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Lessons from Japanese Government Debt in the Meiji Period**

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## Institutions, Reforms, and Country Risk:

### Lessons from Japanese Government Debt in the Meiji Period\*

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## **Abstract**

We evaluate the effect of the establishment of modern state institutions (e.g. a central bank or a constitution) on the risk premium associated with government debt traded abroad. Drawing on evidence from one of the most dramatic reform periods in modern history, and using data on sovereign debt traded in London between 1870 and 1914, we investigate the impact of major reforms on the yields of Japanese government debt following the Meiji Restoration. We show that, although the risk premium on Japanese debt declined during the period, the establishment of modern, western institutions did not elicit an *immediate* market response. The one institutional reform that significantly reduced the perceived risk associated with Japanese bonds was the adoption of the Gold Standard in 1897. In addition, political events such as the Anglo-Japanese treaty (1902) and the military victory over Russia (1905) improved Japan's debt capacity, and led to a substantial increase in the volume of Japanese debt. We conclude that, at least in the short run, well understood monetary rules as well as military achievements matter more for the perception of a country by foreign investors than modern state institutions, although we do not rule out the possibility that in the long run institutions do affect a country's credit rating.

*JEL Classification:* G15, N2, O16.

## **I. Introduction**

Much has been written about institutions that promote economic growth by reducing the cost of capital. This paper explores an important avenue through which institutional reform can promote economic growth: The establishment of a modern state structure, with developed judicial, economic and parliamentary systems, can change the way a country is perceived by foreign investors and thus lower the cost of foreign capital and facilitate capital inflow. Using data on Japan between 1870 and 1914, one of the most dramatic cases of institutional change in modern history, we evaluate the effects of major reforms on the risk premium associated with Japanese government debt traded in London. We show that most reforms, including the establishment of a central bank and the promulgation of a modern constitution, did not affect the way Japan was perceived by British investors, at least not in the short run. The only institutional reform that clearly led to an immediate improvement in Japan's "credit rating" was the adoption of the Gold Standard, which can be viewed as a commitment to modern, stable macroeconomic policy (Bordo and Rockoff, 1996). In addition, political events, most notably Japan's victory over Russia in 1905, did more to establish Japan's image as a modern country than most institutional reforms.

In order to measure the effect of major reforms on bond yields, we use a newly constructed data set on sovereign debt traded in London between 1870 and August 1914. We focus on sovereign debt because governments often play an important role in capital accumulation in early stages of development (especially in nineteenth century Japan, see Rosovsky, 1961). We define the "risk premium" on Japanese government debt as the difference in yields between Japanese government bonds traded in London and British Consols. Our data allow us to detect exact months in which significant changes in yields take place, so that we can estimate the magnitude of the market response to major reforms and to the establishment of modern state institutions.

We find that the yield difference between Japanese and British government debt declined during the period, suggesting that the establishment of modern state structure and institutions may matter in the long-run, or that the fast industrialization of Japan led to a reduction in the perceived risk of Japanese bonds. We also document an increase in Japan's debt capacity: interest rates declined despite the fact that the volume of debt issued abroad increased substantially, both relative to total debt, and relative to government revenues.

More importantly, we do not find that the establishment of most new state institutions were perceived as "news" with an immediate effect on the risk associated with Japanese government debt in London. Almost none of the significant reforms of the Meiji period, e.g. the establishment of the Bank of Japan and the introduction of "modern" monetary policy, the promulgation of the Meiji Constitution, or the introduction of parliamentary elections, produced any quantitatively significant market response in London, suggesting that western institutions, when established in a developing country such as nineteenth century Japan, need not be viewed as credible signs of development or of the government's ability to repay its foreign debt.

Despite the fact that most institutional reforms seemed to matter little for British investors, two institutional reforms coincided with a substantial decline in Japanese bond yields. The first was the agrarian reform which constituted part of the abolition of the feudal system in 1873, and the second was the adoption of the Gold Standard in 1897. The agrarian reform occurred early in our period of observation, and we will argue that it is unlikely to be the cause for the decline in yields that followed. As for the adoption of the Gold Standard, there is little doubt that this was the most significant reform of the period in terms of influence on Japanese debt. Not only did it lead to a dramatic decline in yields, it was also followed by a dramatic increase in the volume of debt issued by the Japanese government abroad. Evidently, the adoption of well-understood "rules of the game" was

appreciated by the London bond market.<sup>1</sup> Naturally, the adoption of the Gold Standard could not have been possible had it not been preceded by the pursuit of prudent monetary policy and by significant accumulation of gold reserves. Nevertheless, the market responded mainly to the actual introduction of the Gold Standard, rather than to any of the preceding, necessary, steps.

Next, we demonstrate that some international political events can have a short-term impact on debt yields beyond that of the introduction of new institutions. The two major wars of the period, the war with China in 1894-5, and the war with Russia in 1904-5, both had a dramatic short-term effect on yields. Unlike the war with China, the Russo-Japanese war was followed by a small decline in yields and, more importantly, by a substantial increase in Japan's ability to raise capital abroad. It therefore seems that some "certification of quality" can be achieved more quickly through military victories than through a modern constitution.<sup>2</sup> We also show that the British-Japanese alliance, the first military treaty ever to be signed between a European power and a "developing country", was also associated with a (small) reduction in the risk premium on Japanese government bonds.

We complete the analysis of market response to institutional change by examining, using annual data, the *long-term* decline in the interest rate differential between Japanese and British debt, and present two results. First, we show that growth of the Japanese economy is, in and of itself, an important factor leading to lower capital costs. Second, we show that, with the exception of war times, foreign and domestic debt were substitutes - the Japanese government tended to borrow where credit was cheaper. This implies that prior to 1897, and despite the drastic reforms at home, the Japanese government considered foreign debt to be an extremely costly financing mechanism, and used it infrequently. This long-run analysis supports our previous conclusion that institutions had little effect on the cost of

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<sup>1</sup> Being "on" the Gold Standard involved a commitment to follow well-specified rules of monetary policy; see Eichengreen (1985), and Bordo and Rockoff (1996).

<sup>2</sup> This evidence supports the view that Japanese militarism did not "crowd out" private investment because successful wars led to cheap foreign credit, as argued by Yamamura (1977).

foreign debt. On the other hand, the adoption of the Gold Standard and the defeat of Russia were significant events, affecting both yields and quantities - both events allowed the Japanese government to borrow substantial amounts abroad.

We conclude that the most developed capital market of the nineteenth century was slow to realize the importance of new institutions in Japan despite the fact that institutional reforms in Meiji Japan were unprecedented in scope, and included mechanisms designed explicitly to establish an impartial rule of law, protect property rights, and enhance economic activity. Foreign investors, it seems, placed a low weight on how modern a country's institutions were, and cared more about its macroeconomic policies and military prowess.

We believe the historical analysis of this paper is very relevant to the discussion of country risk and foreign capital flows into modern emerging markets. Our results suggest that even if a developing economy adopted a legal system that protects property rights, a constitution that limits the arbitrary use of power by rulers, or a central bank modeled after the Bank of England, it would still be unlikely to win an upgrading of its credit rating in New York. Of course, this does not mean that "institutions do not matter" for economic development, but that they need not promote growth through an immediate reduction in the cost of foreign capital.

The paper is part of a growing literature on institutions and their economic significance. Our approach is strongly influenced by North and Weingast's (1989) study of the effect of reforms on the yields on British government debt following the Glorious Revolution of 1688. Methodologically, the paper is in line with recent studies that apply econometric techniques to evaluate market responses to historical events. Of special relevance is Willard, Guinnane, and Rosen (1996) who use data on the gold price of "greenbacks", a currency issued by the Union during the American Civil War, to examine the effect of war-time events on financial markets. The methodology they develop, designed to determine if a price change is "long term" or just a "blip", is similar in spirit to

the methodology used here. The paper is also related to the literature on country risk in more recent periods (e.g. Edwards, 1986), and to the literature on the Gold Standard and its impact on borrowing constraints (Bordo and Rockoff, 1996). Finally, Suzuki's (1994) comprehensive historical study of Japanese bond issues in London during the Meiji is extremely informative, although the methodology and objectives of his study are quite different than ours.

The rest of the paper is organized as follows: Section II provides a historical overview of the Meiji period reforms in Japan. In section III we describe the data used for this study, and present our empirical approach. Section IV presents the results, and Section V concludes and outlines directions for further research.

## **II. An overview of the Meiji period**

The symbol of Japan's transition to modernization and economic growth is the Meiji Restoration of 1868. Following more than 200 years of isolation under the Tokugawa regime, the old feudal system was abolished, and the newly established government embarked upon an ambitious modernization plan. Massive technology import and heavy investment in infrastructure financed by the government, as well as the establishment of a modern state structure were all accomplished within a few decades. Outstanding growth rates during the period enabled Japan to become both an economic and a military power by the turn of the century. Unlike the commercial and industrial revolutions in England which stretched over several centuries, the transformation of Japan from a backward feudal society to a modern industrial state was accomplished within one generation. Although a detailed historical review of the Meiji period (1868-1912) is beyond the scope of this paper, we provide here a brief outline of the major reforms and historical events which will serve as background for the empirical analysis which follows.<sup>3</sup>

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<sup>3</sup> For further historical background on Japan in the Meiji period, see Beasley (1990), Shillony (1997), and Storry (1973).



