Institute for Empirical Research in Economics

University of Zurich

Working Paper No. 2

History as Reflected in Capital Markets: The Case of World War II

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February 1999

HISTORY AS REFLECTED IN CAPITAL MARKETS:
THE CASE OF WORLD WAR II

by

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This paper looks at changes in financial values as reflections of historical events. More specifically, the historical events considered here refer to World War II and the period immediately preceding it. In particular, the time span between Hitler's rise to power (with his appointment as chancellor of the Reich on 30 January 1933) and the redevelopment of Europe after the war (with the two Marshall-Plan-Conferences in September 1947 held at Paris) is taken into consideration. We analyze the change in the values of national government bonds issued in Swiss Francs and traded on the Swiss bourse during the period 1933 to 1946. While all the nations directly or indirectly involved in WW II heavily interfered in, or closed, their stock and bond exchanges, the Swiss government, for reasons of neutrality, refrained from doing so (except for the two months following the German attack against the West in May and June 1940, when the Swiss bourse did close). The government bond market in Switzerland involved five countries: Germany, Austria, France and Belgium, as well as Switzerland itself. There was only very limited

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trading in the government bonds of other countries. But the five countries included in our econometric analysis comprise the major (European) actors: Germany, the main aggressor; Austria, a country integrated into the Third Reich well before the outbreak of the war; France, the major and traditional enemy of Germany in the West; Belgium and Switzerland, two neutral countries, the first of which was drawn into the war, while the latter was spared direct involvement.

Two questions will be studied. They look at the relationship between historical events and capital market developments from two opposite sides.

1. To what extent can changes in government bond values be related to historical events? Do breaks in such capital values series correspond to what has been established as crucial events in WWII? Or are there breaks in capital values series which cannot (or not easily) be related to WWII events?
2. To what extent are historical events reflected in the form of changes in the values of government bonds? Do capital values rise or fall, and how large and significant are the changes? Are bonds issued by the various governments affected in the same or in a different way?

We argue that the answers to these questions may shed new light on the Second World War. Specifically, some events that are generally thought to be crucial are clearly reflected in the government bond prices of the countries being considered. This holds true, in particular, for the *official outbreak* of the war in July to September 1939 (which caused the government bond values not only for Austria, Belgium and France but also for Germany to drop) and for losses and gains of *national sovereignty*. When Austria lost its independence and became part of "Grossdeutschland", the value of its government bonds fell by 46%. When it regained its nationhood at the Potsdam Conference, the value of Austrian government bonds rose by 12%. Similarly, when Belgium and France were defeated and occupied by the German forces in the "Blitzkrieg" of May 1940, the government bond values fell by no less than 35% and 31% respectively.

On the other hand, some events to which historians attach great attention are *not* reflected in bond prices at all: The most prominent example is the German government bonds, which did not react to Germany's *capitulation* in 1945.

The paper proceeds in the following way. The relationship between historical events and information gained from analyzing capital market data is discussed in section *A*. Section *B* presents the sources of our data. The development of the government bond values over the course of the prewar and war period is discussed in section *C* for the overall movement of the government bond prices, as well as individually, for each of the five countries under consideration. The following section *D* looks at the reverse question, namely whether, and to what extent, major war events are reflected as breaks in the capital market series. Section *E* briefly discusses the post war fate of the government bonds being considered and the final section *F* offers concluding remarks. The econometric estimation method used to identify the break points in the government bonds prices is presented in the Appendix.

A.   Historical Events, Interpretation, and Capital Markets.

Some historical events are generally undisputed and their dating creates few problems. In our context, an example would be Hitler's appointment to chancellor, which took place on 30 January 1933 (and not, say, in 1930 or in 1936). Similarly, the unconditional capitulation of the Wehrmacht took place in Reims on 7 May 1945, and was repeated on 9 May 1945 in Berlin (and not, say, in March or April 1945).

But even these events are not just facts; they are the result of an *a priori* decision on the side of historians. Thus, in the above case of the capitulation of the German armed forces, it could be argued that there were still some Wehrmacht units fighting after these dates, so that a more appropriate date for the capitulation would be later. Interpretation is thus a crucial element in historical research. But great care must be taken not to distort the past. In particular, when decisions made by people in the past are evaluated, the knowledge existing at that particular time must be taken into account. This is particularly evident when decisions turn out to be wrong. *Ex post facto,* it is, for instance, not easy to understand why Hitler and his Wehrmacht invaded the

Soviet Union, because according to what we know from subsequent historical events, a defeat was almost inevitable. Scholars make an effort to overcome these dangers by careful study of official and private documents, such as diaries, which are likely to be representative of the situation at a particular moment of time. But it is also a well known fact that the remaining documents are already the result of a selection process (mainly those documents considered „important" being preserved), and many of them are rewritten afterwards. An example is *Hitler's Tischgespräche im Führerhauptquartier*. They have been documented by Mr. Picker, who was present at the time, but it is known that he inadvertently inserted arguments, comments and additions many years after the end of the war. It is possible that these insertions do not fully reflect Hitler's original statements in 1940, but have been read in, or otherwise picked up considerably later (see Urner, 1990: 22).

The use of *capital market data* has three particular advantages over other sources of data:

(1) Provided they are correctly noted down, (which is not so difficult because they belong to the public sector) they solely reflect the situation obtained at the given point of time. The future is unknown and cannot enter into the data at a later date. What can enter are the subjective *expectations* of the decision makers about the future, which is a wholly different matter. Capital market data serve to capture the mood existing among bond traders at a given point in time, in particular the expectations held by the various actors about the likelihood of Germany winning the war and servicing and repaying its international debt.

