Bond Market and War: Evidence from China 1921-42[1]

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Abstract

During the republic period (1912-1949), China suffered from numerous internal conflicts and colonial wars. Historians have not yet reached an agreement on the importance of the various conflicts due to their subjective understandings. An objective way is to look at the people's perception of a specific conflict's impact on the economic situation at that moment. We study the impacts of conflicts by examining the bond markets since the people's confidence on the survivability of the shaky governments could be reflected by the fluctuations of government bond prices. We collect a novel dataset on the prices of Chinese bonds listed in domestic and foreign markets. We first identify the breaks in bond prices, and their corresponding timings and magnitudes. We then match the breaks with the historical events to identify the turning points in the Chinese civil conflicts and the Second Sino-Japanese War (1937-1945). Our results suggest that the reactions of domestic and foreign investors depend on the potential damage of the collaterals by the conflicts. Furthermore, we show that the Sino-Japanese conflicts have stronger long-term impacts than the civil wars on bond prices, but the short-term effects are similar. Finally, our turning points from the data match closely with those identified by historians, except the Battle of Yunnan-Burma Road.

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1. Introduction

Wars have adverse effect on the human welfare, including human life and economic resources. Wars also affect the risk perception of investors and hence alter real economic outcomes. During wartime, government increases expenditures which put pressure on the payments of interest and principal for government bond. The potential change in government regime increases the default risk of sovereign debt. Firms also face higher risk and lower profitability. Consequently, the political uncertainty raises the cost of funding.

China is a unique environment to understand the impacts of conflict on financial market because the variety of conflicts in China was more diverse than those in European countries and the U.S. Exploiting this feature of history, we analyze the default risk of Chinese government and corporate bonds listed in domestic and foreign markets over the period with domestic and international conflicts. Our empirical analysis is based on a novel dataset of bond prices of 13 domestic and 12 foreign bonds for 1921-42 during the Republic of China. Utilizing this dataset, we estimate the timings and magnitudes of structural changes in bond prices to measure the changes in default risk on the Chinese bonds listed in domestic and foreign markets. We identify the turning points by matching the structural changes with historical events. Then, we compare those events identified from the data to those proposed by historian.

Our results suggest that wars have significant impacts on bond prices. We find that the Northern Expedition led by the Nationalists during 1926-28 was a significant local event. Among the international conflicts, the Mukden Incident in September 1931, the Marco Polo Bridge Incident in July 1937 and the Battle of Yunnan-Burma in March 1942 were the turning points perceived by domestic and foreign investors. The domestic investors react stronger than the foreign market at the outbreak of the Second

Sino-Japanese War, but the foreign investors lost their confidences on the Nanjing government after Chinese lost Swatow and Canton. We suggest that the collateral of foreign bonds is more secured than that of domestic bonds, which delays the reactions of foreign investors. Strikingly, the investors of railroad bonds react to the outbreak of war even stronger than the domestic investors. It reflects the war imposes severe damages on the local and railroad revenues which serve as the collateral of railroad bonds. Furthermore, we show that the Sino-Japanese conflicts have stronger long term impacts than the civil wars on bond prices, but the short term effects are similar. Finally, our turning points obtained from the empirical results match closely with those identified by historian, except the Battle of Yunnan-Burma Road. Although historians have diverse opinions on its significance, our results suggest that the domestic investors perceived that it is as important as the Marco Polo Bridge Incident.

Our paper contributes to the literatures on identifying the turning points of conflicts through capital markets. In addition to compare the perspectives of domestic and foreign investors on significant events, we provide new insights on the reactions of investors on government and corporate bonds and compare the impacts of domestic and international conflicts on bond investors. The existing literatures focus on two historical events, namely the U.S. Civil War and World War II. Willard et al. (1996) study the currency price fluctuation of Greenback issued by the Union during the U.S. Civil War. They show that the structural breaks in the currency price are connected to the political and war events between the Union and the Confederacy. Weidenmier (2002) examines the currency price of Grayback issued by the Confederacy to compare the winning odds on the civil war perceived by the investors across those two regions. He shows that Greenback and Grayback investors shared the view that Antietam and Gettysburg were two turning points in the civil war, but they have different opinions on other turning points and the

importance of each event. Furthermore, Brown and Burdekin (2000) and Weidenmier and Oosterlinck (2007) employ the bonds issued by the Confederacy that were traded in Britain and Netherland to identify the important events, respectively. They suggest that the reactions of foreign investors were different from those of domestic investors.

Researchers also look into the changes in financial market during the World War II. Frey and Kucher (2000) examine the domestic and foreign bond prices (France, Germany, Austria, Belgium and Switzerland) in the Zurich stock exchange. Brown and Burdekin (2002) look into the German bonds traded in London, and Frey and Waldenstrom (2004) investigate the Belgian and German bonds listed in Switzerland and Sweden. Investors across countries thought that the outbreak of the World War II was a turning point, but they disagree on other turning points. Furthermore, Oosterlinck (2003) studies the price differential between pre-war French bond and Vichy bond and illustrates that investors react to the outcomes of the World War II. Frey and Waldenstrom (2008) investigate the Nordic (Denmark, Finland, Norway and Sweden) bonds listed at home and in Stockholm, and show that domestic and foreign investors act consistently in timing but foreign investors react stronger than domestic investors.

2. Model

In this section, we outline a model of bond price which allows us to understand what we can learn from bond prices about the wars. Using asset prices to identify the turning points in the past provide a new perspective to understand history. This approach is pioneered by Willlard et al. (1996) to determine the turning points of the U.S. Civil War and then applied to investigate the important events in the World War II (Frey and Kucher, 2000), Israeli-Palestinian conflict (Zussman et al. 2008) and Iraq War (Rigobon and Sack 2005). In contrast to assign significant events in ex-post, asset price reflects the perception

of investors at that time. However, investors are only interested in events affecting financial payoffs. Their views may not represent those of the whole population.

Consider a bond with maturity for T periods, which pays coupon payment c_t in each period and principal C_0 in the last period. However, there is uncertainty whether the government will pay the coupon payments and the principal. We let the payment probability be p_t for coupon payments and p_0 for the principal. In other words, 1-p_t and 1-p_0 are the default probabilities for coupon payments and the principal, respectively. Suppose investors have subjective discount rate, β, the discounted cash flow model suggests that the bond price (*BPrice*) is given by

$$BPrice_t = \Sigma_{t=1,..,T} \beta^t p_t c_t + \beta^T p_0 c_0$$

Since the coupon payments and the principal are often pre-determined, the changes in bond price are subject to changes in interest rate and payment probability. Assume ex-ante payment probabilities are fixed over time, i.e. $p_t = p_0 = p$.[4] We derive the payment probability as follows

$$Pr(Payment) \equiv p = BPrice_t / (\Sigma_{t=1,..,T} \beta^t c_t + \beta^T c_0)$$

The expression suggests that the payment probability relates to bond price and interest rate. If interest rate does not change abruptly, a dramatic change in bond price indicates there is

[4] Weidenmier and Oosterlinck (2007) use a discounted cash flow model to estimate the default probability. Their method requires the knowledge on the timing of each coupon payment and the principal. In our case, we do not estimate the default probability directly because the government did not always have enough revenue to pay the coupons and principal according to the payment schedules of Chinese bonds were uncertain because the government did not have enough revenue to pay off the debt.

a sharp change in default probability perceived by bond investors. In particular, this perception of risk varies across investors. The price of foreign bonds informs the default probability perceived by foreign investors, whereas the price of domestic bond relates to the default probability perceived by domestic investors.

Since the governments in the Republic of China are often threatened by domestic rivals, debt might not be honored by the new government if political power changed hand. We argue the payment probability characterizes the survival probability for the incumbent government. In the period of civil war, the survival probability means the chance of survival for the Beijing government from the challenge of the Nationalists because the government bonds were issued or guaranteed by the Beijing government. During the Second Sino-Japanese War, the survival probability suggests whether the Nanjing government can survive from the conflicts with the Japanese forces.

3. History of Bond Market in China

The first domestic bond issued in China was in 1894 during the Qing Dynasty. The funding was used to support military expenditure for the First Sino-Japanese War during 1894-5. Then, the Qing Dynasty issued another domestic bond in 1898 to pay the indemnity of the Treaty of Shimonoseki (April 17, 1895) for the First Sino-Japanese War. According to Qian (1983), the domestic bond in 1898 raised 20 million taels which were only 10% of the indemnity. The Qing Dynasty repaid the remaining portion with foreign debts, including Franco-Russian Government Loan, Anglo-German Government Loan 1896 and 1898 (Denby 1916; Jin 2000). Foreign loans were also used for paying other indemnities (Boxer Indemnity 1901) and redeeming railroads (Anglo-French Government Loan 1908). Furthermore, there were many issues of railroad bonds during the first decade of the twentieth century, such as Shanghai-Nanjing railroad in 1903, Canton-Kowloon

railroad in 1907, Tianjin-Pukow railroad in 1908, Hukuang railroad in 1911 and Lunghai in railroad in 1913.

Since the establishment of the Republic of China in 1912, the Beijing government relied on foreign debts to finance its expenditures. Notable examples are the Loan from Messrs. C. Birch Crisp and Co. in 1912 and the Reorganisation Loan in 1913. However, the funding opportunity abroad became weaker after the onset of the World War I in 1914. Then, the government switched its sources of funding from foreign markets to domestic market. As a result, there were many issues of domestic bond since 1914. At the end of 1926, Pan (2007) documents that there were 26 outstanding domestic bonds worth 837 million Yuans and 750 outstanding foreign debts worth 1.6 billion Yuans.

Table 1: Distribution of the Domestic Bond Funding, 1931 & 1937

	Year 1931			Year 1937		
	#Bonds	Total amount	%	#Bonds	Total amount	%
Military & Gov't Expenditure	5	200	19	6	220	9
Recovery	9	443	42	15	917	38
Financial Industry	3	148	14	3	95	4
Relief	4	175	17	6	525	22
Production & Infrastructure	8	84	8	19	642	27
Total	29	1040	100	49	2399	100

Sources: Jin & Wang (1991; Research on China Social & Economic History); Li (2004; Hexi College Xuebao). Both cite a table in Qian (1984)

In 1927, the Nationalists unified China and established the capital at Nanjing (We call it Nanjing government). The Nanjing government promised to pay the debt incurred by the

Beijing government. Similar to its ancestor, the government did not have enough revenue to support the fiscal expenditures. In order to solve the financial problems, the government raised 29 types of bonds during 1927-31, which worth 1,040 million Yuans (Jin and Wang 1991). Table 1 indicates that the bond funding was mainly used to support the recovery activities due to the civil wars. Other major areas of spending include military and government expenditures, consolidation of the financial industry and relief. However, the government revenue became weaker after the Japanese acquired Manchuria in 1931-32. The loss of Manchuria reduced the custom revenue for Nanjing government. The Bond Consolidation in 1932 increased the maturity and reduced the interest rate of the outstanding bonds in order to alleviate the fiscal burden. Nonetheless, the government resumed to issue bond in 1933. At the end of 1936, there were 49 bonds outstanding, worth 2,399 million Yuans (Li, 2004). The massive amount of outstanding bond payment triggered another bond consolidation in 1936 in order to restructure the interest rate and the maturity of the outstanding bonds. The bonds were consolidated into 5 series, called Series A, B… and E, as shown in Table 2. The government reduced the outstanding amount of the bonds to 1,460 million Yuans.

Table 2: Consolidated Bonds, 1936

	#Bonds	Total amount	p.a.%	Maturity
Series A	6	150	6	12
Series B	5	150	6	15
Series C	9	350	6	18
Series D	8	550	6	21
Series E	5	260	6	24
Total	33	1460		

Sources: Pan (2003; Journal of Guizhou Normal University, Social Science)

Table 3 puts the situation of China into a comparative perspective; it reports that the loan amortization is more than 20% of the government expenditure which was more than 1.5 times and 3 times the percentage in Japan and other western countries, respectively. It suggests that the bond financing was important for the Chinese government. The high debt services create a close link between the bond markets and the conflicts because the war events have substantial impact on the fiscal position. Furthermore, the frequent warfare became a burden for the Chinese government to raising fund to deliver public goods for economic development.

Table 3: Government debt across countries in 1931

	Italy	Germany	UK	USA	Japan	China
Domestic Debt per capita	115.8	31.7	641.4	134.8	35.1	0.7
Domestic Debt / GDP	83%	14%	149%	22%	45%	3%
Loan Amortization/Gov't Expenditure	4%	9%	4%	8%	14%	23%

Source: Domestic debt, exchange rate, loan amortization and government expenditure are from the Statistical Tables of the Leagues of National 1933-4; Population is from Maddison (2008); GDP of Italy, Germany, UK, USA are from Jones and Obstfled (2001); GDP per capita of Japan and China are from Fukao et al. (2007). Note: Domestic Debt per capita is in 1931 US dollar; GDP per capita of Japan and China are for the year 1934-36; Loan Amortization/Government (Gov't) Expenditure is for the fiscal year 1931-2.

Overall, the bond market in China was less-developed than those in developed countries during the early twentieth century. Table 3 shows that the domestics bond holding per capita and the domestics bond holding to GDP ratio of China were much lower than those of developed countries. Goetzmann et al. (2007) indicate that local events and conflicts may frustrate the integration of China into the global markets. We suggest that the Chinese experience provides a lesson that the political uncertainty discourages the development of domestic bond market and the investment from foreign investors.

4. Data

The sources of our data are Banker's Magazine (BM: *Yin Hang Yue Kan*) and Bankers' Weekly (BW: *Yin Hang Zhou Bao*). The BW started in May 1917 and ended in March 1950. The magazine was published by the Shanghai Banking Association in a weekly basis. The BM published by the Beijing Banking Association. The magazine was published in a monthly basis between January 1921 and December 1928.