The upheaval following the forced opening of Japan by Commodore Perry brought about the demise of the shogunate, the old feudal system, and resulted in a de jure restoration of authority to the emperor, and a de facto revolution under the leadership of a new government which was eager to close the economic and military gap between Japan and the West. The feudal domains were abolished in 1869, and as early as 1871, the first government mission, headed by Prince Iwakura, left Japan to “learn from the West”. Postal service was established in 1871-1872, and the first railroad was constructed at about the same time. Compulsory elementary education for both sexes was introduced in 1872, eight years before its introduction in England. Major agrarian and tax reforms took place in 1873, when rice was replaced by currency as means of payment. General conscription and a modern army replaced the traditional samurai warriors in 1873. Telegraph was introduced in the early 1870s. “Model” textile and other industrial plants were imported by the government starting in the mid 1870s, and students were sent to study in Europe and the US. The early 1880s witnessed the consolidation of the banking system, the establishment of a modern central bank, the Bank of Japan (1882), and, later-on, the introduction of convertible to silver yen notes. Under Count Matsukata as Minister of Finance, Japan restrained the inflation (which resulted from the 1877 Satsuma Rebellion and the large government investment in imported model factories), and began to privatize the industrial plants introduced by the government earlier. Also during the 1880s, a modern, western, cabinet system was introduced. Possibly the most important institutional reform, the Meiji Constitution, was promulgated in 1889, after nine years of deliberations and attempts to incorporate the best features in the constitutions of Germany and France. The Meiji Constitution, which remained unchanged through the end of World War II, guaranteed the rule of law, property rights, some freedom of speech, as well as occupational freedom for citizens. It also established an independent legal system, and set the ground for a two-house parliamentary system which exists in Japan until today. The first parliament convened in 1890 following the first elections.

Other major political events of the Meiji period include the above mentioned 1877 Satsuma Rebellion, led by discontented samurai warriors, and the annexation of Okinawa (formerly jointly ruled by China and the Japanese clan of Satsuma) in 1879. Japan's ambition to colonize Korea led to the 1894-5 war with China, which ended in major Japanese victory, the annexation of Taiwan, extremely large reparations imposed on China, and Korean independence. In 1900, Japan took part, together with the western powers, in the suppression of the Boxer Rebellion in China. In 1902, the Anglo-Japanese military alliance was signed, the first ever alliance signed by England with a non-European country. Struggle for hegemony over Korea and Manchuria led to the outbreak of the war with Russia (1904-5). The war ended in a major Russian defeat, the first time a European power lost a war to a "developing country". Indeed, the Russo-Japanese war is often described as a watershed in the history of both Japan and Russia. In 1909, Ito Hirobumi, one of the most important statesmen of Meiji Japan, was assassinated by a Korean nationalist in Manchuria, and in retaliation, Korea was formally annexed to Japan in 1910. Emperor Meiji died in July 1912. World War I broke in August 1914.

### **III. Data and empirical methodology**

#### **III.1 The construction of the data set: statistical information**

Data on the prices and yields of Japanese government bonds traded in London are calculated from the London Times, and include both the coupon interest rate and the actual closing price on the London market at the end of each month. Given the coupon interest rate and the market price, we construct a series of bond yields which runs from 1870 through August 1914.<sup>4</sup> In our calculations, yield equals the ratio of interest payments to market price, an approximation which is reasonable for long term bonds. Indeed, the maturity of Japanese bonds was thirteen to twenty five years prior to 1897, and about sixty

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<sup>4</sup> Note that the focus on foreign debt enables us to construct a series of yields that is independent of domestic monetary policy. Note also that data on domestic bond yields does not exist for Japan before the beginning of the twentieth century.

years thereafter. For pre-1897 bonds we compare calculated yields with yield to maturity (“buy and hold” returns), and find that the two series are closely correlated at all times except for several years before redemption in the mid-1890s (see Appendix Figure 1-A).<sup>5</sup> We return to the issue of bond maturity when we discuss the impact of the war with China and the Gold Standard on yields.

We also collect *daily* bond return data around the promulgation of the Constitution and the adoption of the Gold Standard. These data are described in more detail in the next section.

British Consol yields are obtained from the NBER Macroeconomic History data set. Since we are interested in market responses of bond yields to institutional change, we define the difference between the yield on Japanese bonds and the concurrent yield on British Consols as the “risk premium”. Because coupons on Japanese bonds were payable in pounds Sterling in London, no exchange rate risk was associated with their yields.

Annual data on the volume of Japanese government debt, as well as on government revenues, and other macroeconomic variables are drawn from the Bank of Japan’s Hundred Year Statistics of the Japanese Economy. Unfortunately there are some discrepancies between the figures on foreign borrowing reported in this source and actual bond issues traded in London. Most importantly, a major issue of bonds, totaling 4.4 million pounds Sterling, that followed the adoption of the Gold Standard in 1897 is entirely missing. We supplement the data on long term capital flows by using Mitchell’s International Historical Statistics. That source, as well as Suzuki (1994) and Tamaki (1995), address the 1897

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<sup>5</sup> The first bond issue, in 1870, was with maturity of thirteen years, to be redeemed in ten annual drawings starting in 1873. Starting in 1873, the Japanese government issued twenty five year bonds, which could also be redeemed before maturity; indeed Japan withdrew much of the 1873 debt by 1897 through a series of “lotteries” in which a fraction of the outstanding bonds was redeemed. Post-1897 bonds were mostly long-term, with maturity of up to sixty years, although during the war with Russia short term bonds were issued as well. The Japanese government could (and did) retire some of the bonds before the end of the period, but only with “adequate” advance notice. In any case, bonds could not be redeemed earlier than five (in some cases ten) years after the issue. The fact that some fraction of the bonds could be “called” by the government before maturity implies that calculating yield to maturity is not straightforward and should incorporate the probability of early redemption. Nevertheless, the results reported below do not change when yield to maturity is used rather than the ratio of interest payments to market price.

lacuna. We therefore adjust the foreign debt series of the Bank of Japan by adding the 1897 issue. GNP growth data are also drawn from the International Historical Statistics , and are available only for the period following 1885.

### **III.2 The construction of the data set: British press reports on events in Japan**

To supplement the statistical information, we record each time in which political or economic events in Japan are reported in the Times between 1870 and 1899. These data will be used to evaluate the nature of information British investors had on reforms in Japan and on other events that could affect the risk associated with Japanese government bonds (e.g. political events). Until Japan was connected to the international telegraph system in 1876 news from Japan arrived in England by mail steamers with a two month delay. After 1876, news from Japan became regularly reported immediately after they occurred.

### **III.3 Methodological approach**

We pursue several avenues to evaluate the London bond market response to reforms in Japan. First, we apply *several* statistical procedures that allow us to test whether institutions and other selected events caused a short-lived or a “long-run” change in the risk premium associated with Japanese debt. This approach is not based on a detailed analysis of how each institutional reform should affect a country’s risk (Calomiris, 1994), but on the notion that the establishment of institutions associated with modern, developed countries may improve a developing economy’s “image” and credit rating. Second, we investigate the long-run trends in Japanese foreign borrowing. This approach focuses mainly on the volume of Japanese foreign debt, whereas the former focuses mainly on its price. We can thus provide both a short and a long-run view of the effect of institutional reform and other important events on Japanese foreign borrowing.

The first part of the analysis is designed to statistically test if *known* historical events (e.g. the establishment of a central bank) caused a significant change in the risk premium associated with Japanese government bonds. We begin this part of the analysis by

conducting a test suggested by Perron (1989), which is based on estimating a regression equation of the following form:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 TREND + \beta_3 EVENT_{long} + \beta_4 EVENT_{pulse} + \sum_{i=1}^k \beta_i + 4\Delta Y_{t-i}$$

where  $EVENT_{long}$  is a dummy variable that takes the value zero at all times prior to the event and the value one from the time of the event onwards, and  $EVENT_{pulse}$  is a dummy variable that takes the value one at the date of the event investigated and zero at all other times. Under the assumption that there is a one-time change in the mean of a unit root process,  $\beta_1=1$ ,  $\beta_2=0$ ,  $\beta_3=0$ , and  $\beta_4 \neq 0$ , because a “shock” will tend to persist. Under the alternative hypothesis of a permanent one-time break in a trend stationary series,  $\beta_1 < 1$ ,  $\beta_2 \neq 0$ ,  $\beta_3 \neq 0$ , and  $\beta_4 = 0$ .<sup>6</sup>

The Perron methodology (and its application to the search of “structural breaks” in US GNP) has been criticized by Christiano (1992), and Zivot and Andrews (1992) on two main grounds. First, Christiano shows that the Perron test will tend to reject the null-hypothesis of no breaks “too easily”, that is, the critical values for the significance of the dummy variables are higher than the ordinary  $F$  or  $t$  values. In our case, this means that we may over-estimate the statistical significance of reforms and institutions. Second, both Christiano and Zivot-Andrews argue that Perron’s breaks are “endogenous”, that is, are based on preliminary observation of the data and informal search for breaks. This second critique is *irrelevant* in the study of institutional reform, where possible break dates are exogenously given historical events. Nevertheless, we do examine two alternative specifications (suggested by Christiano and Zivot-Andrews), which are based on a search for breaks over the entire data without assuming any break date *a priori*. These tests lead to similar conclusions as the Perron test.

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<sup>6</sup> In other words, a series which may appear to be unit root, may actually be stationary before and after a structural break which this methodology will identify. Notice also that the Perron specification allows for a variety of stochastic processes in addition to the examples described here.

In order to apply the Perron methodology to Meiji Japan, we construct an eighteen month “window” around the month in which a major historical event takes place. Each “window” is constructed to include one important event only, and therefore guarantees that we will be able to identify the impact of every event independently of the influence of other events which could increase or reduce its influence.<sup>7</sup> The time frame included in each “window” implies that the “persistent” effects we identify are effects that last for about one year. For example, for the Meiji Constitution, which was promulgated in February 1889, the “window” begins in June 1888 and ends in November 1889; the parliamentary elections of 1890, are not included in this time period. This approach raises two important issues: first, it is possible that the “windows” are too short, both in the sense of containing too few observations, and in the sense of covering too short a period. However, the results reported below do not seem to be sensitive to changes in the length of the event “windows”. Second, events may have been anticipated prior to the actual date in which they occurred. We address the role of expectations when evaluating our results in the next section.