(2) A second advantage of analyzing capital market data is that actors on financial markets are forced to carefully evaluate the prevailing situation, as well as any likely future developments, because errors directly affect them in monetary terms. Even a buyer in sympathy with the Nazis was forced to consider the probability of the German government bonds not being served and repaid if Germany lost the war. If he or she did not do so, and bought German government bonds, he or she suffered a corresponding capital loss. This distinguishes capital market data from other data sources, in particular surveys and questionnaires.

(3) A final advantage of looking at financial markets is that financial markets usually exhibit a high predictive power, due to so-called *marginal traders*. This type of trader decides on a relatively unbiased basis, and carefully collects the relevant information. In the extreme case, one such trader can drive the market price to the underlying equilibrium price (see the literature on the

marginal trader and the Hayek Hypothesis, respectively, e.g. Smith, 1982 or Forsythe et al., 1992).

Apart from the advantages just mentioned one has also to bear in mind the restrictions of this method of analyzing capital market data as a source of historical research,. Most importantly, the actors in government bond markets are only interested in the future financial consequences of war events. They seek to evaluate how a particular event affects the probability that a given government bond is correctly serviced in the future, and is paid back at redemption time. Moreover, the capital market, and even more so the government bond market, does not reflect the general evaluations and expectations of economic and political events existing in a country at a particular moment in time. Rather, it captures the expectations of a special group of people active in these markets. However, these are not only the actual traders working on the stock and bond markets, but the much larger group of actors influencing the supply and demand of these values. It would be of considerable interest to know exactly who the buyers and sellers on the government bond market were during the period in question. But no records exist as to who these persons were; the group of people can be determined only in general terms (see the following section).

The analysis of break points undertaken here does not identify historical facts, but rather the acquisition and assessment of information relevant for bond holders. War events are evaluated with respect to how they are likely to affect the probability of having the government bonds correctly serviced and repaid. Thus, bond traders did not attempt to pin down what happened for its own sake, or for some historical purpose, but in order to predict what happens to the bonds they own, or intend to acquire. Some events that occurred in WWII were important to bond investors and influenced bond prices, while other events did not affect the perceived probability to service and repay the debt, and therefore were not reflected in bond prices.

During the war, information in Switzerland was very quickly and reliably available both in the press and on radio (see von Salis, 1981 or von Moos, 1940-45). This pose the problem that a historical fact may have been predicted in advance by the people active on the financial markets. In such a case, a break should be visible *before* the event or be completely absent, depending on the speed of adjustment. Either way, no break will be visible at the date of the event itself. An

example is both the outbreak and the end of a war that in many cases is foreseen far in advance. There exists suggestive evidence, however, that financial markets tend to overreact to the arrival of news (see, e.g., De Bondt and Thaler, 1985). The overreaction hypothesis implies that although many investors have predicted an event way in advance, and financial markets adjusted accordingly, a break in the price series can still be identified.

B.   The Government Bond Market and Econometric Methods

During WWII, and often also before, all governments directly or indirectly intervened in economic markets, including stock markets. In Germany, in particular, many foreign currency restrictions that had a strong influence on capital markets were either introduced or tightened soon after the Nazi-takeover, i.e. in 1933[1]. The only relevant market, where government bonds of the countries under consideration were freely traded, was the Swiss stock exchange. For reasons of neutrality, the Swiss government neither controlled price movements nor the extent of trading, and there were no restrictions for foreign investors. Trading was stopped only during May and June 1940, when it was unclear whether the German forces would outflank the Maginot line to the North only (i.e. by invading Belgium and the Netherlands), or to the South (i.e. by marching through Switzerland).

Many countries issued government bonds in Switzerland during the time-span between the two world wars. In our analysis, we are only considering obligations of the *national* governments. The countries that borrowed most from the Swiss capital market were France and Germany, followed by Belgium and Austria. Converted into today's Swiss Francs, the value at emission of the 31

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[1] Many capital restrictions in Germany were already introduced during the banking crises in September 1931 and only tightened up by the Nazi government. There were, however, some additional restrictions, such as those concerning the transfers of interest payments, that were introduced by the Nazis.

German government bonds equaled roughly 3 billion Swiss Francs[2]. France's government debt in Switzerland equaled 3.6 billion Swiss Francs, and Belgium and Austria borrowed one billion and 590 million Swiss Francs, respectively. Our analysis considers a weighted index of the values of all government bonds issued in Switzerland after 1922 for each of these four countries.

It is important to note that all of the aforementioned bonds were *issued and traded in Swiss Francs*. Bondholders were therefore protected against debased repayments. However, changes in exchange rates could theoretically alter the probability that bonds would be serviced by changing the cost to the respective government of servicing the debt. But since exchange rates of most currencies were fixed against the Swiss Franc during WWII (the sole exception was the US Dollar) the latter effect probably wasn't of too much importance to the governments.

Due to the large number of government bonds emitted by Switzerland, we restrict ourselves to the twelve largest Swiss government bonds. A value index is constructed by comparing the average rate of return of the twelve government bonds in each month to the average rate of return of the twelve largest Swiss government bonds in the period 1906 - 1925 (which was 4.42%)[3].

No information is available on *who* traded at the Swiss stock exchange during WWII. But as we have mentioned before, even if we knew who the actual traders were, it would remain unclear whose money they invested and therefore who their *clients* were. Given the high degree of openness of the Swiss financial market, it seems likely that investors from all over Europe used this 'safe haven'.