Table 4: Trading Volume of Shanghai Stock Exchanges, 1926-37

Year	Trading Volume	Year	Trading Volume
1926	450738	1932	901710
1927	238169	1933	n/a
1928	370487	1934	3182685
1929	1320555	1935	4773410
1930	2341820	1936	4909980
1931	3362540	1937	2407961

Unit: 1,000 Yuan; Note: Trading volume comes from that of the Shanghai Chinese Merchants Stock Exchange. Figures after 1934 include trading in the Shanghai Commodity Exchange. Figure in 1937 represent trading from January to August; Source: Table 2 in Zhu (2006, Journal of Fudan University-Social Science)

We collect the price data of 13 government bonds traded in domestic markets. Domestic bonds were mainly traded in the Beijing Stock Exchange and the Shanghai Stock Exchange. As shown in Table 4, since the Nanjing government came into power, the trading volume of the Shanghai Stock Exchange increased rapidly. The increasing trading volume assures that the bond markets were well-functioned and the bond prices reflected investor expectation on the default risks. For the bonds traded in foreign market, we look into 5 government bonds and 7 railroad bonds quoted in London Exchange. Our data is different form Goetzmann et al. (2007), in which they examine a composite yield of Chinese government bonds in the London Exchange published in the Investors Monthly

Manual, a monthly publication of The Economist.

Table 5: Sample for Beijing Bonds

Bond	Start/End	Observation	Frequency	Sources
6 Percent	1921/7-1934/11	161	Monthly Max/Min	BM+BW
7th Year	1921/2-1931/10	129	Monthly Max/Min	BM+BW
Financial	1921/3-1928/11	93	Monthly Max/Min	BM
7 Percent	1921/7-1928/12	90	Monthly Max/Min	BM
96 Bond	1922/7-1929/8	86	Monthly Max/Min	BM+BW

Note: The monthly data start from 1921/7 to 1924/8, then we compute the monthly maximum and minimum using the daily data (1553 observations) from the BM for the period 1924/9/29-1928/12/28. The 6 Percent, 7th Year and 96 Bond for the period 1928-34 are extended by the weekly data (not reported every week) in the BW.

Table 6: Sample for Consolidated Bonds

Bond	Start/End	Observation	Frequency	Sources
CB-A	1936/3-1942/12 (excl. 1937/9-12)	78	Monthly Max/Min	BW
CB-B	1936/3-1942/12 (excl. 1937/9-12)	78	Monthly Max/Min	BW
CB-C	1936/4-1942/12 (excl. 1937/9-12)	77	Monthly Max/Min	BW
CB-D	1936/4-1942/12 (excl. 1937/9-12)	77	Monthly Max/Min	BW
CB-E	1936/4-1942/12 (excl. 1937/9-12)	77	Monthly Max/Min	BW

Note: The monthly data start from 1936/3 to 1938/4, then we compute the monthly maximum and minimum using the daily data from 1938/5 to 1942/12. The daily data was not available for April 1942, thus the daily sample stop at the end of March 1942. The monthly data of April 1942 are obtained from a table of monthly bond price in May 1942.

For the period 1921-27, we collect data for 5 domestic bonds issued by the Beijing government (We call them Beijing bonds) from the BM. As reported in Table 5, we have the monthly data on the maximum and minimum prices for those 5 bonds with the

numbers of observation range from 86 to 161. After the Bond Consolidation in 1936, all domestic bonds were consolidated into 5 series. We collect data of those 5 series for the period 1936-42 from the BW. As shown in Table 6, we have the monthly maximum and minimum prices from March 1936 to December 1942 except for the months around the outbreak of the Second Sino-Japanese War between September and December 1937. Furthermore, we have 1425 observations of daily data of those five bonds from the BW which spans from 1938/5/2 to 1942/3/26. The daily data is used to detect the turning points between the Macro Polo Bridge Incident and the Battle of Yunnan-Burma Road.

From the BW, we collect the weekly data over the period 1931/2/16 to 1942/12/1 for 5 foreign bonds issued by the Chinese government. The sample of foreign bonds is reported in Table 7, which indicates that the samples of Reorganisation and Boxer bonds are longer than those of the other three bonds. We use the weekly data to analyze the perspective of foreign investors on several large shocks (e.g. the Marco Polo Bridge Incident), as well as their views on the development during the Second Sino-Japanese War. Furthermore, we collect the weekly data for 4 railroad bonds. Table 8 lists the sample of the railroad bonds, which is a weekly data covers the period 1931/2/16-1942/12/1. We utilize the railroad bonds to examine the reactions of foreign investors who hold corporate bonds with collaterals tie to the local government and railroad revenues.

Table 7: Sample for Foreign Bonds

Bond	Start/End	Observation	Frequency	Sources
Reorganisation Loan	1931/2/16-1941/12/1	546	Weekly	BW
Boxer Loan (Gold Bonds)	1931/2/16-1940/10/28	492	Weekly	BW
Anglo-German Sterling Loan	1932/12/4-1941/12/1	457	Weekly	BW
Anglo-French loan	1932/12/4-1941/12/1	457	Weekly	BW

5% Crisp Gold Loan	1932/12/4-1941/12/1	457	Weekly	BW

Note: The weekly data start from 1931/2 to 1937/8, and then we compute the weekly price by averaging the daily data (From the BW, there are 1546 observations cover the period 1937/9/12-1941/12/5, except 1160 observations for Boxer Loan over the period 1937/9/12-1940/11/14) over one week. Then, we smooth the weekly data by averaging over last 4 weeks to produce a continuous weekly series. The weekly data in the original dataset end in August 1937; we compute the weekly average for the daily data and extend the weekly data to December 1941.

Table 8: Sample for Railroad Bonds

Bond	Start/End	Observation	Frequency	Sources
Shanghai-Nanjing	1931/2/16-1941/12/1	546	Weekly	BW
Tientsin-Pukow	1932/12/4-1941/12/1	546	Weekly	BW
Hukuang	1932/12/4-1941/12/1	546	Weekly	BW
Lunghai	1932/12/4-1941/12/1	546	Weekly	BW

Note: The weekly data start from 1931/2 to 1937/8, and then we compute the weekly price by averaging the daily data (From the BW, there are 1559 observations cover the period 1937/8/30-1941/12/5) over one week. Then, we smooth the weekly data by averaging over last 4 weeks to produce a continuous weekly series. Similar to the foreign bonds, the weekly data of railroad bonds after August 1937 is extended using the daily data.

In addition to the aforementioned data, we employ additional data for comparing the reactions of domestic and foreign investors in face of domestic and international conflicts. First, we use the data of 3 bonds issued by the Nanjing government (We call them Nanjing bonds), which include the monthly maximum and minimum prices of Custom, Arrangement and Disbandment Bond from April 1930 to June 1933. Second, we utilize the weekly prices of 4 railroad bonds from Tianjin-Pukow (issued in 1910 instead of 1908), Daoqing (a railroad run within Henan province) and Canton-Kowloon railroads.

5. Empirical Model

In this section, we introduce the empirical models. We employ the multivariate model developed by Qu and Perron (2007) to analyze the monthly maximum and minimum bond prices. Then, we restrict the multivariate model to a univariate model to deals with the weekly and daily series.

Qu and Perron (2007) extends Bai and Perron (1998, 2003) model from a univariate setting to a multivariate model. They provide an algorithm based on quasi maximum likelihood procedure and a series of tests for determining the number of breaks in the data. This methodology is more suitable to our monthly dataset because the data sources report the monthly maximum and minimum prices for several bonds. It allows us to detect structural changes in a system of equations without prior knowledge on the locations of the breaks. Although the sample size of the monthly data is limited, this method exploits the information obtained from the maximum and minimum prices for identifying turning points.

In our context, the system of equations contains the monthly highest and lowest bond prices. The sample size is 2xT. To estimate the unknown intercepts and breakpoints, we specify the following model

$$Y_t = c_1 + u_t, \quad t = 1,..., T_1$$

$$Y_t = c_2 + u_t, \quad t = T_1+1,...,T_2$$

$$:$$

$$Y_t = c_{m+1} + u_t, \; t = T_m+1,...,T$$

The dependent variable $Y_t = [Y_{ht}, Y_{lt}]'$ is a vector of bond prices at time t. The first equation with subscript *h* is the monthly maximum bond price, whereas the second

equation with *l* is the monthly minimum bond price. The data series is separated by m breaks in which the intercept varies across m+1 segments. This model restricts these two equations experience shifts simultaneously, but the magnitudes of the shifts can be different. The estimated intercepts are $c_j = [c_{jh}, c_{jl}]'$ for j=1 . . . m+1. The vector of disturbance at time t is $u_t = [u_{ht}, u_{lt}]'$, which is allowed to be autocorrelated and heteroskedastic. In this model, there is a trimming parameter, k, which controls the minimum distance between two consecutive breaks relative to the sample size in an equation T. We set the trimming parameter to allow each segment has at least two years for the monthly data. For the weekly and daily series, we calibrate the trimming parameter to allow each segment lasting for one year for the weekly data and at least half years for the daily data. The maximum number of breaks allowed for all analysis is four.

To select the number of breaks, we follow the two-step procedure recommended by Qu and Perron (2007). First, we detect whether any structural change exists in the model. In particular, we evaluate the supF(m|0) to test the null hypothesis of no break (m=0) against the alternative that there is at least one break (m=k where k is unknown). If structural break is detected, we then determine the number of breaks by a sequential testing procedure on evaluating the SEQ(m+1|m) until the test statistic is no longer significant. For example, if SEQ(2|1) is significant, we infer that there are two breaks instead of one. If we find the test SEQ (3|2) is insignificant, then we conclude that there are only two breaks. Additionally, we decide there are two breaks if the there is no more space for inserting the third break given the trimming parameter, k.

As we argued before, the changes in bond prices capture the changes in default probability of the bonds. In the empirical analysis, we compute the changes and the percentage changes in bond prices across two consecutive segments, i.e. $[c_{hj}-c_{hj-1}, c_{lj}-c_{lj-1}]$

and $[(c_{hj}-c_{hj-1})/c_{hj-1}, (c_{lj}-c_{lj-1})/c_{lj-1}]$, to examine the changes in default probability. Our measure is close that used in Weidenmier and Frey (2008). They employ the univariate model of Bai and Perron (1998, 2003) to estimate the changes in bond yield, and hence to examine the changes in probability of war from the prices of domestic and foreign bonds. However, they do not investigate the differential effects between domestic and international conflicts, and those between government and corporate bonds.

6. Empirical Results

In this section, we report the estimated timings and magnitudes of the structural changes. We start with the results from the Beijing bonds during 1921-34, and then we discuss the results from the consolidated bonds during 1936-42. Finally, we report the results on the government and railroad bonds in the foreign market during 1931-41.

Beijing Bonds, 1921-34

In Table 9, we report the structural breaks for each Beijing bond during the period 1921-34. Appendix 1 plots the monthly maximum and minimum prices of those five bonds and their fitted values from the multivariate model. Looking into the timing of the structural breaks, the first two breaks locate at about January-February 1924 and November 1926-December 1927. The first breaks of the bond prices are positive shifts for 40-80% as a response to the Bond Consolidation 1921. In April 1921, the bill of Bond Consolidation was passed and enacted. It altered the maturity and face value of the outstanding domestic bonds. Furthermore, in July 1922, the government passed another bill to use the residual of custom revenue supporting the payment of several domestic bonds. After the bill was enacted in August 1923, the domestic investors became more confident in those bonds because the sources of funding for repayment were more secured. Consequently, there were positive shifts in bond prices in the early 1924 (Shanghai

Commercial and Saving Bank 1931; Bai 2000). On the other hand, the civil wars do not have long-term impacts on the bond prices. The first Zhili-Fengtian War in 1922 and the second Zhili-Fengtian War in August-October 1924 only had temporary negative impacts on bond prices.

Table 9: Structural Breaks of Beijing Bonds, 1921-34

Bond	Break	Year/Month	Bound	Jump in Max	Jump in Min	Events
6 Percent	1	1924/2	[-1,3]	31.6 (64%)	33.7 (77%)	Bond Consolidation 1921
	2	1926/12	[-5,5]	-10.5 (-13%)	-14.8 (-19%)	Northern Expedition
	3	1931/11	[-23,2]	-21.0 (-30%)	-19.8 (-30%)	Invasion of Manchuria
7th Year	1	1924/1	[-1,1]	28.6 (71%)	27.5 (73%)	Bond Consolidation 1921
	2	1927/12	[-2,4]	9.88 (14%)	12.8 (20%)	Northern Expedition
Financial	1	1924/2	[-1,2]	24.0 (36%)	26.8 (43%)	Bond Consolidation 1921
	2	1926/11	[-1,5]	-8.27 (-9.0%)	-12.6 (-14%)	Northern Expedition
7 Percent	1	1924/1	[-1,4]	30.7 (58%)	32.8 (69%)	Bond Consolidation 1921
	2	1926/12	[-2,2]	-14.5 (-17%)	-18.3 (-23%)	Northern Expedition
96 Bond	1	1925/6	[-1,2]	24.5 (88%)	19.4 (81%)	Idiosyncratic news
	2	1928/6	[-1,2]	-28.1 (54%)	-23.3 (-54%)	Idiosyncratic news

The second breaks correspond to the Northern Expedition, but those breaks are less precisely estimated than the first breaks. The negative shifts in bond prices are 10-20%. Although the Nanjing government honored the debt issued by the Beijing government, the investors were less optimistic about the repayment of those bonds than before. The higher default risk was due to the tough fiscal condition faced by the Nanjing government. The 7th Year bond was an exception because its payment was secured by custom revenue instead of the residual of that. During 1927-28, in addition to the war events, there was a

reappointment of the Inspector-General Maritime Custom due to the retirement of Francis A. Algen. Since the officer had strong influence on the use of custom revenue, it created an uncertainty on the payment of bond interest and principal. These political and war events exacerbated the drops in bond prices in 1927, but the investors regained their confidences (with a discount) in those bonds soon after the formation of the Nanjing government.

Since the sample of 6 Percent bond covers both eras of the Beijing and Nanjing governments, we utilize it to compare the impacts of civil wars and Sino-Japanese conflicts. The bond experienced a negative shift for 30% in November 1931 which was two months after the Japanese invasion in Manchuria at the Mukden Incident in September 1931. The loss of Manchuria to the Japanese at the end of 1931 reduced the government revenue from that area to the Nanjing government. Moreover, the drop of bond price was exacerbated by the military conflicts due to the Shanghai Incident during January-March 1932.

Note that the structural breaks obtained from the 96 Bond are different from those from the other 4 bonds. The collateral of the 96 Bond was neither guaranteed by the Beijing government nor Nanjing government. It was not covered in the Bond Consolidation 1921. The 6 Percent, 7th Year, Financial and 7 Percent were supported by the fund established in the Bond Consolidation 1921, but the 96 Bond was only supported by the residual of salt tax (without a secured repayment fund supported by the custom or government revenues). Therefore, the bond price reacted to idiosyncratic news rather than news about political and war events because changes in government regime had less impact on the debt repayment. Furthermore, the bond price did not recover after the Nanjing government had come into power because the government did not honor the 96

Bond.