Using the data contained in each “window”, we estimate a regression equation similar to the one presented above:

$$\log(\text{Risk Premium})_t = \beta_0 + \beta_1 \log(\text{Risk Premium})_{t-1} + \beta_2 \Delta \log(\text{Risk Premium})_{t-1} + \beta_3 \Delta \log(\text{Risk Premium})_{t-2} + \beta_4 \text{TREND} + \beta_5 \text{EVENT}_{long} + \beta_6 \text{EVENT}_{short}$$

where the dependent variable is the natural logarithm of the yield difference between Japanese government bonds and British Consols.

Right-hand-side variables include a constant, two dummy variables for each event as described above (“long” and “pulse”), the logarithm of the risk premium lagged one year, increments in the risk premium lagged one and two years (to correct for various forms

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<sup>7</sup> It is, of course, possible that other events, which Japanese historiography did not deem important, are also included in the “window”. A division of the sample into short “windows” is part of the Willard et. al. (1996) approach as well.

of serial correlation), and a time trend. We demonstrate the application of this methodology to several historical events in the section IV.2 below.

In sum, the “short-run approach” outlined here is essentially an analysis of the stochastic properties of the yield series within relatively short “windows”. In particular, even “long-run effects” are restricted to the duration of the “window”, and can sometimes be misleading. We therefore supplement the short-run (“window”) analysis by several tests which are based on thirty-some years of data. We find that the conclusions we draw from the analysis of the yields data are indeed consistent with the long-run development of Japanese foreign borrowing.

Our long-run analysis is divided into two parts. In the first part, we examine, using annual data, if the Japanese-British interest rate differential was strongly correlated with Japanese growth rates. If, for example, the interest rate differential can be reasonably well predicted using information on the rate of modernization and capital accumulation in Japan, then information on specific institutional reforms can add relatively little to the explanation of (long-run) yield differences.

The second, and main, part of the “long-run analysis” focuses on “quantities” rather than “prices”, that is, the flow of foreign capital into Japan and the mix of foreign and domestic debt chosen by the Japanese government. First, we investigate if bond yields in London affected the composition of Japanese debt, that is, we examine if the Japanese government borrowed more heavily abroad when the price of capital there was cheap. We then proceed to examine if institutional reforms allowed the Japanese government to increase its total volume of debt, or led to an increase in the share of Japanese foreign debt relative to total government borrowing.

#### **IV. Results and discussion**

This section is divided into three parts. The first contains an overview of the data. In the second part, the impact of reforms and major historical events is examined using more

formal statistical tests. Finally, in the third part, we use annual data to investigate the long-run behavior of Japanese bond yields as well as the volume of foreign borrowing. All three approaches confirm that “news” on most institutional reforms in Meiji Japan did not produce a significant impact on either the cost or the volume of foreign debt - institutional reform does not promote growth by immediately alleviating a country’s borrowing constraints.

#### **IV.1 Japanese bond issues in London - an overview**

Japanese debt was first issued in London in April 1870. The London Times (April 26, 1870, p. 8) described this relatively small issue of one million pounds as follows: “The radical changes which have recently taken place in Japan and their important effects, not only on the Japanese themselves, but upon the commercial relations with foreign countries, have been recognized by all who have knowledge of the cast resources and the productive power of that Empire. The natural result of this improved state of things has been the desire on the part of the government of Japan to develop the resources of that Empire by the introduction of railways, and to the accomplishment of that object the present loan is mainly designed...”

Table 1 displays the dates, volume and coupon interest rates for Japanese government debt issued in London. From 1870 to the early twentieth century, coupon interest rates on newly issued Japanese government bonds declined from 9 percent (or about 200 percent higher than Consol yields at the time), to about 4 percent. Fast capital accumulation in Japan during the period (Rosovsky, 1961), as well as the increased integration of world capital markets (Bordo and Rockoff, 1996), seem to have led to a lower risk premium in the long-run. It is also evident that the volume of debt issued in London (as well as in other markets) increased dramatically, especially around the turn of the century, after the adoption of the Gold Standard.

Figure 1 shows the development of the risk premium on Japanese government debt from 1870 to August 1914. Again, observe that yields on Japanese government debt



decreased from about 6 percentage points above British Consol yields in the early 1870s to slightly more than 2 percentage points above Consol yields toward the end of the nineteenth century. It is important to note that this trend was not common to all developing countries of the time. For example, the yields on Russian and Turkish bonds did not fall during the period. The decline in Japanese yields was not smooth, however. While yields fell in the 1870s, there seems to be a trend of moderately increasing yields from the early 1880s until 1897. While the decline in yields in the 1870s coincided with some important changes in Japan (e.g. the abolition of the feudal system, consolidation of the banking system, suppression of an anti-reform rebellion), the increase in yields in the 1880s occurred in a period during which Japan's most important state institutions were established: the Bank of Japan in 1882 (and modern monetary policy under Matsukata), a modern cabinet system similar to that of advanced western countries, an elected parliament, and, most notably, the Meiji Constitution of 1889 which guaranteed explicitly the protection of property rights and the rule of law. Apparently, none of these changes seemed credible at the time, or had any effect on the London market perception of Japanese debt.

The absence of any significant effect of institutional reform on the London capital market is echoed in the data on the volume of foreign borrowing and the composition of the Japanese government debt. Figure 2 shows the development of capital flows and the ratio of foreign to total debt. With the exception of two debt issues floated in London during the early 1870s, the period of institutional reform was characterized by *negative* capital flows, in part because of payments to service and retire foreign debt. This outflow of capital is reflected in the share of foreign debt out of total debt, which *declined* steadily until 1897. The trend of both capital flows and the share of foreign debt was reversed following the adoption of the Gold Standard, and reached a peak of capital inflow using foreign debt during the war with Russia.

In order to clarify the perception of Japanese debt by market participants in London, we classify newspaper articles dealing with Japan in the London Times into several categories: articles dealing with political instability and wars; articles dealing with economic and commercial news; articles dealing with diplomacy and foreign policy (e.g. treaties with foreign countries); and articles dealing with reforms and institutional change, see Table 2. During the 1870s, the majority of reports in the Times had to do with political instability and wars, most notably the Japanese navy's attack on Taiwan in 1874 and the counter-reform Satsuma Rebellion of 1877. This seems to be in line with the high risk premium associated with Japanese government bonds. The 1880s had fewer reports on instability (mostly dealing with political unrest around the promulgation of the Meiji Constitution), and had far more reports on the Japanese economy and on institutional change. In the last decade of the century, British press reports from Japan emphasized the war with China (1894-5) and the Gold Standard. Overall, the risk premium on Japanese government debt reflected the nature of information British investors had on Japan. The increase in the number of "positive" articles on economic change, diplomatic ties with foreign nations and institutional reforms were associated with the trend of declining risk premia. Nevertheless, the reforms of the 1880s did not seem to be as thoroughly covered as the instability of the 1870s or the Gold Standard and the war with China of the 1890s, and consequently these events did not win the appreciation of British investors.

This overview suggests that, prior to 1897, Japanese institutional reform did not win the appreciation of the London bond market. We now proceed to a more formal examination of the impact of institutions and historical events on bond yields.

#### **IV.2 Did institutions lower the cost of foreign debt? - evidence from changes in yields**

Table 3 lists some of the major historical events of the Meiji period. For each event, the table displays the coefficient and statistical significance of the appropriate "long" and "pulse" dummy variable. Since none of the series we examine is unit root, if the "pulse"

dummy variable is significant, we denote the event as a “blip” whose influence is short-term only.

### **The 1870s**

Consider first the agrarian reform of 1873. During the eighteen month “window” around the reform, the series is trend-stationary. The negative and significant “long” dummy on this event suggests a dramatic “permanent” (for the duration of the “window”) decline in the Japanese-British yield difference of about 1.5 percentage points (out of a total of about 4 percent). In this particular case, however, it is hard to verify that agrarian reforms were indeed the cause for this break. The risk premium associated with Japanese bonds, first issued in London in 1870, may have been especially high, just like initial stock offerings of firms that go public for the first time (“IPO underpricing”). It is therefore quite possible that the reforms of the early 1870s were not the reason why the 1873 bond issue had a coupon rate of only 7 percent, relative to 9 percent on the first issue in 1870.

To shed more light on the events of 1873, it is interesting to examine consular reports from Japan during the period (British Parliamentary Papers, Embassy and Consular Commercial Reports - Japan, Volume 6). For example (on p. 11), it is reported that the first Japanese official report on public finance was issued in June 1873 to counteract rumors in Japanese newspapers that the government would run a major deficit. The view of Japan during the period was as “being as yet neither endowed with nor fit for parliamentary institutions, there is no public body which has the power to look into or control the national accounts. The public has therefore no guarantee... that the figures... are correct” (p. 13). In addition to indicating that institutions mattered for British investors, this report suggests that the decline in yields on Japanese bonds may have been a response to better and clear information provided by the government rather than to the agrarian reforms. The provision of information by the Japanese government was probably of great importance during the early 1870s because Japan was connected to the international telegraph network only in 1876. Another explanation for the declining yields in the 1870s is provided later in the

same volume of Parliamentary Papers (p. 187), where it is reported that the Japanese government was to intervene in the market for bonds after previous issues had been discounted by 40 to 50 percent. Finally, it is possible that the suppression of the anti-reform Satsuma Rebellion in late 1877 proved to investors that pro-reform forces were indeed powerful in Japan, yet the end of the Rebellion did not cause a significant market response (Table 3). We conclude that the declining yields in the 1870s are not necessarily related to institutional reforms, although the changes that took place in Japan during this decade may have had a cumulative effect that reduced the risk premium.