There is, however, limited information available concerning the *extent of trading* in government bonds on the Swiss stock exchange. Unfortunately, the Swiss National Bank did not keep any

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[2] All amounts indicated in this paragraph are in 1999 Swiss Francs. For the conversion of WWII prices into 1999 Swiss Francs we only took inflation into account. Since the Swiss CPI is nowadays about 6.9 times higher than during WWII, values at emission were multiplied by 6.9 in order to get 1999 Swiss Francs. So, for example, the actual value for the 31 German government bonds at time of emission was only roughly 460 million WWII Swiss Francs. However, some researchers (like Jost, 1998) point out that not only inflation but also the development over time of national income should be taken into account when converting WWII prices. This, of course, would yield considerably higher values in 1999 Swiss Francs.

[3] For December 1939, for example, the average return of the twelve bonds was 4.25 percent. Comparing this to the 4.42 percent average return yields an index of 104.00 ((4.42/4.25)*100).

records regarding the turnover in stocks or bonds. Turnover was, however, taxed by the Swiss government and the resulting tax information can be used to estimate the extent of trading. Schwab (1948) carried out such an estimate and came up with the following results: The extent of trading in *foreign* government bonds fell from about 18 billion of today's Swiss Francs in the year 1937 to about 3.5 billion in 1943, and rose again to about 7 billion in 1946. German and French government bonds each accounted for roughly 30 percent of the annual turnover, whereas the respective shares of Belgium and Austria stood at seven and six percent. Trading in *Swiss* government bonds reached about half the level of all foreign bonds together in 1937. During the war, investing in government bonds of the countries at war became more and more risky, so investors put the money they withdrew from these countries into Swiss government bonds, and hence the extent of trading in Swiss government bonds rose relative to foreign government bonds. The best estimates available indicate an annual turnover of approximately 9 billion of today's Swiss Francs in 1937, 4.5 billion in 1940 and 13 billion in 1946 respectively.

World War II "officially" started with the German invasion of Poland on 1 September 1939, and ended in the West with the unconditional and complete capitulation of the German forces in Reims on 7 May and in Berlin on 9 May 1945. In many respects, however, the war started earlier, e.g. with the occupation of the Rheinland by Germany in March 1936 or the invasion of Sudetenland and thereafter the remainder of the Czechoslovak Republic in March 1939. It could even be argued that the Second World War was a direct consequence of the Nazi takeover in January 1933. In order to be able to analyze whether it makes sense to look at this period as a form of war preceding the official war dates, we include monthly data extending from December 1928 to December 1948 for the Swiss bond index[4]. Due to lack of data, we consider December

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[4] Unfortunately data at higher frequencies (like weekly or even daily data) are not available. While data at very high frequencies are econometrically not necessary, monthly data might raise two problems: (1) Event A in November might raise bond prices and event B lower them. The data will report this as a wash and one might miss two potentially important events. (2) The data might say that something happened in November, but if several things happened in November, then one might find oneself at a loss (relying on the data only) to say which particular event it was that moved the prices. However, while we cannot exclude the possibility that we missed some dates in our study due to the usage of monthly data, we never experienced that two important events happened in the month before a break point. So while daily data might enable us to identify events with greater precision, we do not think that they would lead us to new insights.

1933 to December 1948 only for the foreign government bond indices. The data were collected from the '*Monatsberichte der Schweizerischen Nationalbank*' (monthly publication of the Swiss National Bank), January 1929 - January 1949[5].

The econometric method used is aimed at searching for structural breaks in the series of government bond prices just discussed. In contrast to an event study, the starting point is *not* a list of dates with the data then telling which matter. Rather, the method used here allows the data to speak for itself, without *a priori* specification of the dates.

The basic idea behind the procedure used is to estimate *random walks* within small time windows and then test for differences in the means of the bond prices between these time windows. This will provide information on *common threats* for all countries considered. While this method might be useful to answer a variety of questions regarding events that affected *all* bonds, it also means that nothing can be said about *country-specific threats*. Therefore, in a second step, we test for country specific threats by estimating *conditional* random walks and then test again for differences in the means of the bond prices for each country. The term 'conditional' must be stressed here, since the second procedure corrects for effects, which influence all government bonds traded in a similar way. We will, therefore, not find breaks in, say, the German government bond index as a result of changing inflation or real interest rates. This also holds for mean differences: The second procedure only tests for significant structural mean breaks of the bond prices *conditional* to the price movements of all government bonds traded in Switzerland. This means that an (historical) event that led to, say, a ten percent increase of the Swiss government bond prices and to a five percent increase of the prices of all government bonds, will be shown to increase the *conditional* mean of the Swiss government prices by five percent only. It also means that an event that has the same effect on the bond prices of all countries will not be recognized by the econometric method used[6].

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[5] Data for the Swiss series can be found in table 13 (1928 - 1930), table 12 (1931 - 38 and 1942 - 1944), table 9 (1939 - 1941 and 1947 -1949) and table 10 (1945 - 1946) of the 'Monatsberichte'; indices for foreign government bonds are taken from table 14 (1934 -1938 and 1941 - 1946), table 18 (1939), table 17 (1940) and table 12 (1947 - 1949), respectively.

[6] But it will of course show up in the first (unconditional) estimation procedure.