Consolidated Bonds, 1936-42

Looking into the period 1936-42, we identify three important events from the consolidated bonds. The monthly maximum and minimum of bond prices are plotted in Appendix B. According to the figures of bond prices, we identify two turning points, namely the Macro Polo Bridge Incident in July 1937 and the Battle of Yunnan-Burma Road in May 1942. These two events caused large drops in the bond prices as reported in Table 10. After the Macro Polo Bridge Incident, the bond market stopped trading in September 1937 and then re-opened in January 1938. The prices of consolidated bonds in February 1938 were about 49% lower than those before the market was closed in September 1937. The significance of the Macro Polo Bridge Incident suggests that investors revised their beliefs on the default risk of sovereign bonds when the Second Sino-Japanese War began. The potential change in government regime, if the Nanjing government failed, increased the default risk of the consolidated bonds. Even if the Nanjing government survived from the war, investors still worried about its ability for debt repayment after the intense warfare.

Table 10: Macro Polo Bridge Incident and Battle of Yunnan-Burma Road

	Bond A		**Bond B**		**Bond C**		**Bond D**		**Bond E**	
	Marco Polo Bridge Incident, 1937/7									
Month/Year	Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest
7/1937	87.6	75.5	85.3	74.3	83.85	71.8	82.95	70.9	82.25	70.7
2/1938	45	42.7	42.3	37.7	40.2	37.7	40.15	37	40.3	37.2
Changes	-42.6	-32.8	-43	-36.6	-43.7	-34.1	-42.8	-33.9	-42.0	-33.5
%Change	-49%	-43%	-50%	-49%	-52%	-47%	-52%	-48%	-51%	-47%

Battle of Yunnan-Burma Road, 1942/3-6

5/1942	73.5	59.5	68.2	52.5	68	51.5	61.5	46	63.5	47.8
6/1942	45.8	30	44.4	27	44	28.7	41.8	25.8	43	27
Changes	-27.7	-29.5	-23.8	-25.5	-24.0	-22.8	-19.7	-20.2	-20.5	-20.8
%Change	-387%	-50%	-35%	-49%	-35%	-44%	-32%	-44%	-32%	-44%

Similarly, the loss of the Battle of Yunnan-Burma Road brought down the bond prices by about 40% during May-June 1942. After losing the battle, the Nanjing government faced a complete blockade by the Japanese forces on land and maritime transportation. Since then, the military supplies need to be transported by flight from India to China (more specifically, to Chongqing) over the Himalaya. The drops in the bond prices were close to those reductions associated with the Marco-Polo Bridge Incident, it suggests investors were worry about the fate of the Nanjing government, and considered those two events have comparable significance. However, the Macro Polo Bridge Incident receives a greater attention than the Battle of Yunnan-Burma Road from historians. For instance, Spence (2001) cover both incidences in his chapter on the World War II. On the other hand, Fairbank and Goldman (2004) do not mention the Battle of Yunnan-Burma Road in their chapter of the Second Sino-Japanese War.

Using the daily data, we look into the period May 1938-March 1942 which lies between the Marco-Polo Bridge Incident and the Battle of Yunnan-Burma Road. In Table 11, our estimation results suggest that there are four structural breaks during this period. We also plot the daily data and the fitted values in the Appendix 3. Although there are disagreements in the break dates identified from the consolidated bonds, there are three breaks identified from all consolidated bonds consistently. The timings of structural changes are June 29-July 1 1939, December 30-31 1939 and August 28-October 3 1940,

which correspond to the Swatow Operation, the Battle of South Guangxi and the Hundred Regiment Offensive, respectively. The shifts in bond prices are relatively small (less than 10% in absolute term) except those for the Hundred Regiment Offensive (positive shifts for 23-25%). We infer that the third turning point relates to the Second Sino-Japanese War is the Hundred Regiment Offensive. The domestic investors perceived the counter-attack from the Communist party and the potential alliance of the Communist party and the Nationalist party increasing the survival odds of the government regime, and hence reducing the default risk. Moreover, the other two breaks suggest that domestic investors responded to the war events. They became more optimistic about the bond payment when the Nanjing government won a series of battles since the Battle of South Guangxi. On the other hand, they reacted negatively to the blockade by the Japanese forces in the Swatow Operation.

Table 11: Structural Breaks of Consolidated Bonds, 1938-42

Bond	Break	Year/Month	Bound	Jump in estimate	Events
CB-A	1	1938/12/20	[-8,64]	4.02 (7.3%)	Battle of Wuhan
	2	1939/6/29	[-13,16]	-3.77 (6.4%)	Swatow Operation
	3	1939/12/30	[-30,6]	5.11 (9.2%)	Battle of South Guangxi
	4	1940/10/3	[-16,2]	13.6 (23%)	Hundred Regiment Offensive
CB-B	1	1939/6/30	[-3,41]	-4.50 (-8.7%)	Swatow Operation
	2	1939/12/31	[-0,4]	4.31 (9.1%)	Battle of South Guangxi
	3	1940/8/28	[-0,0]	12.9 (25%)	Hundred Regiment Offensive
	4	1941/2/28	[-12,175]	4.82 (7.5%)	Battle of South Henan
CB-C	1	1939/6/30	[-7,32]	-4.76 (-9.4%)	Swatow Operation
	2	1939/12/31	[-2,7]	3.77 (8.2%)	Battle of South Guangxi

	3	1940/9/4	[-0,0]	12.3 (25%)	Hundred Regiment Offensive
	4	1941/3/7	[0,183]	5.57 (9.0%)	Battle of South Henan
CB-D	1	1939/6/30	[-4,32]	-5.19 (-10%)	Swatow Operation
	2	1939/12/31	[-6,3]	3.82 (8.5%)	Battle of South Guangxi
	3	1940/9/4	[-16,0]	11.7 (24%)	Hundred Regiment Offensive
	4	1941/3/7	[-12,303]	4.36 (7.2%)	Battle of South Henan
CB-E	1	1939/7/1	[-8,30]	-4.57 (-9.1%)	Swatow Operation
	2	1940/1/1	[-4,4]	3.97 (8.7%)	Battle of South Guangxi
	3	1940/9/6	[-0,0]	11.8 (24%)	Hundred Regiment Offensive
	4	1941/3/9	[-6,219]	4.65 (7.6%)	Battle of South Henan

Foreign Bond, 1931-41

In this section, we examine the weekly prices of government bonds quoted in London to analyze the perspectives of foreign investors on the survival odds of the Chinese government. We also compare the viewpoints of domestic and foreign investors on the survival probability of Nanjing government.

Table 12 reports that there are three breaks detected from most of the foreign bonds, except there are only two breaks with the Anglo-French Loan. The first breaks are positive and lie between March 1933 and November 1934. The world economy was in depression during the period of 1931-34. In particular, the interest rates stayed at a lower level than the inflation rate because the inflation increased dramatically after the collapse of the gold standard. As a result, the Chinese government bonds became more attractive to foreign investors, and hence it brought up the prices of Chinese bonds in the foreign market.[5]

[5] Since the Nanjing government faced a strong pressure from the Japanese forces in Manchuria and

Table 12: Structural Breaks of Foreign Bonds

Bond	Break	Jump in estimate	Year/Month/Date	Bound	Events
Reorganisation	1	26.7 (40%)	1933/6/4	[-1,4]	Economic depression
	2	-35.3 (-38%)	1937/8/16	[-8,0]	Macro Polo Bridge
	3	-24.5 (-42%)	1939/7/24	[0,22]	Swatow Operation
Boxer	1	23.2 (34%)	1933/3/5	[-6,1]	Economic depression
	2	5.71 (6.3%)	1935/2/17	[-17,44]	Economic depression
	3	-37.1 (-38%)	1937/9/6	[-12,0]	Macro Polo Bridge
Anglo-German	1	1.80 (1.8%)	1934/11/25	[-4,138]	Economic depression
	2	-24.2 (-24%)	1937/7/18	[-1,0]	Macro Polo Bridge
	3	-33.2 (-43%)	1939/7/3	[-1,2]	Swatow Operation
Anglo-French	1	13.2 (15%)	1934/11/25	[-66,12]	Economic depression
	2	-50.2 (-52%)	1938/11/14	[-5,3]	Canton Operation
Crisp	1	21.4 (35%)	1934/11/25	[-6,1]	Economic depression
	2	-36.5 (-44%)	1937/8/30	[-6,1]	Macro Polo Bridge
	3	-24.3 (-53%)	1939/7/31	[0,12]	Swatow Operation

The second breaks are 24-44% negative shifts around July-September 1937. The

Mongolia, the possible good news happened in this period is the 5 encirclement actions perform by the Nationalists on the Communists. Moreover, the first breaks of the Anglo-German Loan, Anglo-French Loan and Crisp correspond to the Long March of the Communists after the 5th encirclement in order to isolate themselves from the Nationalists. The results may suggest that the encirclement effort increased the confidence of foreign investors in the Nanjing government for sustaining its leadership in China and hence the financial capability for debt repayment. However, it is less likely be the reason for the rise in bond prices because these domestic conflicts actually increased the fiscal burden of the Nanjing government.

breaks relate to the Macro Polo Bridge Incident, which is the outbreak of the Second Sino-Japanese War. Consistent with the reaction of domestic investors, the foreign investors perceived that the Second Sino-Japanese War was a negative shock to the fiscal condition and the survival of Nanjing government.

The last shifts correspond to the Swatow Operation in June 1939, which results in a negative shock to the foreign bonds for 40-50%. After the Swatow Operation, the Japanese forces successfully blocked the ports of Southern China to stop the strategic/military materials flowing into China. The foreign investors perceived that it was a substantial threat to the survival of Nanjing government. The blockade also reduced the custom revenue obtained from those ports to the Nanjing government. The Anglo-French Loan has the second break in November 1938, which is close to the Canton Operation. It is another piece of evidence that the foreign investors thought that the blockade of the ports in Southern China by the Japanese forces was a serious threat to the Nanjing government.

Railroad Bond, 1931-41

We identify three breaks for each of the railroad bonds. The first breaks locate in January 1934 with positive shifts for 42-72%. Similar to the foreign bonds, we suggest that the positive shifts in the railroad bonds were driven by the economic downturn in the foreign markets, which makes the railroad bonds became more attractive than other investments in the foreign market.

The second breaks for the Tianjin-Pukow, Hukuang and Lunghai railroad occurred in February-March 1936. They respond to the consolidations of railroad bonds, which aimed to restructure the interest payment and extend the maturity. It increased the likelihood for the railroads to make the payment in the future. The first settlement was in February 1936

for the Tianjin-Pukow railroad, and then in August 1936 and in April 1937 for the Lunghai railroad and the Hukuang railroad, respectively. Our results suggest that the investors of those three bonds reacted right after the first settlement with an expectation that the other two negotiations would achieve successful outcomes as well.

Table 13: Structural Breaks of Railroad Bonds

Bond	Break	Jump in estimate	Year/Month	Bound	Events
Shanghai-Nanjing	1	33.9 (42%)	1934/1/14	[-9,2]	Economic depression
	2	-44.5 (-59%)	1937/8/30	[-11,4]	Battle of Shanghai
	3	-14.9 (-49%)	1939/7/31	[-1,21]	Central China Railroad Corporation
Tianjin-Pukow	1	11.4 (57%)	1934/1/14	[-19,3]	Economic depression
	2	11.5 (37%)	1936/2/16	[-1,19]	Railroad Bond Consolidation
	3	-29.8 (-70%)	1938/11/21	[-4,1]	Tientsin–Pukow Railway Operation
Hukuang	1	17.3 (72%)	1934/1/21	[-7,1]	Economic depression
	2	3.40 (8.2%)	1936/3/15	[-1,56]	Railroad Bond Consolidation
	3	-30.7 (-69%)	1939/6/5	[-1,1]	Battle of Nanchang
Lunghai	1	4.79 (42%)	1934/1/27	[-1,37]	Economic depression
	2	13.3 (82%)	1936/2/23	[-2,2]	Railroad Bond Consolidation
	3	-16.7 (-56%)	1938/6/6	[-5,3]	Battle of Xuzhou

The remaining breaks for those bond prices correspond to the war events on those railroads. They are all negative shifts because the controls of the railroads are lost to the Japanese forces in the wars. 1) For the Shanghai-Nanjing railroad, the investors reacted to the Battle of Shanghai in August-November 1937. Moreover, the last break coincides with the establishment of Central China Railroad Corporation in April 1939. The foreign

investors revised the default risk after the corporation put the Shanghai-Nanjing railroad under the control of the Japanese military. 2) For the Tianjin-Pukow railroad, the control of this railroad was under threat during the operation of Tianjin-Pukow Railroad during in 1937 in which the Japanese forces advanced along the railroad towards the area around Yellow River including Nanjing. However, the break date for the Tianjin-Pukow railroad is later than the operation because the collaterals of this bond are the likin and internal revenue of surrounding provinces, which may delay the loss of investor confidence. 3) The Lunghai railroad runs from the coastal city (Lianyungang) to Lanzhou in the west through Xuzhou. In addition to the damage made during the Battle of Xuzhou in May 1938, the railroad fell into the hand of the Japanese forces. 4) The Hukuang railroad is the Hunan-Hubei portion of Canton-Hankow Railway. China lost the Battle of Nanchang in May 1939 in which part of the railroad was destroyed. Investors also thought that the Chinese forces might not able to sustain the control rights of the Hubei and Hunan provinces, which contributed the collaterals of this bond.

7. Discussions

In the previous section, we discuss the empirical results on structural changes and the relevant historical events. In this section, we suggest the driving forces behind those results by using three comparisons. First, we compare the perspectives of domestic and foreign investors on the survival odds of the Nanjing government during the Second Sino-Japanese War. Then, we compare the reactions of government and railroad bonds. Finally, we compare the impacts of civil wars and Sino-Japanese conflicts.