### **The 1880s and 1890s: Institutional reforms and the Constitution**

In this sub-section we examine the series of major institutional changes that took place in Japan in the last two decades of the nineteenth century. As is apparent from Figure 1, no institutional change until 1897 constitutes a major break in Japanese bond yields. In particular, none of the major changes of the 1880s, most notably, the establishment of the Bank of Japan in 1882, the Meiji Constitution of 1889, and the first parliamentary elections of 1890 - brought about a significant reduction in the risk premium associated with Japanese debt.

Because the Meiji Constitution of February 1889 is a major landmark in the modernization of Japan, we investigate the market response to its promulgation in more detail. As is evident from Table 3, monthly data indicate that the Constitution was not associated with a significant change in yields. We therefore examine press reports dealing with the Meiji Constitution. There are five detailed articles describing the Meiji Constitution in the London Times in February and March of 1889: British investors were clearly well informed (and in real time) regarding the on-going changes in Japan. The Constitution is described as a major step forward, granting Japanese citizens substantial liberties, and more importantly, establishing an independent judicial system. At the same time, the articles emphasize the Emperor's divine status and the limited accountability of

the cabinet to the parliament. The overall impression of the Constitution was mixed, a feature which may account for the lukewarm market response.

In order to further examine the impact of the Constitution we supplement our data set by collecting *daily* bond yield data from January to April 1889. Searching for breaks in this series, we detect no major changes in yields around the dates in which the Constitution is discussed in the London Times, although in the daily data there is a very moderate decline in interest rates during February and March of 1889, captured by the trend variable in the regression (not shown). We conclude that British investors were not convinced the Constitution would prove to be a major turning point, and did not modify their perception of the Japanese government following its promulgation.

The only event during the 1880s which had some impact was the introduction of yen notes convertible to silver, see Table 3. In this “window” yields were stationary (with no trend), and the introduction of silver convertibility in 1886 was associated with a relatively small (though statistically significant), decline in yield levels.<sup>8</sup> We interpret this finding as evidence that while institutions were poorly understood or their credibility hard to evaluate, the adoption of well-known economic “rules of the game” did elicit a positive market response.

### **The Gold Standard**

The most dramatic reform of the Meiji period (in terms of its influence on the Japanese bond yields) was the adoption of the Gold Standard in 1897. Consequently, yields fell from approximately 4 percentage points above the yield on British Consols, to a 2 percent premium. This decline was driven by the complete withdrawal of the 1873 7 percent bonds, and the issue of new 5 percent bonds of much longer maturity - over fifty years (with restrictions on early redemption), relative to twenty five year maturity on

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<sup>8</sup> When using yield to maturity (instead of the ratio of interest payments to price), the effect of silver convertibility appears to be even bigger.

previous issues. Part of the post-Gold Standard decline in yields could be attributed to investors' expectation of continued decline in interest rates after the adoption of the Gold Standard. Stated differently, to the extent that the Gold Standard was interpreted as evidence of future macroeconomic stability in Japan, the Japanese government could issue longer term debt without having to pay a maturity premium.<sup>9</sup>

The effect of the Gold Standard on Japanese bond yields is evident in historical records as well. Count Matsukata, then Minister of Finance, declared that the adoption of the Gold Standard was designed "to command higher credit and to be able to borrow on more favourable terms in foreign countries" (cited in Suzuki, 1994, pp. 65-66). The importance of the Gold Standard is reflected also in a number of reports in the London Times in spring 1897 describing its expected adoption in June of that year. Finally, historical documents examined by Suzuki (1994) also indicate that the 1897 bond issue (which coincided with the adoption of the Gold Standard) commanded such interest that it was more than six times over-subscribed.

In addition to a decline in yields and increased interest, the adoption of the Gold Standard was accompanied by an increase in the volume of debt issues by the Japanese government in London, as is evident in Figure 2 (and also in Table 1 above). Figure 2 clearly indicates that within a few years following the adoption of the Gold Standard, Japanese foreign debt increased from a very small amount to around 20 percent of total Japanese debt. The adoption of the Gold Standard resulted in a substantial inflow of capital to Japan at a cost that was much lower than ever before. Unlike the establishment of a modern state structure, the Gold Standard was apparently interpreted as evidence of significant development in Japan. Indeed, Tamaki (1985) argues that the Gold Standard

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<sup>9</sup> Because the entire stock of old Japanese government bonds was redeemed, it is impossible to formally estimate the impact of the Gold Standard on yields using the Perron methodology - as the bonds approached maturity, their yield approached the short-term risk-free interest rate (or prices approached the coupon redemption value), see Figure 1-A. The decline from seven to five percent is therefore likely to be an over-estimate of the impact of the Gold Standard, since market yields in the early 1890s (before the approaching redemption began to drive them upwards) were around 6 percent (Figure 1-A).

was virtually a “prerequisite” for Japan to raise large amount of capital on the London bond market.

While the discussion so far suggests that the Gold Standard constitutes the most important break during the entire Meiji period, it is important to bear in mind that its adoption was the culmination of a series of economic reforms and political changes. For example, a central bank and “modern” monetary policy are prerequisites for the Gold Standard, as is the accumulation of substantial gold reserves, which Japan obtained as reparations from China after the Sino-Japanese war. What we wish to emphasize, however, is that the London bond market did not respond much to changes which preceded the adoption of the Gold Standard, but responded strongly to the adoption of the Gold Standard itself. In other words, the institutions of a modern economy themselves were not appreciated until they enabled Japan to acquire a clearly understood “status symbol” in the form of the Gold Standard. It is also possible that yields declined in response to the adoption of the Gold Standard because it represented a form of collateral for the Japanese government debt.

It is interesting to note that the effect of the Gold Standard on the ability of the Japanese government to raise capital abroad resembles its effect on other countries. Gregory (1979) documents a massive capital inflow into Russia following its adoption of the Gold Standard, at about the same time as Japan did. Nevertheless, while Japan enjoyed a reduction in the cost of capital as well, no such reduction occurred in the Russian case. Bordo and Rockoff (1996) find that countries that were committed to the Gold Standard “as a good housekeeping seal of approval” (e.g. Canada and Australia) enjoyed lower risk premia (yield spread relative to British consols) in the period 1870-1914 relative to countries that went “on” and “off” the Gold (e.g. Brazil). Our results indicate not only that the Gold Standard was important for Japanese foreign debt, but also that other more dramatic institutional reforms, were not.

**Major political events: Wars with China and Russia and the Anglo-Japanese Treaty**

In this sub-section we examine the effect of some of the major political events in Asia during the Meiji period on the risk premium. First, the effect of the war with China in 1894-5 (that ended in a dramatic Japanese victory which imposed huge reparations on China) is described in Figure 3.<sup>10</sup> The war caused a 10 percent increase in yields after its outbreak (Table 3), but overall brought about no substantial change in the yield difference between Japanese and British bonds, or in the volume of Japanese debt issued in London. The market, it seems, could not make much out of these intra-Asian affairs, and did not view the Japanese success in the war as a sign of modernization.<sup>11</sup>

Of some importance was the Anglo-Japanese military alliance of 1902. The signing of a treaty between the leading European power of the time and the Japanese government was interpreted as a “signal of quality” and resulted in a 7 percent decline in the Japanese risk premium (see Table 3).

The political event that had the strongest impact on the cost of raising capital in the London bond market was the Russo-Japanese war which is described in Figure 4.<sup>12</sup> In the historiography of modern Japan, this war is often described as a major watershed (e.g. Shillony, 1997). Not only did the war prove Japan’s military might, it also proved its capacity to produce arms and armaments, and was followed by a “boom” for Japan’s heavy industries (Yamamura, 1977). In terms of Japanese debt, the war with Russia seems to have had both a short and a (relatively) long-term effect: Before the war, Japan was perceived as the “underdog”, and yields on Japanese government bonds rose dramatically, reaching the highest level of the decade in early 1904. Subsequent Japanese victories over Russia led to

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<sup>10</sup> Our estimation technique is slightly different here: the short-run impact of the war is estimated using a dummy variable that equals one only in the month in which the war broke. The long-run effect of the war is measured using a dummy variable that equals one from the end of the war through the end of the “window”.

<sup>11</sup> This absence of long-term impact may be driven by the approaching maturity of the 1873 bonds discussed above, which may have prevented bond yields from declining in response to the victory over China.

<sup>12</sup> Because of its length, the “window” around war with Russia is a two year “window”. As in the war with China, the short-run impact of the war is estimated using a dummy variable that equals one only in the month in which the war broke. The long-run effect of the war is measured using a dummy variable that equals one starting from the battle of Lushon (which established Japan’s victory in the war about half a year prior to its formal conclusion) through the end of the “window”.



a decline in the perceived risk of Japanese bonds; yields returned to their prewar levels in 1905 and continued to decline, albeit slowly, until about 1910 (see Figure 1).<sup>13</sup> Much more important than the relatively small decline in yields, the war with Russia was followed by an increase in the Japanese government's ability to borrow abroad. As a percent of government revenues, debt increased from about 200 percent around 1900 to over 400 percent in 1905. Most of the new debt was issued abroad: foreign debt accounted for about half of total outstanding Japanese debt after the end of the war with Russia, relative to about a fifth around 1900 (see Figure 2). Foreign debt could now be issued in foreign bond markets other than London, for example, Paris, New York, Hamburg, and Berlin (Suzuki, 1994, Tamaki, 1995), and indeed, the Japanese government issued debt five times within a period of nineteen months. Japanese debt accounted for about a fifth of total sovereign debt traded in London during this period (Suzuki, 1994). New long-term bonds at low interest rates quickly replaced the costly, short term bonds issued during the war. Moreover, following the victory over Russia, foreign debt was issued not only by the Japanese government itself, but also by quasi-governmental institutions, municipalities and even some private Japanese companies (e.g. Tokyo Harbourworks, Osaka Electric Tramway, the South Manchurian Rail Company, the Imperial Industrial Bank of Japan, and Kanegafuchi Spinning). And there is yet more evidence on the impact of the war: underwriting commissions on Japanese bonds, another measure of risk, declined by a third (!) after the victory over Russia, and furthermore, the Japanese government was no longer required to back its debt by securities (e.g. customs income) deposited in London (Suzuki, 1994).

