairs in the Ottoman Empire, there are several research studies on the İstanbul bourse for the sample period, such as Koloğlu (1987), Kazgan (1995), Fertekligil (2000), and Al & Akar (2014). Using unique data

on the most actively traded Ottoman government bond, we extend the historical literature on the İstanbul bourse. We also provide insight into the impacts of reforms and financial measures of supervisory organizations on solvency problems of developing countries such as Greece. Based on the Ottoman case, we can argue that investors positively responded to reforms and supervisory organizations when the reforms provided relatively comprehensive and long-lived measures effecting monetary and fiscal systems. In addition, foreign control of the economic and fiscal system could result in a belief of a higher redemption ratio of debts. This paper, however, has several limitations due to the absence of data on the profile of bond investors and bond prices in real terms, giving an opportunity for future research.

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