In order to find all possible dates for structural breaks, a four step procedure based on Banerjee, Lumsdaine and Stock (1992) and Perron (1989) is applied. Similar methods were previously used effectively by Sobel (1998) or Willard, Guinnane and Rosen (1996), in order to identify breaks in the series of exchange rates. For a full account of the technical details, see the Appendix.

C.   From Structural Breaks to Historical Facts

1.   Common Threats

As can be seen in figure 1, there is a strong downturn in the index of all government bonds traded in Switzerland until the outbreak of WWII. During the war, the index remained relatively stable at around 40 percent of par. One interesting feature is the peak in 1944 just about when the allied forces invaded the Normandy.

The fall in the bond prices mentioned above is particularly interesting since, until the official outbreak of WWII, all countries considered maintained their interest payments[7]. In addition, the Swiss government decided (against the explicit advice of the National Bank, see Crettol and Halbeisen, 1999, p. 14) to massively devaluate the Swiss Franc. On September 26, 1936, the Swiss government changed a law requiring that the National Bank no longer support the strong Swiss currency. As a consequence, the Swiss National Bank could be expected to loosen the monetary policy, herewith creating some potential for *falling* interest rates. This, in turn, would have a *positive* impact on bond values.
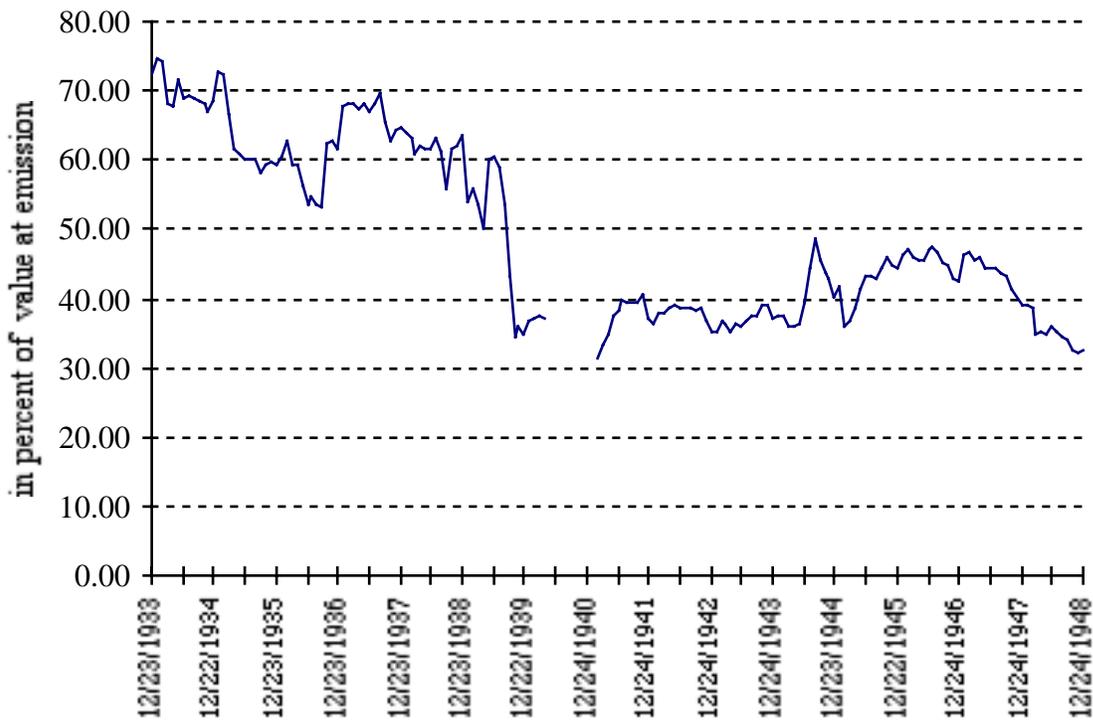
Since both of these economic influences would raise rather than lower bond values, it seems to be likely that the steady decline in bond prices has something to do with the ongoing war preparations. It therefore remains unclear which events were considered important by the then active traders. In order to distinguish between alternative possible explanations, the formal method described above[8] was applied. In this section we are interested in events that affected *all* government bonds, and consequently try to isolate break points in the index of *all* government bonds. Therefore, an unconditional random walk was estimated.

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[7] Most of the countries stopped interest payments after the German Wehrmacht invaded them. For the countries under consideration, this was the case for Belgium as well as for the remaining parts of France, which ceased interest payments in the summer of 1940 and November 1942, respectively. Germany continued interest payments somewhat longer, i.e. until June 1943. It is interesting to note that none of the countries formally 'canceled ' its outstanding debt and all of them resumed interest payments (for more details see section E below).

[8] For a more detailed technical explanation, see also the Appendix.

Figure 1: Index of all Government Bonds traded in Switzerland, 1933 - 1948.

The four step procedure identified nine statistically significant breaks in the time series of all government bonds. They are displayed in table 1 below. All of the events identified have the 'expected' signs. With the exception of the devaluation of the Swiss Franc, and to some extent the Marshall-Plan Conferences in Paris, all of them are related with either prolonging or shortening the war. Both events that indicate an earlier end to the war, the Allied invasion in the Normandy and, of course, the German capitulation itself, have a positive impact on bond prices. On the other hand, all events that indicated that there would be war, that the war would last longer, or that it would involve more countries than previously thought, had a negative effect on the overall bond index. Most prominently, the actual outbreak of WWII reduced bond values by more than one quarter. Most of the events identified will be described in detail in the sections below. In this section, we will therefore only comment on those two events that could not be identified in any of the country specific estimations.