Our statistical test confirms that the war had both short-term effects (an initial increase in perceived risk) and a long-term "certification of quality" effect which led to further decline in the risk premium associated with Japanese debt. It should be noted,

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<sup>13</sup> The increase in yields starting in 1910 was due to poor market conditions (even for British issues), and a bond floatation that failed and resulted in under-subscription (Suzuki, 1994). It should be noted, however, that observed yields in that period are somewhat misleading since there were also "bonuses" pledged to investors in addition to interest payments.

however, that the analysis of the Russian war “window” tends to overestimate the true long-run effect of the war on yields. While Table 3 suggests a long-run decline in yields of about 9 percent from the end of the war onwards, Figure 1 indicates that much of the post-war decline in yields reflects a return to prewar levels not captured by the relatively short war “window”. Nevertheless, it is clear that, unlike the Meiji period institutions, victory over Russia, a major European power, which required major industrial production of armaments and military equipment, was interpreted by the London bond market as important news, that is, a credible signal that Japanese industrialization had been successful. The large amounts of capital raised by the Japanese government in London after the war at a low cost must have played an important role in financing the on-going modernization of Japanese industry in the early twentieth century. This conclusion is very much in line with the Yamamura (1977) view of Japanese militarism as supporting private investment (through an inflow of capital), rather than “crowding it out”.

### **Robustness Tests**

We now turn to discuss the sensitivity of our results to the specification of the Perron test. First, recall that Perron-style tests tend to accept breaks too easily, and nevertheless, we have not been able to identify any major break caused by an institutional reform, other than the Gold Standard. Can expectations account for the fact that the reforms of the 1880s had such a small impact on debt yields? Perhaps breaks occurred at dates prior to official announcements of major changes. In other words, are there other dates in which there is a major change in the risk premium? The answer to this question is “no”. First, by observing Figure 1, it is clear that the entire period of institutional reform was characterized by non-decreasing yields, and there seems to be no break at a date earlier than that of the major reforms. More formally, following Christiano (1992) and Zivot and Andrews (1992), we search for breaks in the yield data without assuming them *a priori*. This is done in two ways. The first is based on using the entire forty-some years of observations iteratively: if there is one break that divides the sample period, then the search for more breaks continues

within each of the two subsamples separately. This process ends when no more breaks are detected in any subsample. The second method of searching for an unknown break is based on “moving the windows” one month at a time, and searching for break dates with the highest statistical significance (as in Willard et. al., 1996). Both methods confirm that institutional reforms had little impact on yields: no significant breaks can be detected during the reform period of the 1880s. The iterative search for breaks identifies the outbreak of the war with Russia as a (relatively minor) turning point in the post-Gold Standard period; the “moving windows” search method identifies short-term “blips” around both the war with China and the war with Russia, but overall, our conclusions remain unchanged. Again, it is impossible to apply these tests to the adoption of the Gold Standard itself (see footnote 8). Finally, we detect no major breaks in the 1880s when we use yield to maturity data (described in Figure 1-A) instead of the ratio interest payments to price.

#### **IV.3 Did institutions lower the cost of foreign debt? - a long-run analysis**

We now proceed and test the long-run relation between the interest rate differential, the growth trend of the Japanese economy, and the composition of the Japanese debt (foreign and domestic). Figure 5 plots the interest differential between Japanese and British bonds, the growth differential between the two countries, and the foreign debt ratio, defined as the ratio of foreign to domestic debt.<sup>14</sup> The data show a decline in the interest rate differential between Japan and Britain which coincides with a decline in Japanese growth rates, at the conclusion of the first “long swing” of investment and capital accumulation (Ohkawa and Rosovsky, 1973). We interpret the decline in the interest differential as a decline in the perceived risk associated with Japan, probably as a result of the successful conclusion of twenty-some years of modernization. Figure 5 also shows the impact of the

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<sup>14</sup> The series were smoothed using the Hodrick-Prescott filter to highlight the long-run trends in the data. Data on Japanese growth rates are available only starting in 1885.

war with Russia, which was followed by further decline in interest rates, large capital inflows, and a new “swing” of growth in the Japanese economy.

More importantly, Figure 5 shows that, for the most part, there is an inverse relation between the fraction of Japanese debt that is foreign and the Japanese-British interest rate differential. This suggests the existence of “optimizing behavior” on behalf of the Japanese government: when interest rates in London declined, the Japanese government borrowed more abroad and less domestically.<sup>15</sup>

We test the validity of these relations more formally through a number of co-integration tests using annual data. The results, reported in Table 4, show that, indeed, there is a positive relation between the Japanese-British interest rate differential and growth rate differential: At the early stages of Japan’s industrialization, the rate of growth was high, and so was the risk premium. Later on, after the initial phase of its modernization, Japan was characterized by lower growth and lower risk. Table 4 also documents a positive relation between interest rates and government deficit, as well as between interest rates and the fraction of Japan-related articles in the London Times dealing with political instability and wars. In addition, there is a negative relation between interest rates and “positive” reports on Japan, namely the fraction of Times articles dealing with institutional reforms, economic transformation and (friendly) contacts with other countries (not shown). These results that are very much in line with the literature on modern country risk (Edwards, 1986). Table 4 also suggests the existence of an inverse relation between the foreign debt ratio and the interest rate differential, that is, the Japanese government turned to foreign capital markets when the “price was right”. Finally, we find that the Gold Standard affected the interest rate differential, whereas the war with Russia affected both the interest rate and

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<sup>15</sup> In addition to high interest rates, another possible reason for the Japanese government’s reluctance to issue debt abroad could be the weakness of the yen relative to foreign currencies in the 1880s despite the reforms (Okazaki, 1997).

the growth rate of the Japanese economy.<sup>16</sup> Our conclusion is that it seems possible to describe the long-run “price” and volume of Japanese foreign debt without reference to any particular institution or reform. This does not mean that “institutions do not matter”; indeed, Ohkawa and Rosovsky (1973) have argued persuasively that various institutions in Japan played an important role in facilitating the absorption of foreign technology, and may have therefore played an extremely important role in the modernization of Japan. It also does not imply that there was no cumulative effect of reform measures on yields. Our reading of the results is that, with the exception of the Gold Standard, no single institutional reform was important for the determination of the cost of foreign capital.

Figures 6a and 6b present a more detailed view of the development of foreign and domestic borrowing. The figures echo the findings of Figure 5 and the co-integration analysis of Table 4: foreign and domestic borrowing seem to have been substitutes in the eyes of the Japanese government. During the period of institutional reform, the Japanese government preferred to borrow at home and to liquidate much of its foreign debt. After the adoption of the Gold Standard, the picture is reversed — the government borrowed abroad and retired domestic debt. Prior to the adoption of the Gold Standard, the government financed the successful war with China from domestic sources. Following the adoption of the Gold Standard (and after the initial success in the war with Russia), the Japanese government was able to increase the volume of its foreign debt, and retire the domestic debt it assumed in preparation for the war. This analysis of “quantities” - the volume of debt - complements the previous analysis of “prices” (yields). It is apparent that institutional reforms were not appreciated by foreign lenders, and therefore did not reduce the cost of capital in Japan. Again, the two events that did contribute substantially to the reduction of the cost of capital were the adoption of the Gold Standard and the victory in the war with Russia.

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<sup>16</sup> Using Vector Error Correction procedures, we find that the Gold Standard is statistically correlated with the residuals from the regression of interest rates on growth rates, and the war with Russia is correlated with the residuals of both the interest rates - growth rates regression and the foreign debt ratio - interest rate regression.

## V. Concluding remarks

One plausible channel through which institutions may affect growth is through the cost of capital. Modern institutions which provide adequate protection for investors lower risk premia, and therefore contribute to economic growth through a lower cost of capital. In addition, a modern state structure can lower a country's risk premium abroad, make it more attractive to foreign investors, and reduce the cost of foreign debt. Our analysis, which has focused on the cost of foreign capital, suggests that most institutions established in Japan during the Meiji period had little immediate impact on the cost of Japanese foreign debt. With the exception of the Gold Standard, none of the major institutions established during the Meiji period, including the Meiji Constitution, had any discernible effect on Japanese bond yields in London, or on the volume of foreign debt raised. Although there is a pronounced decline in yields over the forty year period we examine, it is not clear if this decline reflects a cumulative effect of institutional change on the risk premium, or a direct effect of industrialization and modernization. The major events that did elicit a response from the London bond market were the adoption of the Gold Standard and the war with Russia. Both events indicate that credible signals of government "quality", at least as far as foreign capital markets are concerned, are not to be found in the adoption of institutions that establish the rule of law at home, but rather in actions which are well understood abroad, are monitored by international observers, and clearly indicate that a foreign government is likely to survive and be able to repay its debt. We conclude that institutions may well be important for modernization and growth, but the "transmission mechanism" does not seem to go through lower cost of foreign capital. Naturally, this does not preclude the possibility that institutional reforms may affect domestic capital markets.

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**Table 1 - Japanese bond issues in London**  
 Source: Suzuki (1994)

| Year | Issue (pounds) | Interest Rate | Maturity (years) | Use of Proceeds     |
|------|----------------|---------------|------------------|---------------------|
| 1870 | 1,000,000      | 9%            | 13               | railways            |
| 1873 | 2,400,000      | 7%            | 25               | misc.               |
| 1897 | 4,390,000      | 5%            | 53               | military            |
| 1899 | 10,000,000     | 4%            | 55               | railways, telephone |
| 1902 | 5,104,000      | 5%            | 55               | military, telephone |
| 1904 | 22,000,000*    | 6%            | 7                | military            |
| 1905 | 60,000,000*    | 4.5%          | 25               | military            |
| 1905 | 25,000,000     | 4%            | 25               | misc.               |
| 1907 | 23,000,000     | 5%            | 40               | misc.               |
| 1910 | 11,000,000     | 4%            | 60               | misc.               |

\* denotes total proceeds raised in two separate issues of similar terms.