Comparing domestic and foreign investors

A notable feature of our dataset is the availability of bond prices in the domestic and foreign markets. We compare their reactions to understand the differences of risk

perceptions between domestic and foreign investors. Table 14-1 compares the reaction of bond prices for the period of Mukden-Shanghai Incident. The prices of bonds issued by the Beijing and Nanjing governments dropped by more than 40%, whereas the prices of government bonds listed in London decreased by 14%. The price reductions of domestic bond about 3 times larger those of foreign bonds. It suggests that the foreign investors perceived the incidents less as a threat to the Nanjing government than the domestic investors.

Table 14-1: Mukden–Shanghai Incident, September 1931-February 1932

Bond	Beijing	Nanjing	Foreign	Railroad
%Change	-51%	-41%	-14%	-16%

Note: Beijing bonds include the maximum and minimum prices of 6 Percent and 96 Bond; Nanjing bonds include the maximum and minimum prices of Custom, Disbandment and Arrangement; Foreign bonds include Reorganisation and Boxer bond; Railroad bonds include Shanghai-Nanjing, Tianjin-Pukow, Hukuang, Lunghai and Shanghai-Hangzhou railroads.

Table 14-2: Marco Polo Bridge Incident, July 1937- February 1938

Bond	Consolidated	Foreign	Railroad
%Change	-49%	-31%	-61%

Note: Consolidated bonds include the maximum and minimum prices of Series A, B, C, D and E; Foreign bonds include Anglo-German, Anglo-French, Crisp, Reorganisation and Boxer bond; Railroad bonds include Shanghai-Nanjing, Tianjin-Pukow, Tianjin-Pukow 1910, Hukuang, Lunghai, Daoqing and Canton-Kowloon railroads.

Table 14-3: Sino-Japanese War, February 1938-November 1940

Bond	Consolidation	Foreign	Railroad
%Change	61%	-59%	-42%

Note: Consolidation bonds include the maximum and minimum prices of Series A, B, C, D and E; Foreign bonds include Anglo-German, Anglo-French, Crisp, Reorganisation and Boxer bond; Railroad bonds include Shanghai-Nanjing, Tianjin-Pukow, Tianjin-Pukow 1910, Hukuang, Lunghai, Daoqing (within Henan province) and Canton-Kowloon railroads.

Table 14-2 reports that the domestic investors reacted stronger than the foreign investors to the Macro Polo Bridge Incident. The price drops of consolidated bonds were about 50% whereas the prices of foreign bonds decreased by 30%. Furthermore, comparing the reactions of consolidated and foreign bonds in Table 11 and 12, the domestic investors reacted stronger than the foreign investors at the outbreak of the Second Sino-Japanese War. Our results indicate that the domestic investors reacted stronger than the foreign investors at the Mukden-Shanghai Incident and the Macro Polo Bridge Incident. Then, the reaction of foreign investors became stronger than the domestic investors at the Swatow Operation. The domestic bonds had weaker collateral (residual income from custom revenue) than the foreign bonds. The foreign bonds were usually backed by custom duties, whereas the domestic bonds were supported by the residual income from custom duties or other government revenues. The payment of domestic bonds was secured by weaker assets than those of foreign bonds, thus losing Manchuria imposes a higher default risk on the domestic bonds than the foreign bonds.

On the other hand, the foreign investors reacted stronger than the domestic investors for the Swatow Operation according to Table 11 and 12. The negative price changes of consolidated bonds were about 5% whereas the price drops of foreign bonds were 40-50%. It suggests that the foreign investors perceived higher default risk after the loss of Swatow (or Canton for the investors of Anglo-French Loan). Losing the ports in Southern China reduced the custom revenue for the Nanjing government dramatically because Southern China (such as Fujian and Guangdong provinces) handled most of the international trade of China. However, after the fiscal condition had deteriorated, further damages of custom revenue affected more on the default risk perceived by foreign investors than that by domestic investors.

We then look into the survival odds of Nanjing government during the Second Sino-Japanese War perceived by the domestic and foreign investors in Table 14-3. From February 1938 to November 1940, the prices of consolidated bonds increased by about 60%, whereas the prices of foreign bonds decreased by about 60%. It suggests that the domestic and foreign investors have different opinions on the survival of Nanjing government during the Second Sino-Japanese War. The foreign investors became more pessimistic about the survival of Nanjing government, but the domestic investors actually retained their confidences on the government especially after the Hundred Regiment Offensives.

The Chinese experience provides several insights to the literatures on identifying turning points in historical episodes. Foreign bonds react stronger than domestic bonds at the outbreak of World War II (Frey and Waldenstrom, 2008). Waldenstrom (2006) argues that foreign investors in the Europe react stronger because the cost for defaulting foreign bond is lower than that for domestic bond. Although the results from the European bonds are different from those from the Chinese bonds, our results suggests that price fluctuations in both cases indeed are driven by the time varying default probability which ties to the collateral value. Furthermore, the results in Table 14-3 are different from those related to the U.S. Civil Wars and WWII. In those literatures, foreign investors usually share the same beliefs as domestic investors during wartime, but they react at different point in time. However, the Chinese experience suggests that if domestic investors have different risk perceptions or information sets from foreign investors, it may result in a prolonged period of divergence in the movement of bond prices. Nonetheless, the opinions of those two groups of investors converged after a large shock - the loss of the Battle of Yunnan-Burma Road.

Comparing government and railroad bonds

Turning our comparison to government and railroad bonds, we look for another evidence for the relationship between the reactions of bond prices and their collaterals. Table 14-1 reports that the prices of foreign and railroad bonds listed in London decreased by about 15%, which suggests that the initial threat of Mukden-Shanghai Incident was not large to those investors. When the Second Sino-Japanese War began, as shown in Table 14-2, the railroad bonds had the most negative reaction (-61%) among all types of bonds, in contrast the prices of foreign bonds decreased by 31% only. The collaterals of railroad bonds tied to local and railroad revenues which under a serious threat of the war. In particular, the railroads were vulnerable to the wars due to its strategic importance. In addition to the damages on track and cars, the control rights of the railroads were lost to the Japanese in some cases. Consequently, the default risk of railroad bonds increased substantially. The results reinforce our view that the collateral is a contributing factor to the bond price fluctuation.

Comparing domestic and international conflicts

To compare the effects of domestic and international conflicts, we employ the 6 percent Bond and additional data from Young (1971; Table 10 and 11 from page 100-101) for the foreign and railroad bonds. Since Young (1971) only records data on the annual maximum and minimum prices, we compute the difference between the maximum and minimum prices in year 1927 and 1931 to examine the short-run impacts of the Northern Expedition and the Sino-Japanese conflicts on 6 Percent, foreign and railroad bonds.

According to the empirical results in Table 9, the price decline of 6 Percent bond due to the Sino-Japanese conflicts in 1931 was larger than that associate with the Northern Expedition. Moreover, the instant impact of the conflicts on the price of 6 Percent bond

was about 50%, which was large relative to most events occurred during the era of Beijing government. However, Table 15 indicates that the short-run impacts of the Northern Expedition and Sino-Japanese conflicts are similar. Our results suggest that the Sino-Japanese conflicts impose a stronger and more persistent impact on the investor perception about the survival odds of incumbent government and its ability for debt payment.

Table 15: Difference between Max & Min Prices in 1927 & 1931

	6 Percent	Foreign	Railroad
1927	-52%	-30%	-35%
1931	-60%	-27%	-68%

Note: Foreign bonds include Anglo-German, Anglo-French, Crisp and Reorganisation bond; Railroad bonds include Shanghai-Nanjing, Tianjin-Pukow, Hukuang and Lunghai railroads.

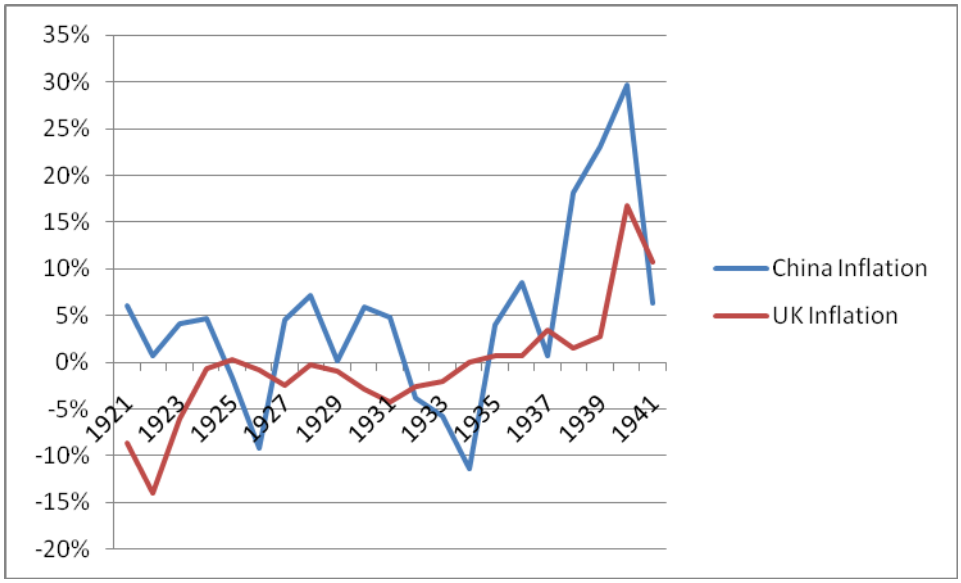
The short-run impacts of those two conflicts on the foreign bonds are similar. It is consistent with our hypothesis that the foreign investors did not think the conflicts in China imposing substantial default risks on the government bonds traded in London. On the other hand, the impacts of Sino-Japanese conflicts on the railroad bonds were twice as much as that produced by the Northern Expedition. The investors of railroad bonds perceived that the collaterals were more vulnerable in the Sino-Japanese conflicts than in the civil wars.

8. Robustness Check

Our empirical results suggest that the dramatic shifts in bond prices match with the domestic war events. To further support our hypothesis, we examine the relationship between the bond prices and macroeconomic variables in order to attribute which of the structural changes in bond price are mainly driven by the war events. Bond price inversely

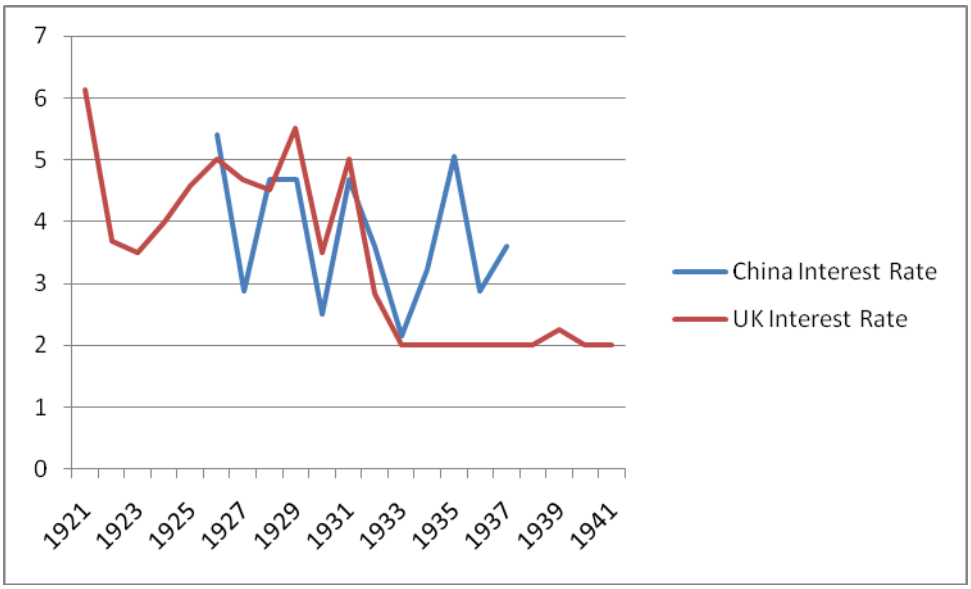
depends on interest rate and inflation rate. When interest rate increases, demand of bonds decreases because investors reallocate their funds to assets with higher return. Investors also demand fewer bonds when inflation is high because the real return of bond becomes lower.

Figure 1: Inflation in China and the UK



Note: China: Wholesale Price Index in Wang (2008); The U.K: Consumer Price Index in O'Donoghue,et al. (2004).

Figure 2: Interest rate in Chin and the UK



Note: China: Loan rate charged by local banks in Shanghai, Source: Shen (1941); The U.K: Bank rate set by the Bank of England, Source: Bankers' Almanac (1980).

Figure 1 plots the inflation rate in the U.K. during 1921-1941. There was a period of deflation during 1931-34, and then the inflation rate turned to positive at 0.7% for two years and reached 2% in 1937. Finally, the inflation rate rose above 10% after 1940 in which the Battle of Britain in the WWII occurred. Turning to the bank rate set by the Bank of England reported in Figure 2, the Bank of England reduced the rate from 5% in 1931 to 2.85% in 1932 and then to 2% in 1933. Since then, the bank rate was kept at about 2% for more than a decade.

The prices of foreign bonds respond to the macroeconomic conditions. The bond price increased during 1931-34 and then deceased after 1937. Since there was no significant war events occurred during 1931-34, the rises of bond prices were mostly due to the poor economic conditions. For the negative shifts in bond prices in 1937, it coincided with the increase in inflation. However, the maturity of Anglo-German and Anglo-French were less than 10 years; it is unlikely for 3% increase in inflation to have impacts of more than 40% on the prices of those bonds. On the other hand, the price drops of bond with longer maturity, such as Reorganisation, can be driven by default risk and reduction in present value of future coupons. For the positive shifts in bond prices in 1939, there was no corresponding shift in macroeconomic conditions. It suggests that the bond prices were mainly driven by the dramatic changes in default risk.

In order to analyze the importance of change in default risk in affecting the prices of foreign bonds, we perform the following regression

$$FBPrice_{jt} = \beta_j + \beta_1 BankRate_t + \beta_2 Inflation_t + \beta_3 D1933 + \beta_4 D1937 + \beta_5 D1939 + \varepsilon_{jt}$$

In this regression, we aggregate each variable at the annual frequency by taking average over each year. The index j = 1,..,5 denotes five foreign bonds (Anglo-German, Anglo-French, Crisp, Reorganization and Boxer) and t=1932,..,1941 denotes year. Table 16 shows that bond prices relate negatively to bank rate and inflation rate when the prices of foreign bonds regress on bank rate, inflation and bond-specific effects. According to our results, the structural changes of prices locate in year 1933, 1937 and 1939 for foreign bonds, we add dummy variables D1933, D1937 and D1939 which take value one in and after year 1933, 1937 and 1939, respectively. However, when the dummy variables are added in the regression, those two macroeconomic variables become statistically insignificant (in particular the bank rate) whereas the dummy variables are significant with expected signs. It suggests that, in addition to inflation rate, changes in default risk due to the war events drive the bond prices.