Table 1: Structural Break Points and corresponding Historical Events

for all Government Bonds traded in Switzerland

Date	Percentage change in overall Bond Index	Major (historical) events
March 1935	- 5.6 %**	Allgemeine Wehrpflicht („general draft') in Germany
October 1936	+ 2.3 %**	Devaluation of the Swiss Franc
February 1939	- 7,7 %**	German invasion of the Czechoslovak Republic
September 1939	- 26.4 %**	Outbreak of WWII
December 1941	- 1.7 %*	Pearl Harbor, War Entry of United States
November 1942	- 1.9 %*	Russian Offensive at Stalingrad
June 1944	+ 5.4%**	Allied invasion of Normandy
April 1945	+ 4.3%**	German Capitulation(s)
July 1947	- 5.2 %**	Marshall-Plan-Conferences in Paris

Notes: Column (2) is the percent change in the absolute mean
* and ** indicate statistical significance on the 95- and 99-percent confidence level, respectively.

The devaluation of the Swiss Franc on September 27 had the expected positive impact on bond prices. This 'event' cannot be identified in any of the country specific estimations – probably because it had approximately the same effect on all (government) bonds, and therefore disappears in the conditional random walk in the country analyses (which correct for the overall development).

The other event that can be traced is the Paris Marshall-Plan Conference of July 1947. The idea that a conference deciding on a program to rebuild Europe should have a negative impact on government bonds seems quite paradoxical. But it marks at the same time the beginning of the cold war. The first conference of the Three Powers, taking place in Paris from June 27 to July 2, was planned to conceptualize the proposals made by US Secretary of State Marshall in June 1947. It soon turned out that the differences between the United States and England on the one side, and the Soviet Union on the other side, could not be resolved, and the conference ended without the intended results. This failure had important consequences: The common European program, which Marshall had in mind when making his proposals, had turned into a Western European program with several anti-Soviet elements (see e.g. Hardach, 1994; p 48ff). The confrontation culminated as first Poland and later all countries under the influence of the Soviet Union

withdrew their promise to participate in the follow-up conference (see e.g. Parrish and Narinsky, 1994). The negative break in the index of all government bond prices suggests that even in 1947 the negative impact of this withdrawal, which nowadays is widely regarded as the beginning of the cold war, was understood by the capital markets.

2. *Germany*

Figure 2 shows the monthly index of the 31 German government bonds traded at the Swiss bond exchange.

Figure 2: Index of the 31 German Government Bonds, 1933 - 1948.
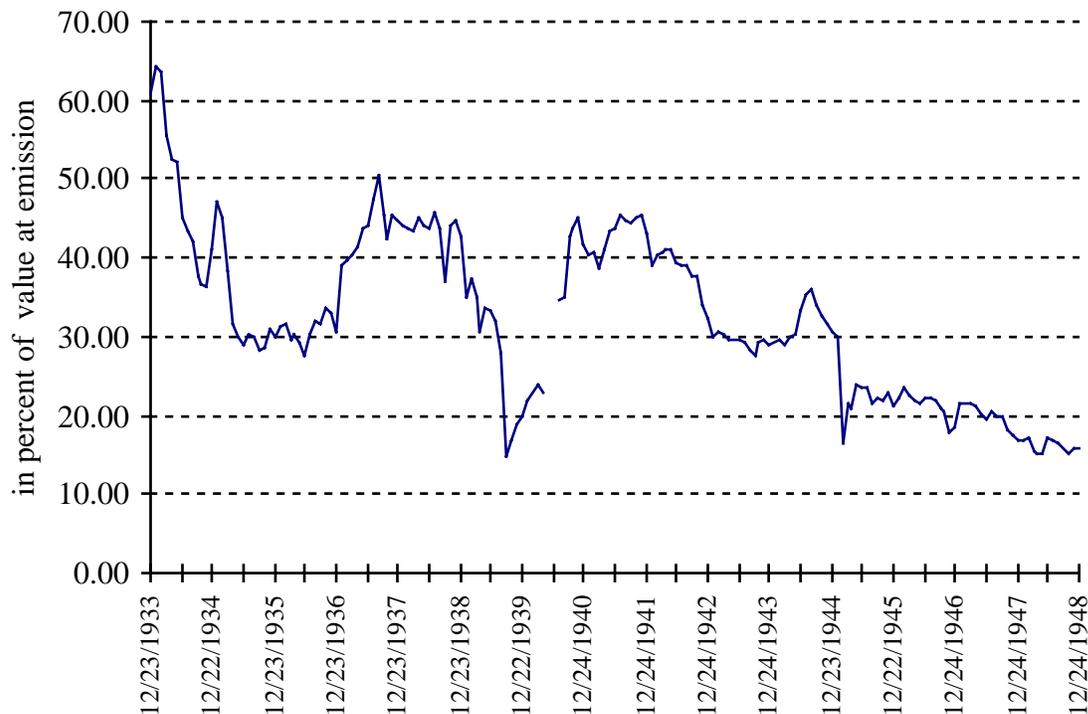
Source: Monthly Publication of the Swiss National Bank (SNB) 1933 - 1948

First *visual analysis* reveals, that over the whole period, there is a strong downturn in the value of German government bonds traded in Switzerland. This also holds for the period 1933-1936, i.e. for the first years of the Third Reich. The drop in bond values between 1933 and 1935 may be attributed to the fact that the bondholders may have feared that the Nazis would renegotiate foreign debt, or simply stop repayment. This fear was strongly nurtured by official policy

pronouncements advocating extreme autarchy, which indicated that the Nazis would withdraw from the international capital markets (Fischer 1961, Köllner 1982). In addition, the heavy interventions into, and the strong regulations imposed on the capital markets by Hitler's government depressed the expectations of the bond holders who suffered a decline in their returns[9].