**Table 2: Articles on Japan in the London Times**

The table displays a classification of Japan-related articles in the London Times between 1871 and 1899. The classification is based on our own reading of the articles. Articles which could not be classified into the four categories below (e.g. articles dealing with miscellaneous news on Japan, or with Japanese culture) are not included.

| <b>Year</b> | <b>Internal instability and wars</b> | <b>Commerce and economics</b> | <b>Foreign relations</b> | <b>Institutions and reforms</b> |
|-------------|--------------------------------------|-------------------------------|--------------------------|---------------------------------|
| 1871        | 3                                    | 5                             | 2                        | 1                               |
| 1872        | 4                                    | 14                            | 4                        | 1                               |
| 1873        | 5                                    | 8                             | 6                        | 3                               |
| 1874        | 20                                   | 11                            | 3                        | 0                               |
| 1875        | 1                                    | 6                             | 6                        | 3                               |
| 1876        | 0                                    | 4                             | 13                       | 0                               |
| 1877        | 23                                   | 3                             | 2                        | 0                               |
| 1878        | 6                                    | 16                            | 6                        | 1                               |
| 1879        | 4                                    | 14                            | 2                        | 5                               |
| 1880        | 4                                    | 10                            | 6                        | 5                               |
| 1881        | 1                                    | 3                             | 5                        | 0                               |
| 1882        | 3                                    | 5                             | 4                        | 0                               |
| 1883        | 0                                    | 4                             | 3                        | 0                               |
| 1884        | 0                                    | 2                             | 3                        | 0                               |
| 1885        | 0                                    | 2                             | 3                        | 2                               |
| 1886        | 0                                    | 1                             | 5                        | 3                               |
| 1887        | 2                                    | 2                             | 9                        | 3                               |
| 1888        | 3                                    | 9                             | 3                        | 3                               |
| 1889        | 15                                   | 12                            | 10                       | 9                               |
| 1890        | 4                                    | 13                            | 10                       | 6                               |
| 1891        | 7                                    | 5                             | 3                        | 2                               |
| 1892        | 2                                    | 8                             | 3                        | 7                               |
| 1893        | 1                                    | 4                             | 1                        | 1                               |
| 1894        | 19                                   | 5                             | 3                        | 2                               |
| 1895        | 18                                   | 9                             | 12                       | 0                               |
| 1896        | 3                                    | 8                             | 1                        | 0                               |
| 1897        | 1                                    | 10                            | 11                       | 1                               |
| 1898        | 1                                    | 4                             | 7                        | 0                               |
| 1899        | 0                                    | 5                             | 6                        | 1                               |

**Table 3 - Tests for structural breaks around major historical events**

Using an eighteen month “window” around each event, we regress (the natural logarithm of) the risk premium, that is, the difference between Japanese bond yields and the yield on British Consols, on (a constant), the logarithm of the risk premium lagged one year, increments in the risk premium lagged one and two years, a trend (if significant), and two dummy variables for each event. The first dummy variable (“long”) takes the value zero until the event, and the value one starting in the month in which the event took place and in every month thereafter, through the end of the “window”. The second dummy variable (“pulse”), takes the value one in the month of the event, and zero in all other months. If an event had a long-term impact on Japanese bond yields, we would expect the “long” dummy variable to be different from zero, unless the series is unit root during the “window”, in which case the “pulse” dummy will reflect persistent (long-term) changes. In all other cases, a significant “pulse” dummy implies that an event created a short-term “blip”. Yields are calculated as the ratio of interest payment to market price. For the wars with China and with Russia, the “long” dummy variable takes the value one starting in the month in which the war ended, and the “pulse” dummy variable equals one when in the month in which the war broke. We report the coefficient of the event dummy variables, both long-term and temporary, if their impact is statistically significant. Coefficients should be interpreted as percent change in existing yields. \* denotes a statistic significant at the five percent level; \*\* denotes a statistic significant at the ten percent level.

| Date       | Event   | Long-term break? | Short-term “blip”? |
|------------|---|------------------|--------------------|
| June 1873  | Agrarian reform                                 | -0.35*           | None               |
| Dec. 1877  | Suppression of the Satsuma Rebellion            | None             | None               |
| Nov. 1880  | Privatization of government plants              | None             | None               |
| Oct. 1882  | Establishment of the Bank of Japan              | None             | None               |
| June 1885  | Introduction of convertible to silver yen notes | -0.05*           | None               |
| Feb. 1889  | The Meiji Constitution                          | None             | None               |
| July 1890  | First Parliamentary elections                   | None             | None               |
| July 1894  | Outbreak of the Sino-Japanese war               | None             | +0.10*             |
| April 1895 | End of the Sino-Japanese war                    | None             | None               |
| June 1897  | Adoption of the Gold Standard <sup>17</sup>     | -0.50            | Not available      |
| June 1902  | Anglo-Japanese treaty                           | -0.07*           | None               |
| Feb. 1904  | Declaration of war on Russia <sup>18</sup>      | None             | +0.17*             |
| Jan. 1905  | Russian surrender in Lushon                     | -0.09*           | None               |
| Aug. 1910  | Annexation of Korea                             | None             | None               |
| July 1912  | Death of Emperor Meiji                          | None             | None               |

<sup>17</sup> Because the entire stock of outstanding bonds was redeemed, it is impossible to apply the test to this event. The estimated impact is based on the issue of new 5 percent bonds instead of the outstanding 7 percent debt.

<sup>18</sup> The “window” around the war with Russia is two years long.

**Table 4 - Long-run co-integration results, 1871-1913****The risk premium and the volume of Japanese foreign debt, annual data**

The risk premium is defined as the annual average of the difference between Japanese bond yields and the yield on British Consols. The ratio of foreign debt to government revenue, the government deficit, and the growth rate (available only starting in 1885) are adapted from the Bank of Japan's Hundred Year Statistics of the Japanese Economy. Newspaper Times articles are drawn from the London Times and defined as the percentage of articles dealing with political instability and wars out of the total number of Japan-related articles published in the same year. All regressions include one lag. Standard errors are reported in parentheses.

| Variable                          | (1)                  | (2)                  | (3)  |
|-----------------------------------|----------------------|----------------------|--|
|                                   |                      | <b>Risk Premium</b>  | <b>Foreign debt/<br/>Government<br/>revenues</b> |
|                                   | (1885-1913)          | (1871-1889)          | (1871-1913)                                      |
| Constant                          | -0.02                | 0.03                 | 6852   |
| Growth rate                       | 0.82<br>(0.26)       |                      |  |
| Government deficit                | 0.00002<br>(0.00001) | 0.00008<br>(0.00004) |  |
| Newspaper articles on instability |                      | 0.46<br>(0.01)       |  |
| Interest rate differential        |                      |                      | -189879<br>(125444)                              |
| N                                 | 26                   | 28                   | 42   |
| Likelihood ratio                  | 36.15                | 42.99                | 32.74  |
| 1% critical value                 | 35.65                | 41.07                | 24.60  |