Turning our focus to the domestic market, Figure 2 depicts that the interest rate in Shanghai fluctuated between 2 to 3% during the period 1926-1937. It is different from that in the U.K. in which the Bank of England reduced the bank rate aggressively to 2% in year 1933, and maintained it at that level for about two decades. We assume that investors expected the interest rate in China fluctuating around the average and have no significant impact on bond prices. On the other hand, the movement of inflation rate was more dramatic as shown in Figure 1. There were two periods of deflation, namely 1925-26 and 1932-34. The poor economic prospect in 1925-26 was due to the civil wars among warlords in China, which led the Nationalists to unite China in 1927. The Gold Standard collapsed in 1931 which made Chinese currency appreciating relative to other currencies; in turn the weak export induced the recession during 1932-35. Finally, the inflation rate was high during the early phase (1938-41) of the Second Sino-Japanese War.

Table 16: Robustness Check

China			London		
Variables	DBPrice	DBPrice	Variables	FBPrice	FBPrice
Inflation	-150.7***	-102.4***	Inflation	-299.8***	-25.54
	[30.27]	[24.21]		[39.49]	[40.55]
Highest	4.882	4.882**	Bankrate	-13.76***	0.0956
	[3.104]	[1.880]		[3.787]	[3.630]
D1924		24.08***	D1933		22.12***
		[2.520]			[6.425]
D1927		-4.883	D1937		-9.522**
		[2.977]			[3.679]
			D1939		-36.49***
					[4.922]
Constant	59.73***	43.23***	Constant	110.2***	67.22***
	[2.238]	[2.077]		[9.111]	[12.68]
Observations	70	70	Observations	51	51
R-squared	0.302	0.752	R-squared	0.572	0.857

Standard errors in brackets; *** p<0.01, ** p<0.05, * p<0.1

We observe that the bond prices went up during 1925-26 since the domestic bonds provided a higher return to investors than other investments when the economy was weak. When the inflation rate in year 1927 returned to the level as in year 1924, the bond prices were even lower than those in year 1924. It suggests that the demand of domestic bonds were brought down not only by the higher return of other investments but also by the higher default risk. Moreover, the price of 6 Percent bond was increasing over the period of 1932-34 which coincides with the deflationary experience in the same period. Finally, the bond price was increasing during the Second Sino-Japanese War which is inconsistent with the upward movement of inflation rate. It suggests that the rises of bond prices were driven by the lower default risks.

Analogous to the foreign bonds, we analyze the importance of changes in default risk

in driving the bond prices. We perform the following regression

$$DBPrice_{jt} = \beta_j + \beta_1 Highest + \beta_2 Inflation_t + \beta_3 D1924 + \beta_4 D1927 + \varepsilon_{jt}$$

In this regression, we aggregate each variable at the annual frequency. The index j = 1,..,5 denotes five domestic bonds (6 Percent, 7 Year, 96 Bond, Financial and 7 Percent) and t=1922,..,1928 denotes year. Since we have the highest and lowest prices of each bond, we use both series and include a dummy variable, Highest, for the monthly series of highest price. We do not have data on interest rate in Shanghai over the period 1922-28, thus we only use inflation as a macroeconomic factor. According to our results, the structural changes of prices locate in year 1924 and 1927 for domestic bonds, we add dummy variables D1924 and D1927 which take value one in and after year 1924 and 1927, respectively. Table 16 shows that bond prices relate negatively to the inflation rate in China. Furthermore, all variables are statistically insignificant with expected signs after we add the dummy variables in the regression. It suggests that, in addition to inflation rate, changes in default risk drive the prices of domestic bonds over the period 1922-28.

9. Conclusion

This paper examines the impacts of conflicts on the Chinese bonds during 1921-42. We show that the domestic investors reacted stronger than foreign investors at the outbreak of the Sino-Japanese conflicts, but the reaction of foreign investors became larger after most of the ports were captured by the Japanese force. Since the custom revenue was used to pay the foreign bonds before the domestic bonds, we argue that the seniority of foreign investors on claiming the custom revenue delay their negative reactions. Our results also suggest that the international conflicts have stronger long term impacts than the domestic conflicts on the investors, but the short term effects of those two types of

conflicts are similar. Furthermore, we also show that the investors of railroad bonds reacted stronger to the international conflicts and the war events occurred around the corresponding railroads. Finally, the turning points estimated from the bond prices are close to those identified by historian, except the Battle of Yunnan-Burma Road. Domestic investors thought it was as important as the Marco Polo Bridge Incident, but historians do not completely agree on its significance.

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Appendix 1: Figures for monthly maximum and minimum prices and their fitted values, Consolidated Bonds: Series A-E; March 1936 – December 1942

Figure A1: 6 Percent

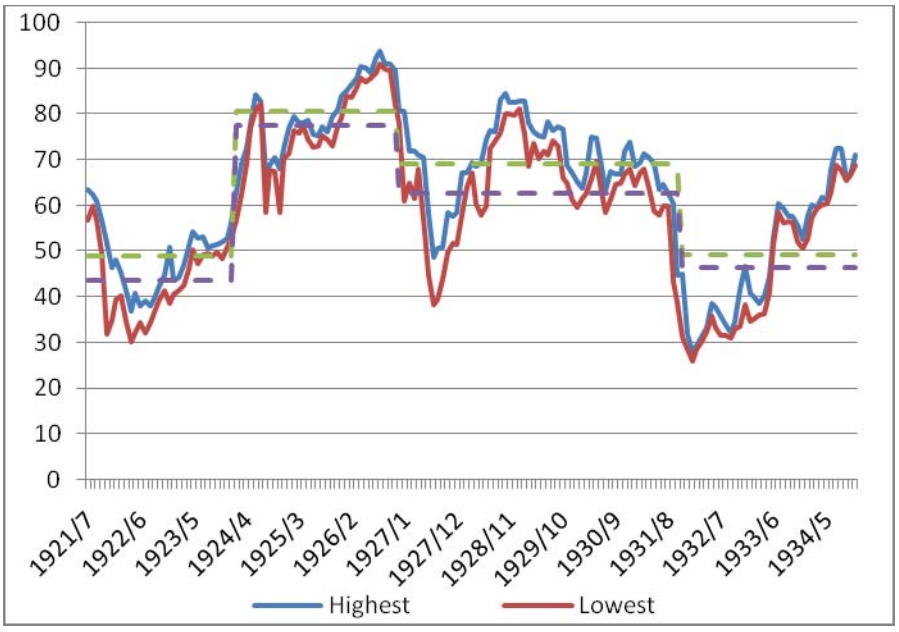


Figure A2: 7th Year

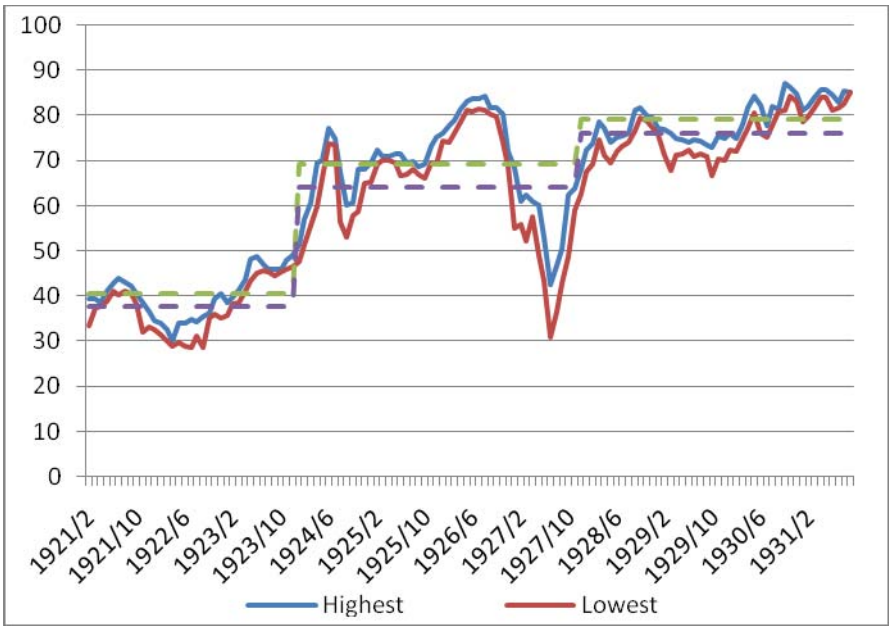


Figure A3: Financial Bond

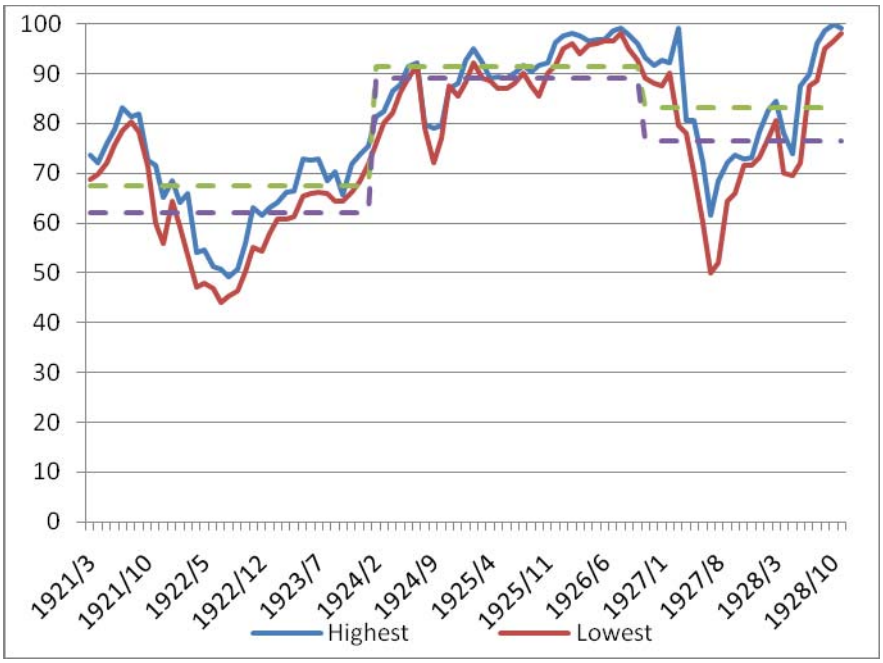


Figure A4: 7 Percent

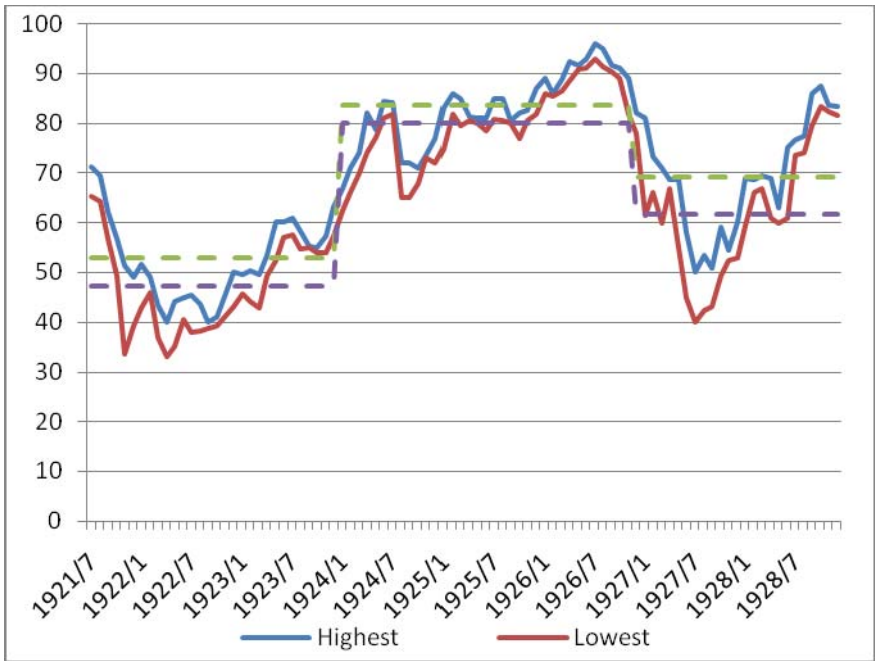
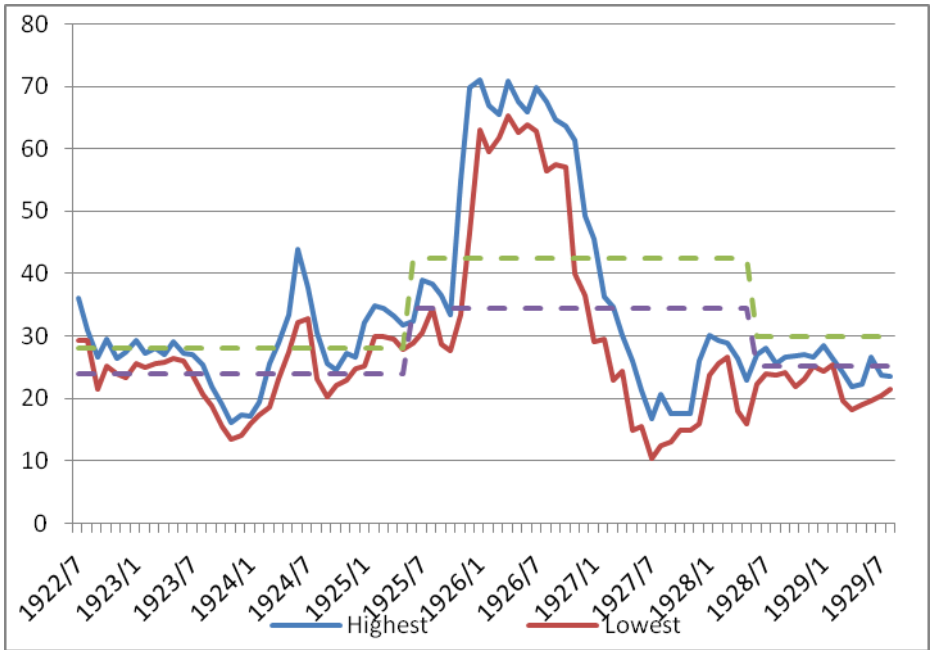