The partial recovery in 1937 and 1938 may be attributed to the (short-term) success of the expansionary fiscal policy (undertaken for rearmament purposes): national income picked up, and unemployment fell sharply. The share of foreign debt in total government debt fell from 18.7% to 5.4% (Erbe, 1958, p. 51). A moratorium on servicing foreign debt was imposed in the summer of 1933, but at the same time the government (again for military reasons) paid back foreign debts in an effort to become as autarchic as possible against foreign countries[10].

The Nazi government thereby gained some financial respectability with foreign investors in 1937/38. While the German government amassed a huge public internal debt to finance armaments and other government expenditures without having to raise the tax burden, the probability of repayment of the foreign debt was considered to have improved.

But Hitler's aggressive foreign policy and increasing isolation led to a drastic fall in German bond prices, from the middle of 1938 to the end of 1939, when WWII broke out. The bond traders feared that the impending war would reduce Germany's willingness and ability to service and repay its foreign debt. There was again a rise in the value of German government bonds after the successful *Blitzkrieg* at the beginning of 1940. But it did not last long: from the second half of 1941 on, there was a permanent fall in German bond values, suggesting that the actors on the bond market expected early on that the Nazis would lose the war, that the debt would no longer be serviced and that the capital would be lost.

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[9] German economic policy in the pre-war and war period is discussed in e.g. Boelcke 1985, Köllner 1982, Milward 1977, Federau 1962, Fischer 1961 or Erbe 1958.

[10] This policy was not (directly) relevant for the German bonds issued in Switzerland, as it was particularly aimed against the huge reparation payments levied on Germany in the Versailles Peace Treaty.

The *econometric analysis* identifies six break points for Germany. Table 2 gives a survey of the resulting break points and the corresponding percentage changes in the conditional mean price index.

German government bonds experienced a statistically significant and large upward surge, beginning in the summer and autumn of 1936. In July/August of that year, the conditional average index rose by more than 7% relative to the conditional mean, i.e. the average development of all other government bonds traded on the Swiss market. This might be attributed to the Olympic Games in Berlin, which took place in August 1936, and which made the Nazi regime look peaceful to many observers. Thus, for example, the French delegation used the fascist salute upon entering the stadium at the Olympic opening ceremony. The market remained bullish until January 1937, when the boom was particularly marked.

In mid-March 1938, the Nazis invaded the remaining parts of the Czechoslovak Republic (after the Sudetenland was given to them at the Munich Conference, 29 September 1938). According to many historians (e.g Weinberg, 1994), it heralded the beginning of the Second World War. The government bond markets support this interpretation of history. The value of German government bonds fell by no less than 17% compared to the average market values. The actors thus lost even more confidence in the German government's capacity to service and pay back its bonds (which had already been seriously hampered before). The invasion of the Czechoslovak Republic was the first time Hitler annexed territory beyond "German" lands, which was taken as an indication that he would not stop there, and that it was likely that a major war would be started. However, some amount of uncertainty remained; some actors on capital markets obviously thought that the annexation of the Czechoslovak Republic satisfied Hitler's demands. Accordingly, the value of German government bonds dropped only half as much, compared to when World War II "officially" broke out in September 1939.

The Second World War began on 1 September 1939, when German troops invaded Poland. Since the end of 1938, the stock market had been interpreting previous actions by the Nazi government in a strongly negative way. The actual start of the war sent it plummeting down 39%. Obviously, the capital market was extremely pessimistic about the prospects of a German victory.

As already noted, the Swiss stock exchange was closed in May/June 1940 so that the effect of the German *Blitzkrieg*-victories are not reflected in our data. But figure 2 clearly shows that the

average level of the German government bond values rose again to a similar level as they had been before the war. It is, however, worth noting that it did not rise above that level. This may be interpreted to indicate that after the *Blitzkrieg*, peace was considered a likely prospect, with 'normal' pre-war conditions expected to resume.

Table 2: Structural Break Points and corresponding

Historical Events for Germany

Date	Percentage change in German Bond Index	Major events
July 1936	+ 8 %*	Olympic Games in Berlin (30 July - 16 August)
March 1939	-17 %*	Invasion of the Czech Republic (15 - 16 March)
September 1939	-39 %**	Outbreak of WW II (1 Sept.)
December 1941	- 5 %*	Pearl Harbor, War-Entry of the USA (7 - 11 Dec)
November 1942	- 7 %**	Russian offensive at Stalingrad (Nov - 2 Feb)
February 1945	- 34 %**	Yalta Conference (4 -11 February)

Notes: Column (2) is the percent change in the conditional mean (i.e. the parameter from equation (2) in the Appendix).
* and ** indicate statistical significance on the 95- and 99-percent confidence level, respectively.

The fourth structural break is identified in November/December 1941, but the decline of average bond prices is rather small (around 5%). It reflects another major war event, namely, the Japanese attack on Pearl Harbor (7 December) and the consequent war declarations of the United States (and the United Kingdom) on Japan, and of Germany (and Italy) on the United States (8 and 11 December, respectively).