Figure 1

**Interest rate differential 1870-1914:**  
Japanese government bonds vs British Consols

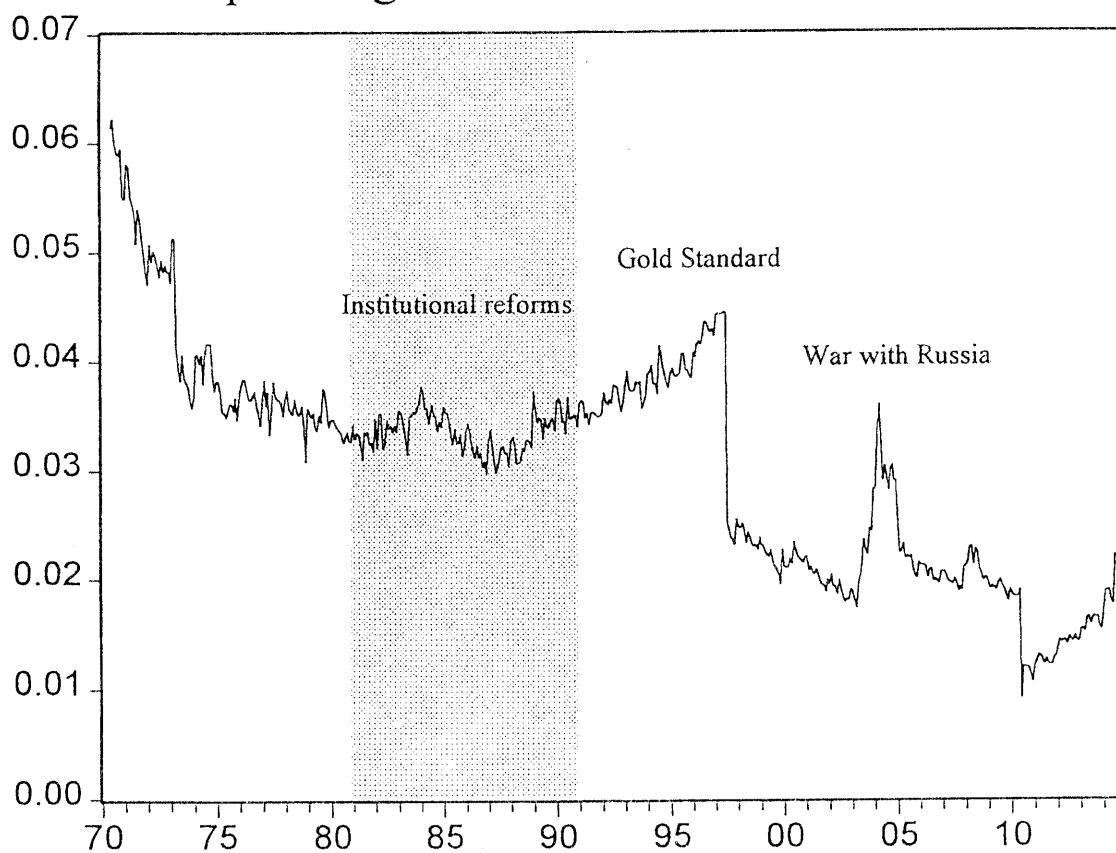
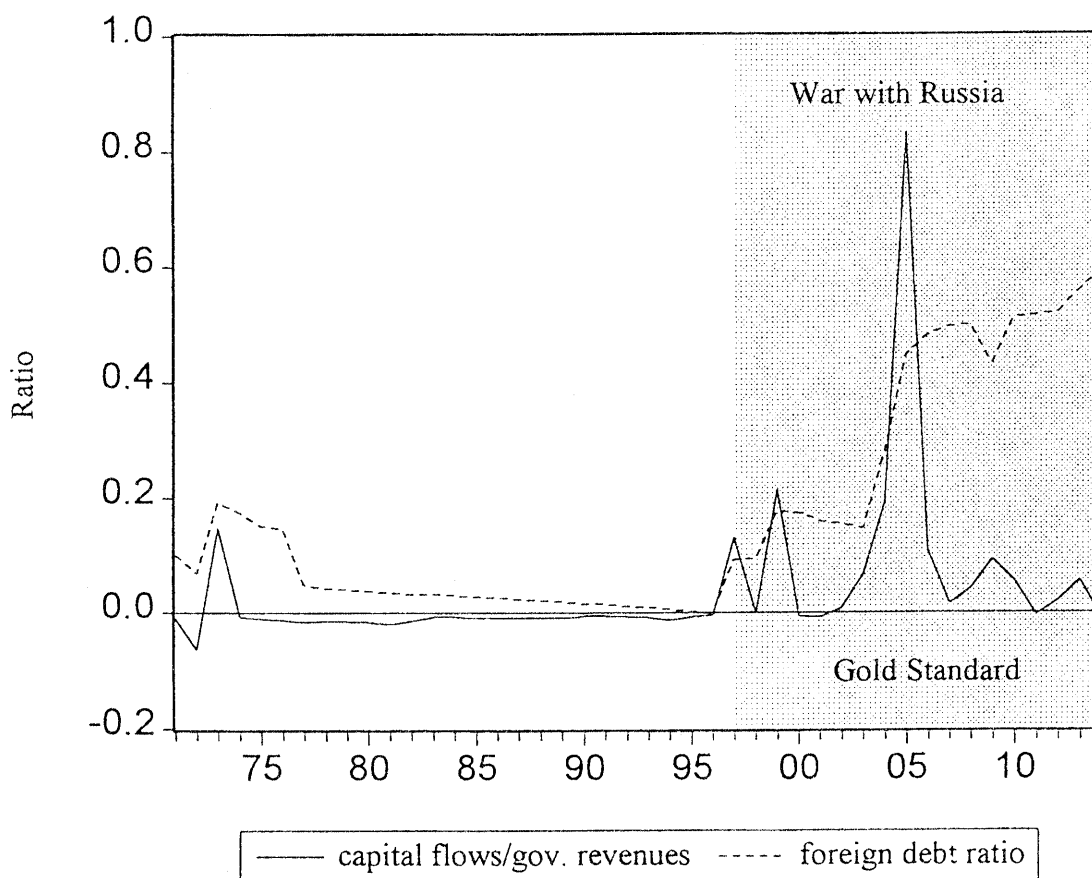


Figure 2  
Japanese Foreign Borrowing: 1870-1914



### **Tests for structural breaks around the wars with China and Russia - Figures 3-4**

Using a “window” around each event, we regress (the natural logarithm of) the risk premium, that is, the difference between Japanese bond yields and the yield on British Consols, on (a constant), the logarithm of the risk premium lagged one year, increments in the risk premium lagged one and two years, and two dummy variables for each event. Yields are calculated as the ratio of interest payments to market price. In the war “windows”, the “long” dummy variable takes the value one starting in the month in which the war ended, and the “pulse” dummy variable equals one in the month in which the war broke. The “window” around the war with China includes also a (marginally significant) time trend. The “window” around the war with Russia is two years (rather than eighteen months) long, because of the length of the war. The figures display the actual risk premium, the fitted regression line, and the residual.