Figure A5: 96 Bond



Appendix 2: Figures for Monthly Maximum and Minimum Prices, Consolidated Bonds: Series A-E; March 1936 – December 1942 (Series C-E start from April 1936)

Figure B1: Consolidated Bond Series A

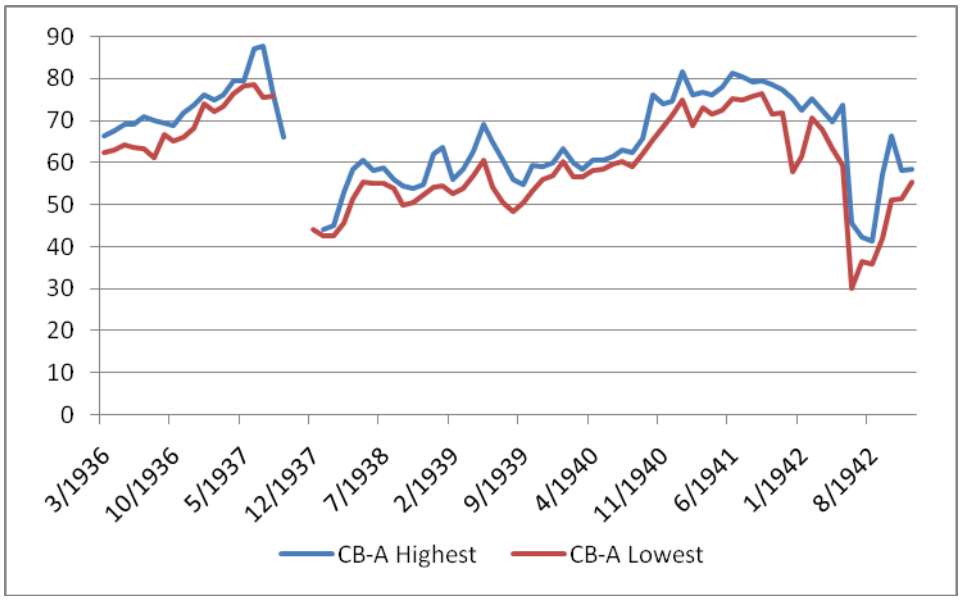


Figure B2: Consolidated Bond Series B

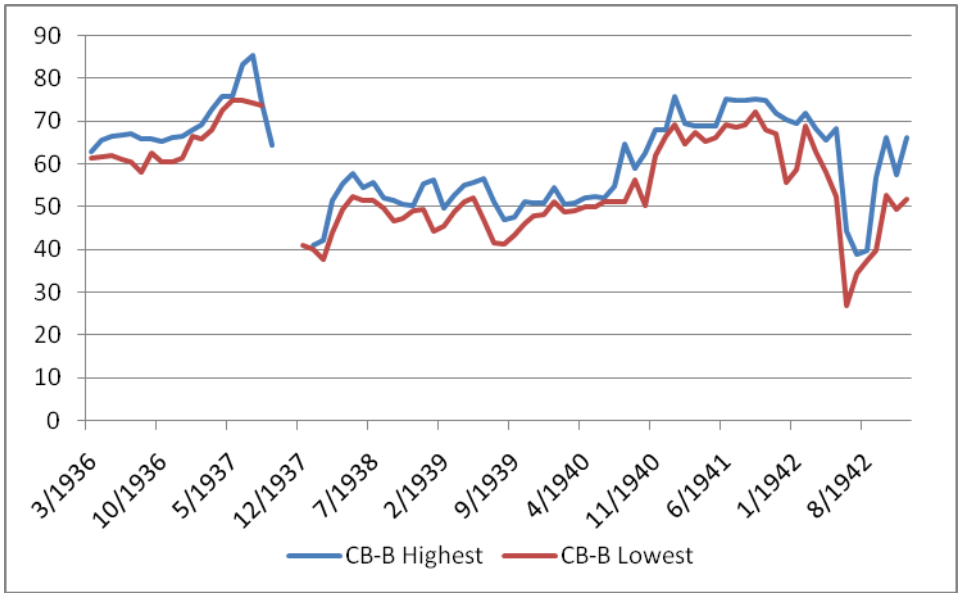


Figure B3: Consolidated Bond Series C

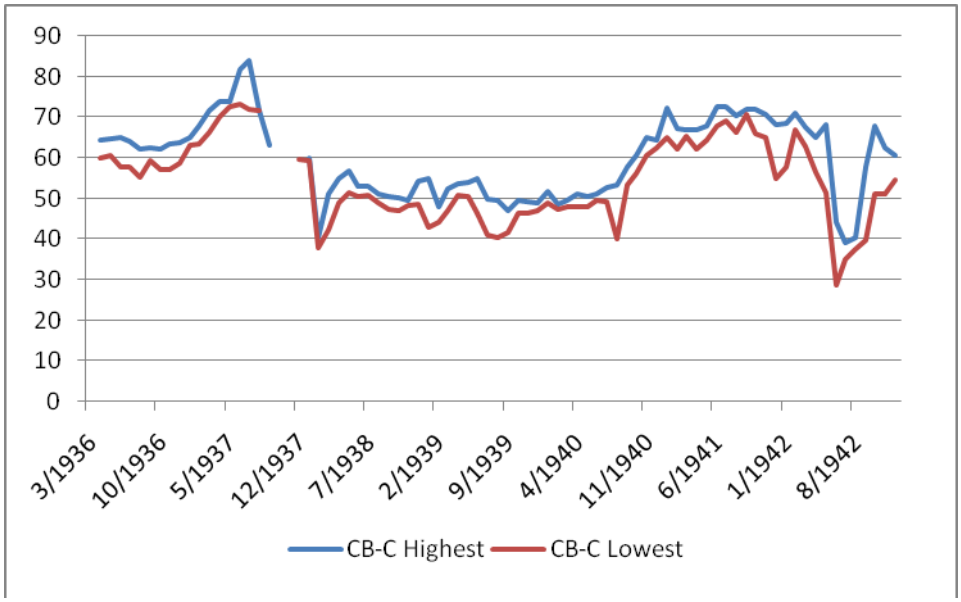


Figure B4: Consolidated Bond Series D

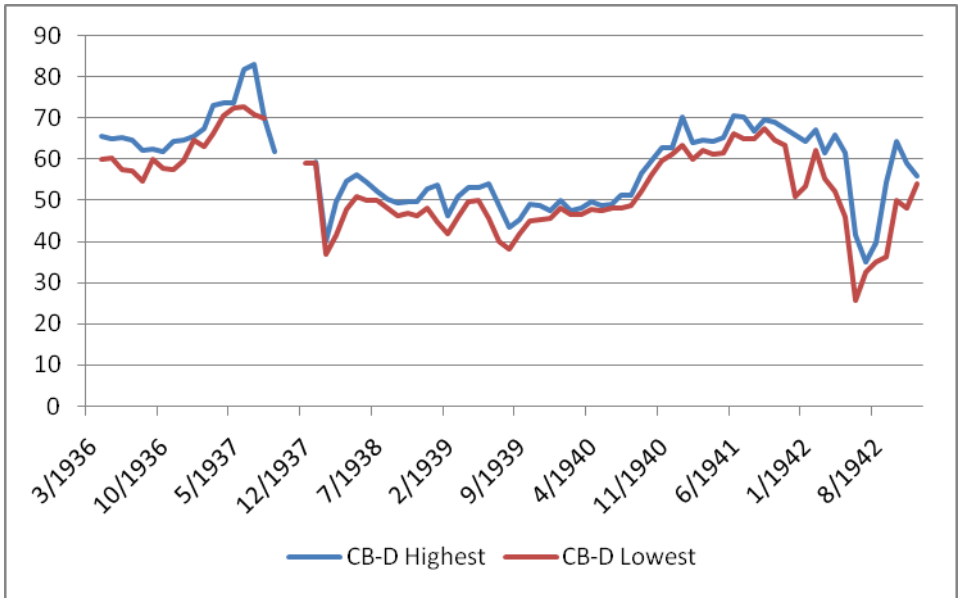
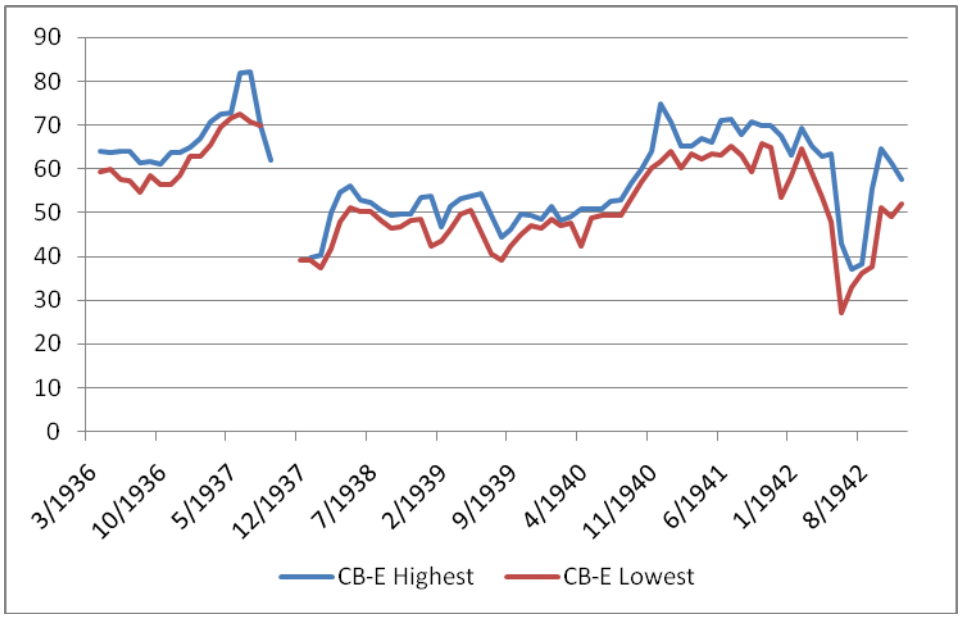


Figure B5: Consolidated Bond Series E



Appendix 3: Figures for daily prices and their fitted values, Consolidated Bonds: Series A-E; May 1938 – March 1942