Yet another significant drop in German bond values (about 7%) occurred in November 1942. In that month, the Soviet army started a large counter-offensive against the German 6th Army and parts of the 4th Panzer Army. More than 300,000 German troops were encircled at Stalingrad. Traders on the Swiss capital market considered the launching of the offensive as having a more negative affect on Germany's ability to service and repay its debt than the capitulation by field marshal Friedrich Paulus three months later (2 February 1943).

The last break point indicated by the data took place towards the end of the war, in February 1945. At the Yalta Conference, the Allied powers decided that only a complete capitulation of all German forces on all fronts would be accepted, and that Germany would be divided into three military occupation zones (at that time, France was not yet recognized as one of the world war victors). This was interpreted to be a final blow for the Nazis (more so than the formal capitulation of the German military in May 1945) and resulted in a fall of German bond prices by 34%.

3. *Austria*

Figure 3 shows the monthly index of the 9 Austrian government bonds traded in Switzerland during WWII. In contrast to Germany, it shows a marked increase in value between 1933-1937. There was a huge drop with the *Anschluss* (annexation) of Germany in 1938, and the index remained much depressed thereafter. This drastic fall in the value of Austrian government bonds may not only be due to political factors, but also due to the fact that with the annexation, Austrian bonds became subject to the severe German capital market and foreign currency regulations. It is, however, worth noting that the Austrian index remained much below the respective German index until mid 1944, even though Germany formally acknowledged all Austrian foreign debts. This suggests that at least part of the 1938-drop was due to political factors.

Figure 3: Index of the 9 Austrian Government Bonds, 1933 - 1948.
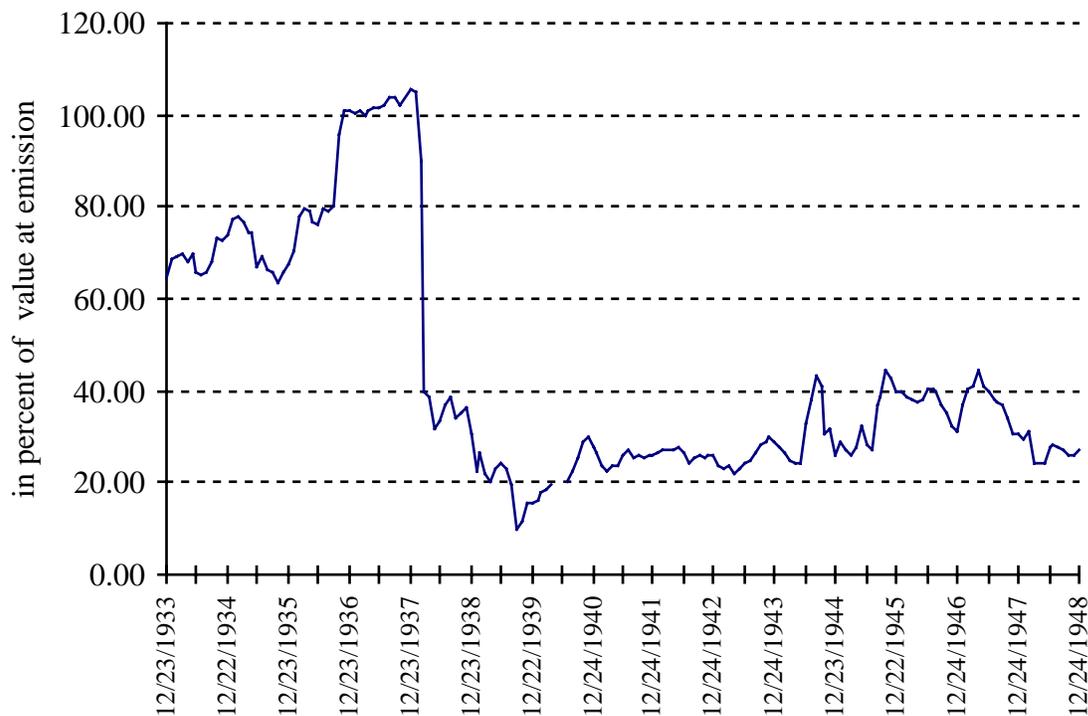
Source: Monthly Publication of the Swiss National Bank (SNB) 1933 - 1948

The evaluation of German and Austrian bond values thus differed significantly, which is an interesting fact in itself because, after 1938, the two countries formally merged into one, *Grossdeutschland*. But the actors dealing with the two bonds nevertheless maintained the difference.

The econometric analysis of the Austrian government bonds identifies three dates with statistically significant structural breaks (see table 3).

On 13 March 1938, Hitler declared the *Anschluss* of Austria with Germany to form *Grossdeutschland*. The prices for Austrian government bonds fell by no less than 46% in that month. A significant drop is visible as of the beginning of the year, when the Nazi government prepared that event. It is noteworthy that the traders on the Swiss stock exchange did not consider the seemingly enthusiastic support of the *Anschluss* in Austria during the invasion of the German troops to be relevant for their interests. The same holds for the unanimous support (more than 99 % of the votes) of the *Anschluss* in a plebiscite undertaken on 10 April of the same year.

Approximately 4'453'000 of the 4'484'000 electorate voted 'yes', only 11'924 voted 'no' and 5'776 spoilt their papers (Henschy, 1989).

Similar to Germany, the outbreak of the war strongly depressed average Austrian government bond values (again minus 46% for September 1939).