Figure 3: Japan - China War, 1894 - 1895

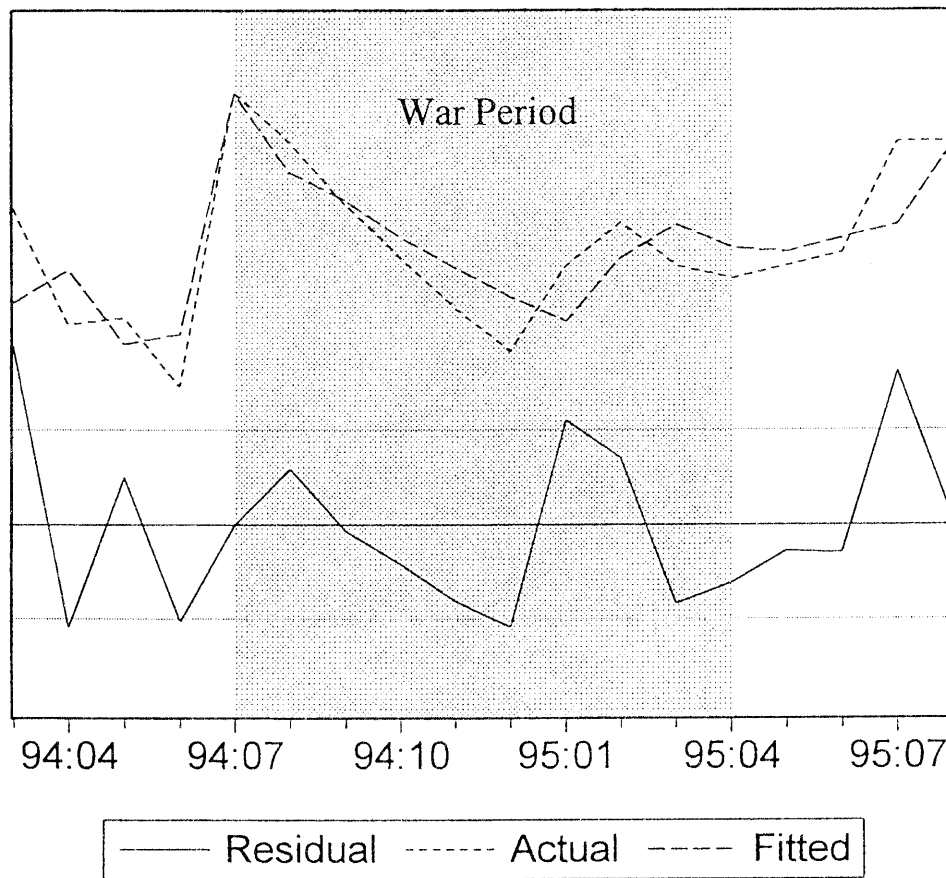




Figure 4: Japan - Russia War, 1904-1905

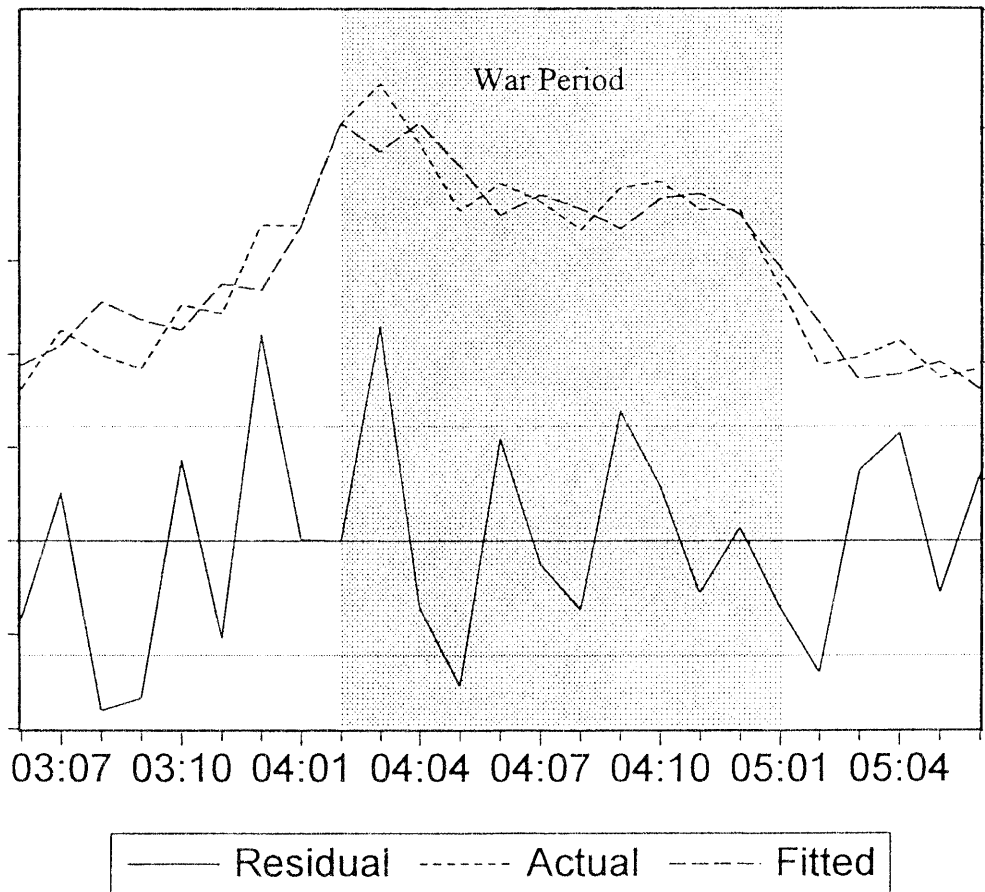


Figure 5  
Trends in the Japanese risk  
premium, growth rate and foreign debt

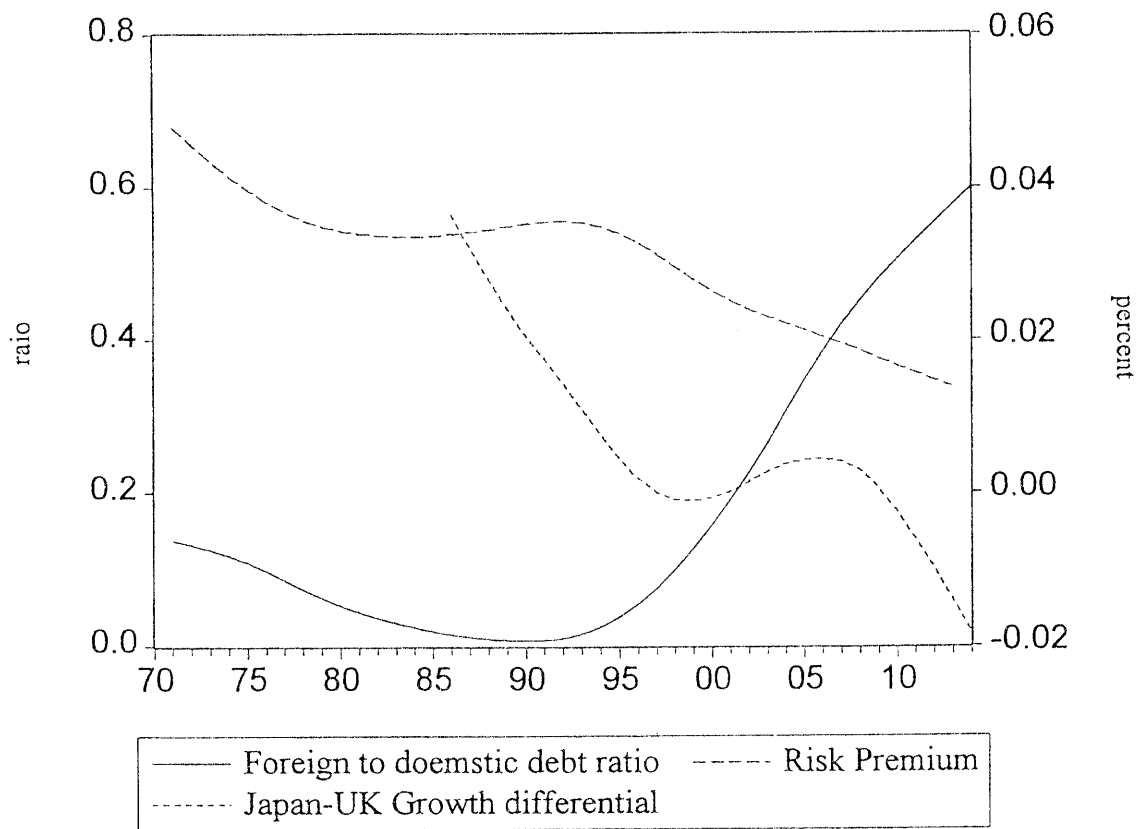


Figure 6a  
 Domestic vs. Foreign Borrowing  
 Institutional Reform Period

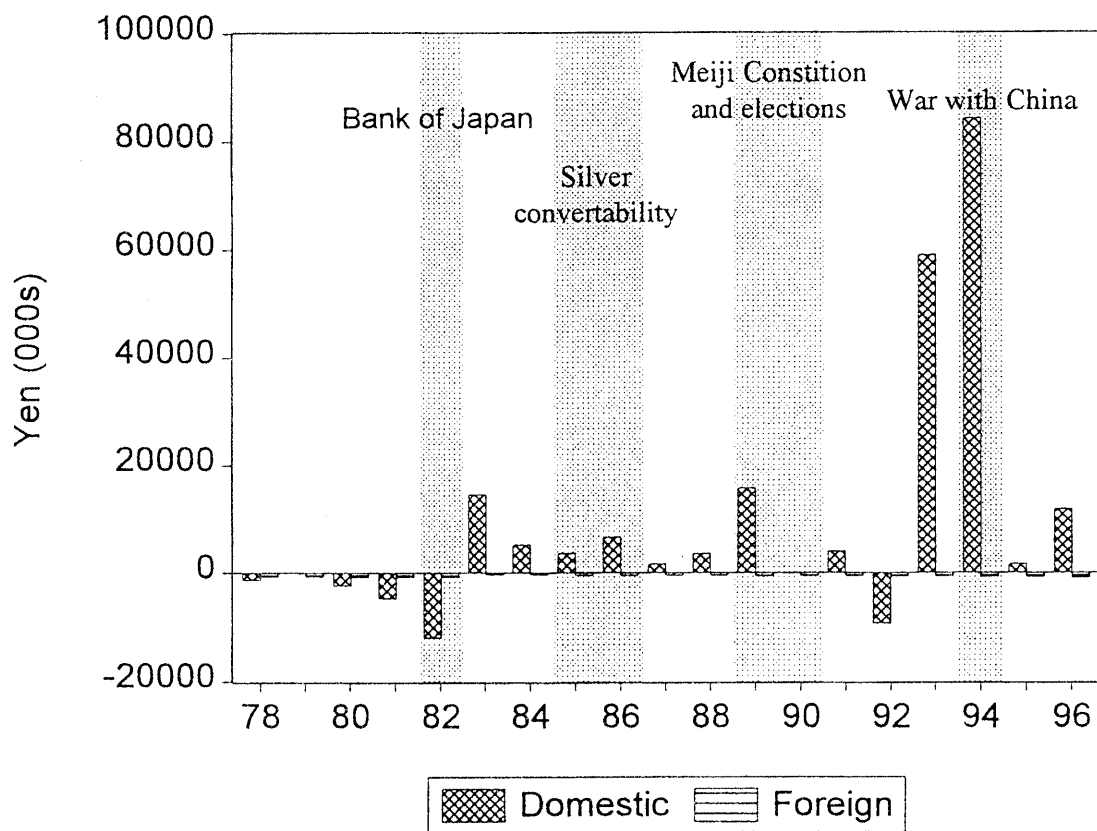
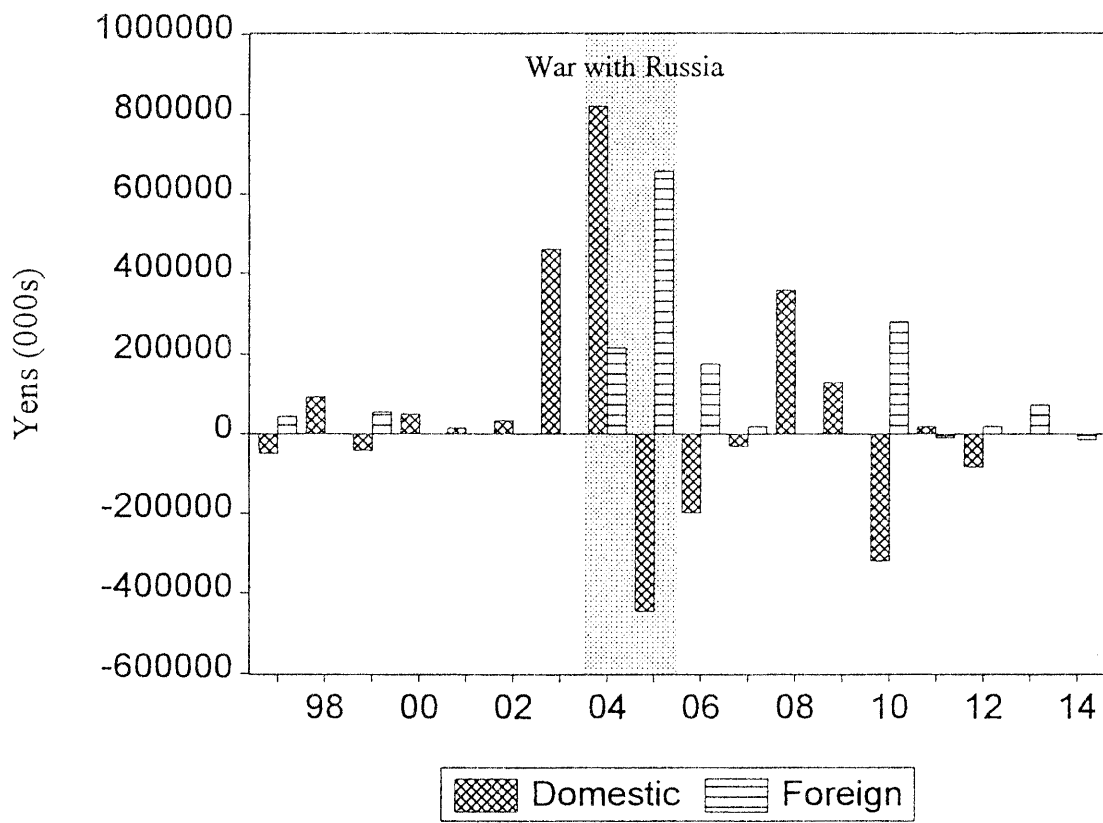


Figure 6b  
Domestic vs. Foreign Borrowing  
Gold Standard Period



Appendix Figure 1-A  
**Interest rate differential 1870-1914:**  
Japanese government bonds vs British Consols