Figure C1: Consolidated Bond A

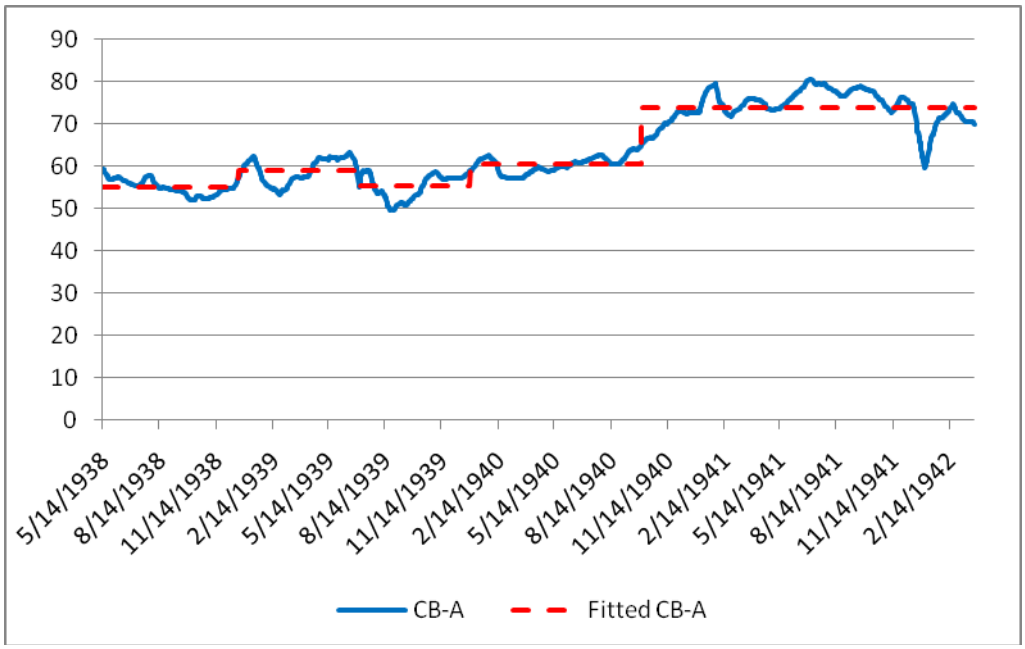


Figure C2: Consolidated Bond B

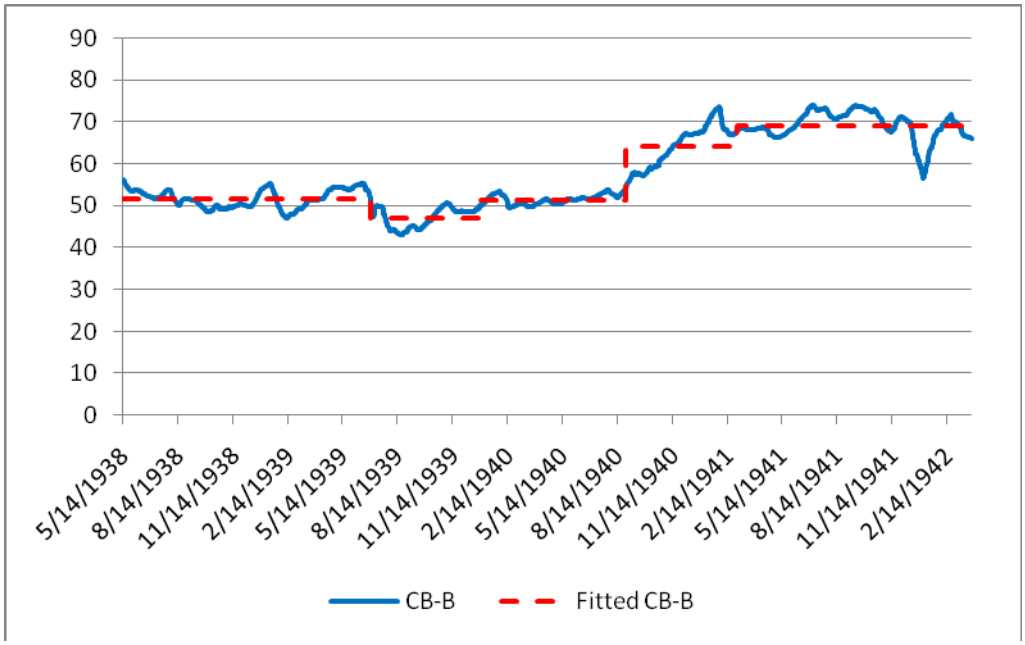


Figure C3: Consolidated Bond C

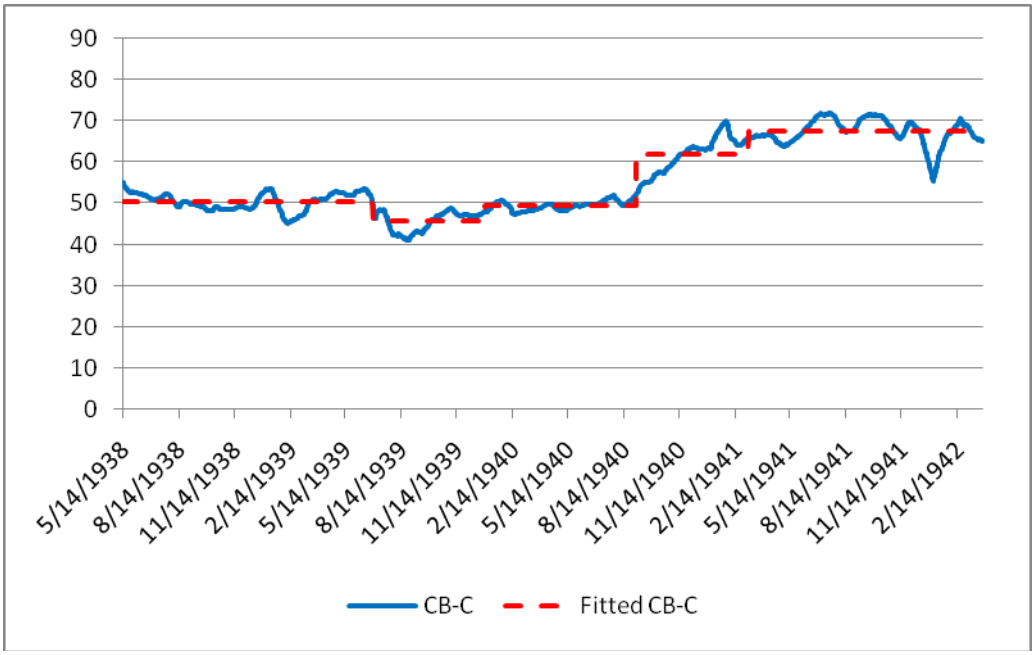


Figure C4: Consolidated Bond D

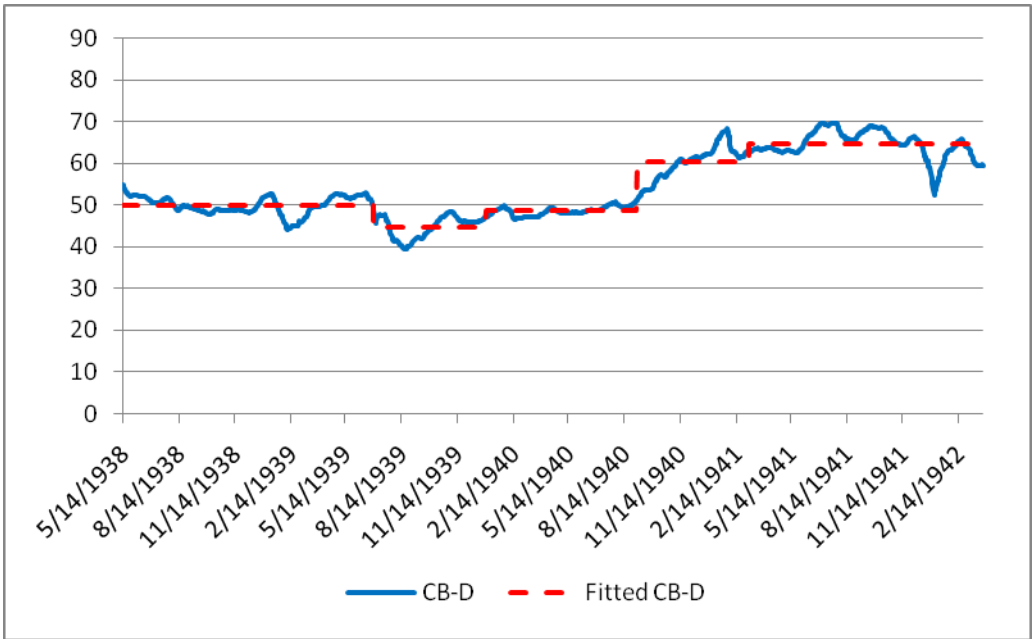
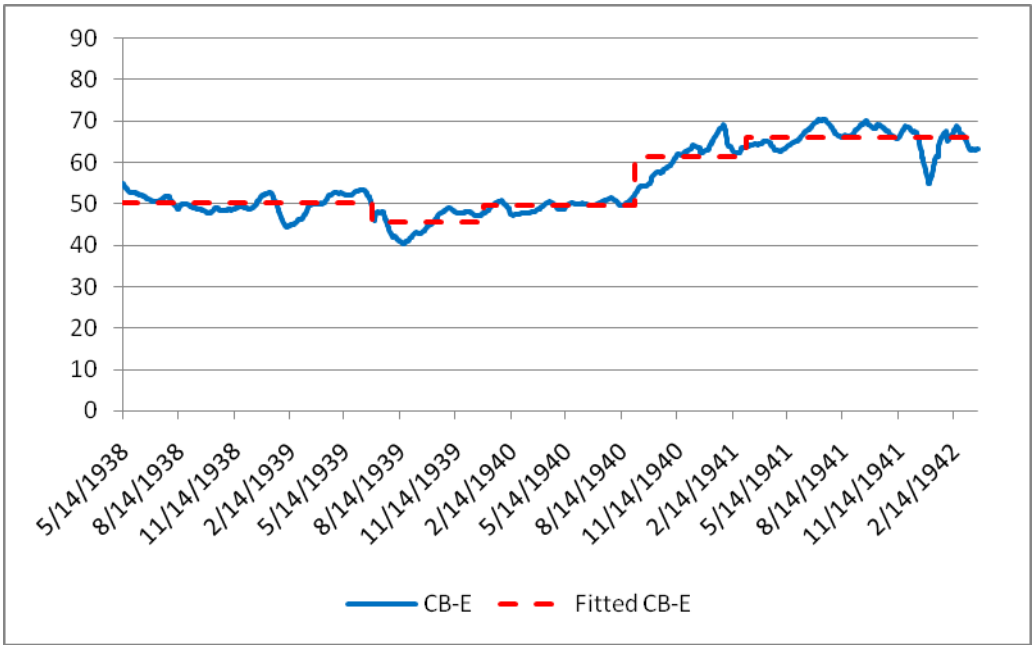


Figure C5: Consolidated Bond E



Appendix 4: Figures for weekly prices and their fitted values, Foreign Bonds; March 1931 –December 1941

Figure D1: Reorganisation Bond, 1931-41

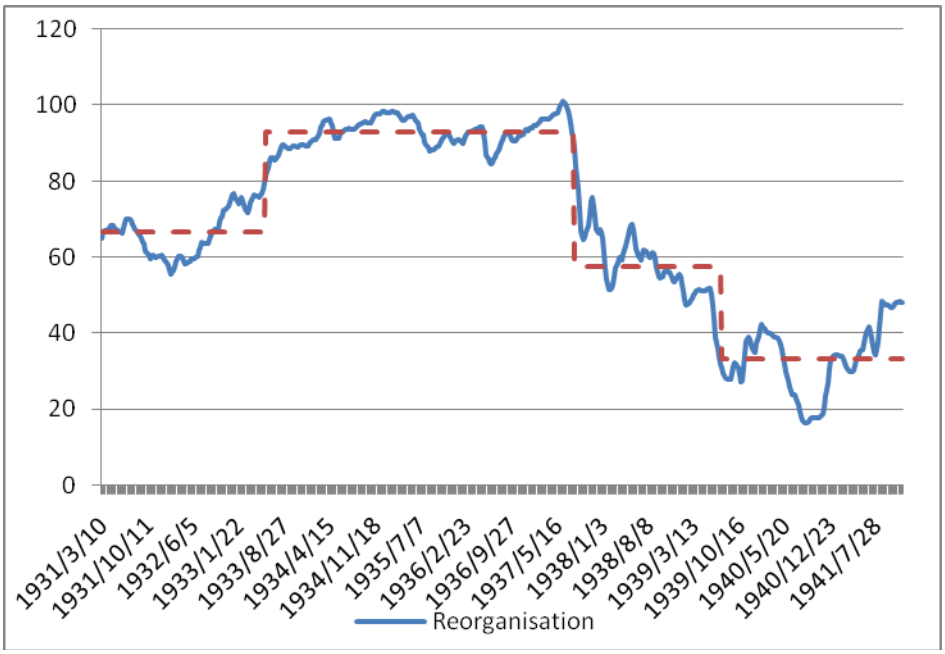


Figure D2: Boxer Bond, 1931-41

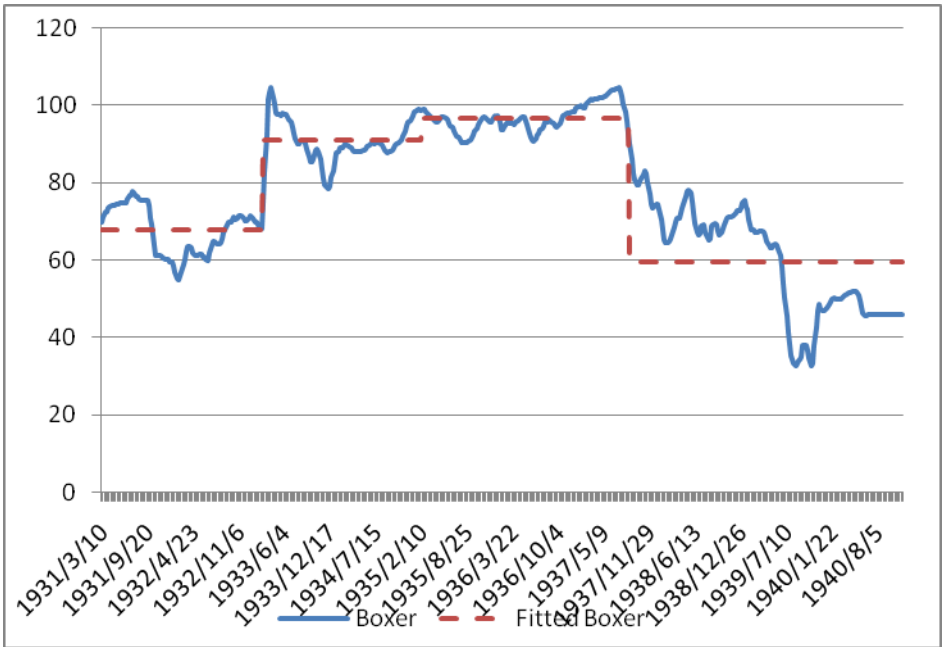


Figure D3: Anglo-German Loan, 1932-41

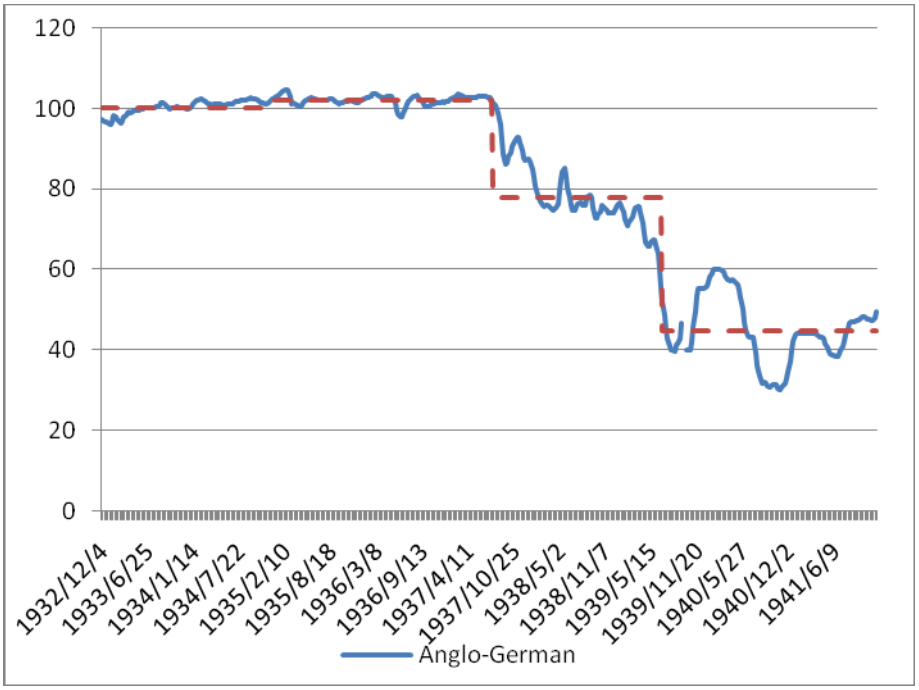


Figure D4: Anglo-French Loan, 1932-41

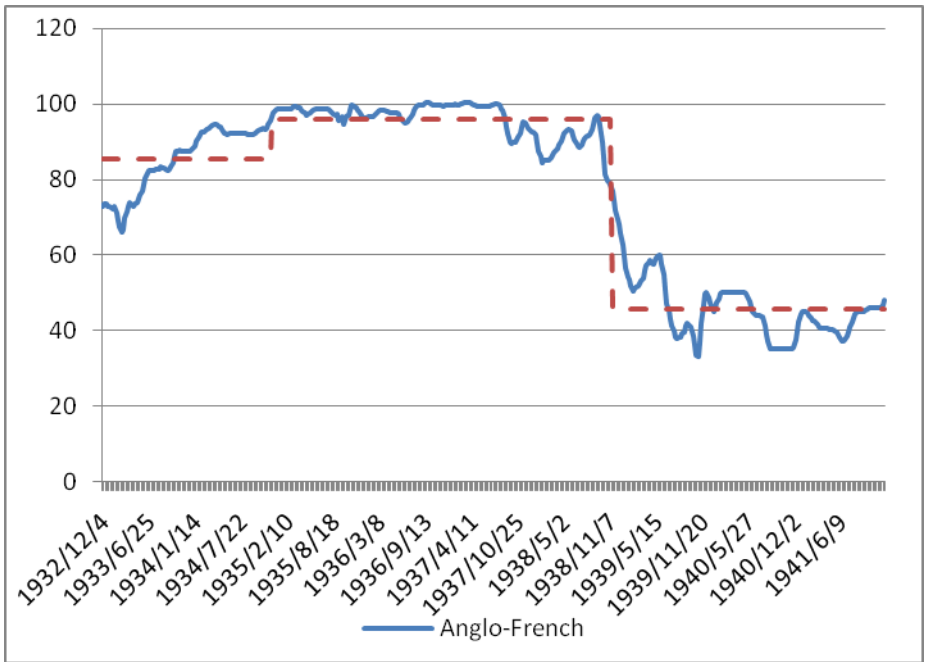
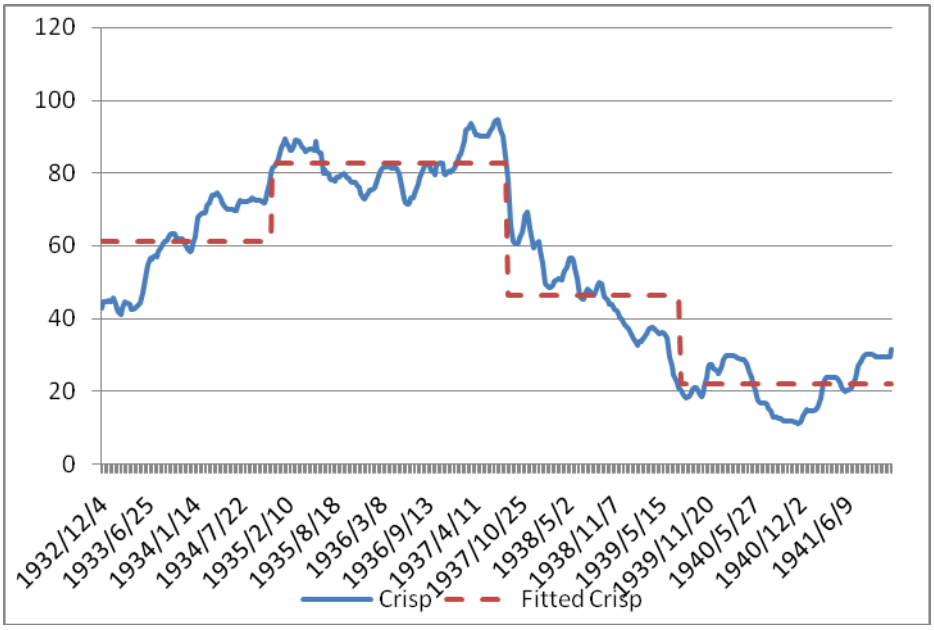


Figure D5: Crisp Bond, 1932-41



Appendix 5: Figures for weekly prices and their fitted values, Railroad Bonds; March 1931 –December 1941

Figure E1: Shanghai-Nanjing Railroad Bond, 1931-41

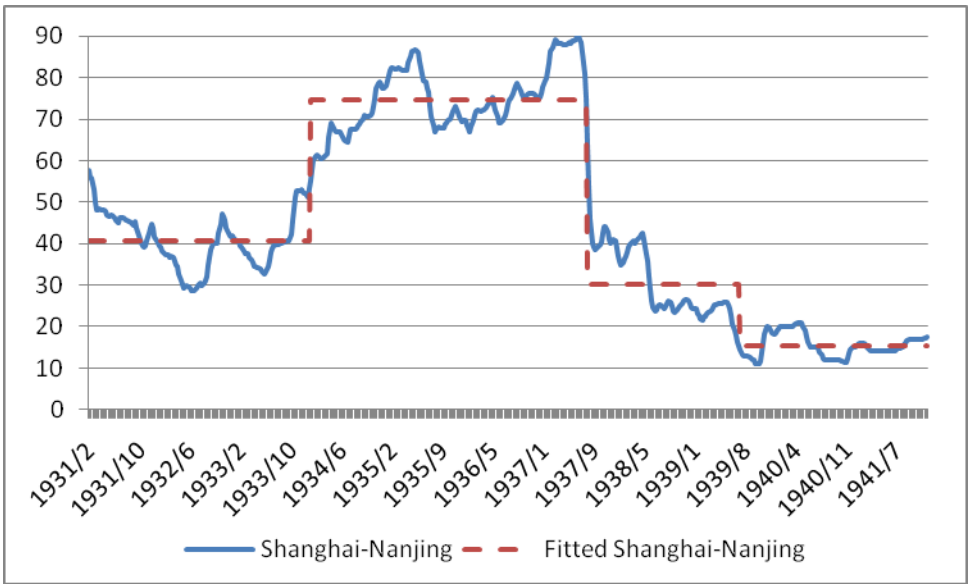


Figure E2: Shanghai-Nanjing Railroad Bond, 1931-41

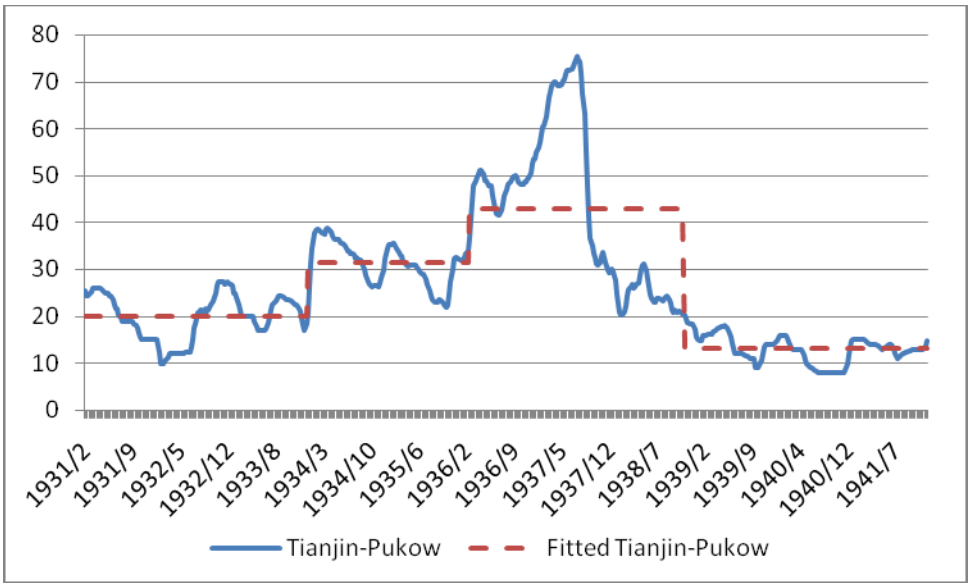


Figure E3: Hukuang Railroad Bond, 1931-41

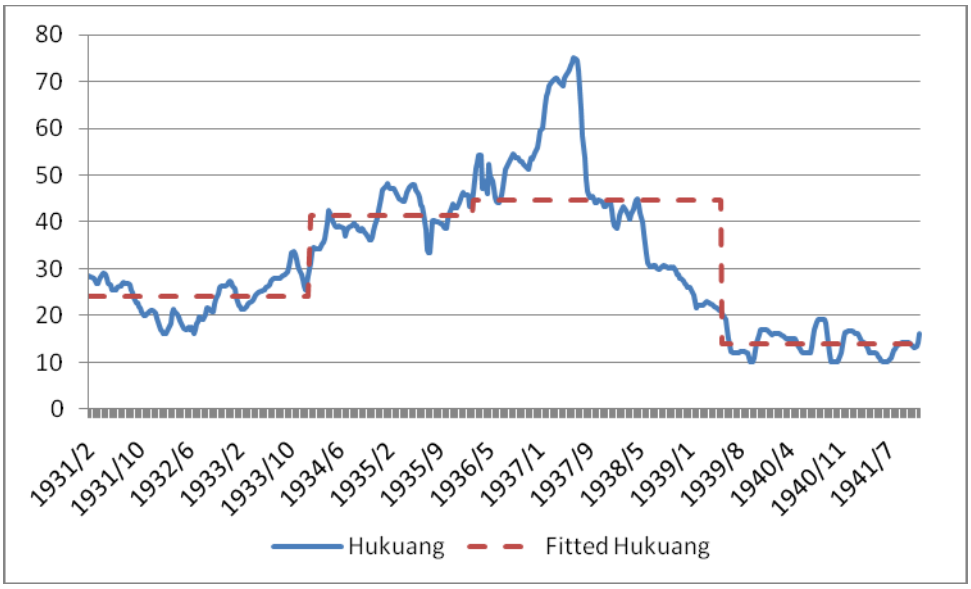
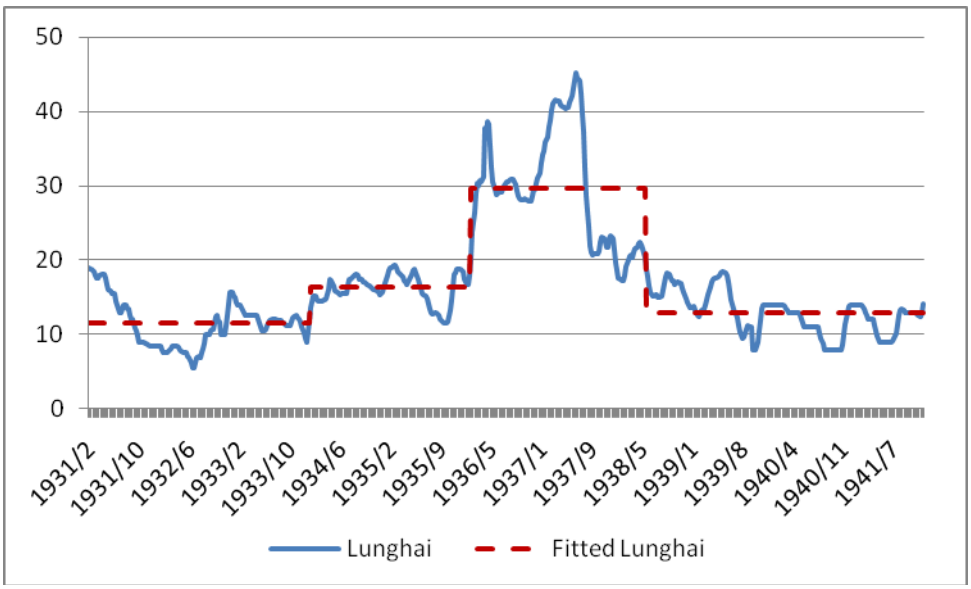


Figure E4: Lunghai Railroad Bond, 1931-41



Appendix 5a: Information on domestic bonds issued by the Beijing government

Bond	Face value	Interest (p.a.)	Start	Amount	Reason	Collateral	Repayment
6percent	100	6%	1921/5	54392228	Swap for Y1912 Bond	Consolidate domestic fund	Deferred & merged into unified bond E in 1936
7year	100	6%	1918/5 & 1918/10	47027650	Swap for inconvertible note issued by BOC and BOComm, and build reserve fund	Deferred payment for Boxer Indemnity	Deferred & merged into unified bond D in 1936
Financial	100	6%	1920/10	60000000	Swap for inconvertible note issued by BOC and BOComm, and build reserve fund	Tariff after foreign debt repayment	Redeemed in 1928/12
7percent	100	7%	1921/6	13600000	Swap for Y1919 Bond	Consolidate domestic fund	Deferred & merged into unified bond E in 1936
96 Bond	90	8%	1922/2	56391300	Repayment for salt-backed loan	Salt tax after foreign debt repayment	No payment for interest and principal at all

Source: Pan (2007)

Appendix 5b: Information on consolidated bonds issued by the Nanjing government

Bond	Face value	Interest (p.a.)	Maturity (year)	Amount (mil)	No. of bonds included	Original maturity	Original interest
CB-A	100	6%	12	150	6	1-13	6% p.a. - 5% p.m.
CB-B	100	6%	15	150	5	5-13	6% p.a. - 5% p.m.
CB-C	100	6%	18	350	9	10-14	6% p.a. - 5% p.m.
CB-D	100	6%	21	550	8	10-25	6% p.a. - 8% p.m.
CB-E	100	6%	24	260	5	13-22	6% p.a. - 5% p.m.

Source: Arthur N Young (1971) China's nation-building effort, 1927-37

Appendix 5c: Information on foreign bonds

Bond	Face value	Interest (p.a.)	Start	End	Amount (mil pound)	Collateral	Note
Reorganisation Loan	100	5%	1913	1960 (47years)	25 (21)	Surplus revenue of Salt Tax	Mainly by HSBC
Anglo-German Sterling Loan	94 (90)	4.5%	1898	1943 (45years)	16	Maritime Custom Revenue	Issued by HSBC & Deuysch-Asiatische Bank
Anglo-French loan	98 (94)	5%	1908	1938 (30years)	5	Surplus revenue of Chekiangm Kiangsu, Hupeh and Chihli	Redemption of Peking Hawkow Railraod
5% Crisp Gold Loan	95 (89)	5%	1912	1952 (40years)	5	Surplus revenue of Salt Tax	Issued by C. Birch Crisp & Co. in London
Gold Bonds (Boxer Loan)	100	5%	1925	1948 (23years)	10	Maritime Custom Revenue, native custom revenue and Salt Tax	Issued by the Soc. Francaise de Gerance de la Banque Industrielle de Chine

Source: Denby (1916) & Kuhlmann (1983)

Appendix 5d: Information on railroad bonds

Bond	Face value	Interest (p.a.)	Start	End	Amount (mil pound)	Collateral	Note
Shanghai-Nanjing	97.5 (90)	5%	1904	1953 (50years)	2.25	Profits of & mortgage on the railroad.	British & Chinese corporations
Tientsin-Pukow	98.75 (93)	5%	1906	1938 (30years)	3	Likin & internal revenues of Hebei, Shandong & Jiangsu	Issued by HSBC & Deuysch-Asiatische Bank
Hukuang	108 (95)	5%	1911	1951 (40years)	6	Hubei & Hunan salt & likin revenues, & Hubei rice tax	British, French, German and Amercian
Lunghai	108 (100)	5%	1912	1952 (40years)	10	Gov' t guarantee & mortgage on railway	Belgian & Lanchow

Source: Denby (1916)