Table 3: Structural Break Points and corresponding

Historical Events for Austria

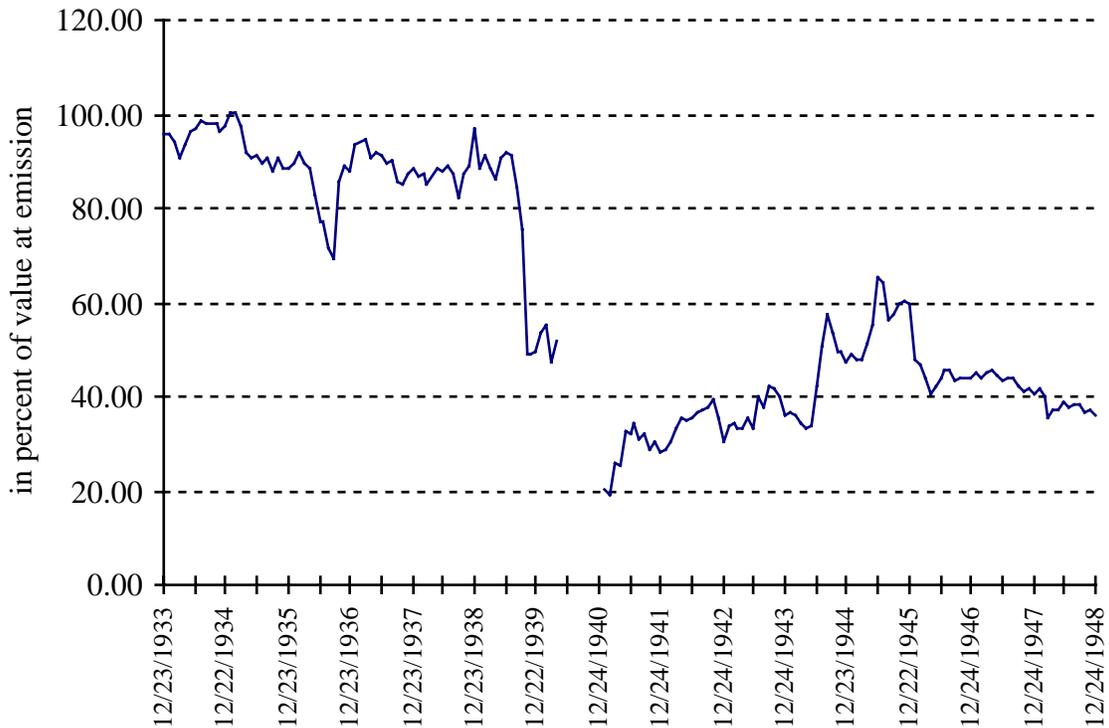| Date	Percentage change in Austrian Bond Index	Major events
March 1938	- 46 %**	Annexation of Austria
September 1939	- 46 %**	Outbreak of W.W. II
August 1945	+ 12 %*	Potsdam Conference

Notes: see table 2.

The capitulation of the German forces (May 1945) is not reflected in the data for Austria. One reason might be that the future of Austria, and thereby the servicing and repayment of its bonds, was taken to be uncertain, and traders were not able to clearly predict how it would affect that part of the Reich which, after all, was annexed by the Germans. This uncertainty was mitigated in August of the same year when the Potsdam Conference (15 July-2 August) settled crucial issues relevant for Austria. It was decided that Austria would re-emerge as a country on its own, which is reflected in an increase in average bond prices of 12%.

4.   *France*

The raw data for the French government bonds (figure 4) show a constant value until the middle of 1938, followed by a huge drop coinciding with the "official" outbreak of the war, the invasion by German forces, and the French capitulation (22 June 1940). After trading was resumed at the Swiss bourse, the French bonds experienced a continuous increase in value until the end of 1945.

Figure 4: Index of the 12 French Government Bonds, 1933 - 1948.

It is interesting to note that the value of the French government bonds remained above 20% of the emission value, even though France suspended interest payments in November 1942, and did not resume servicing its debts until the end of the period considered. The fact that French government bonds did not drop to zero shows relatively high confidence on the part of the traders that France would reemerge as an independent nation, would pay back at least part of its debts by the due date and resume paying interest.

Our econometric procedure identifies five statistically significant break points for France (table 4).

Table 4: Structural Break Points and corresponding

Historical Events for France

| Date	Percentage change in French Bond Index	Major events
May 1936	- 4 %*	German Occupation of Rheinland
September 1939	- 25 %**	Outbreak of W.W. II
May 1940	[- 31 %]	German Invasion of Belgium, France, Holland
June 1944	+ 16 %**	Allied Invasion in Normandy
January 1946	- 14 %**	Not identified

Notes: see table 2. [..] means the difference in the bond values between the day when trading was stopped and when it was resumed. For methodological reasons it is not possible to identify such 'breaks' by the econometric techniques used.

French government bond values suffered a blow when the Germans occupied the demilitarized Rheinland in May 1936. The financial investors may to some extent have lost confidence in the French to be able to successfully oppose the Nazi government's aggressive policy. The "official" outbreak of World War II at the beginning of September 1939 reduced its bond values still further. An even stronger fall in French government bonds occurred when that country was defeated and occupied by the Germans in May and June 1940. The invasion of the Allied troops in Normandy in June 1944 was greeted as a decisive sign of military and political recovery, and raised French government bond values.

5. Belgium

The values of Belgian government bonds traded in Switzerland exhibit marked variations (Figure 5). A strong increase from 1934 to 1937 is followed by an even stronger fall, dropping to a value of about 30% in 1940. Over the remaining course of World War II, the bond values show a continuous recovery, ending in 1947.

Figure 5: Index of the 11 Belgian Government Bonds, 1933 - 1948.
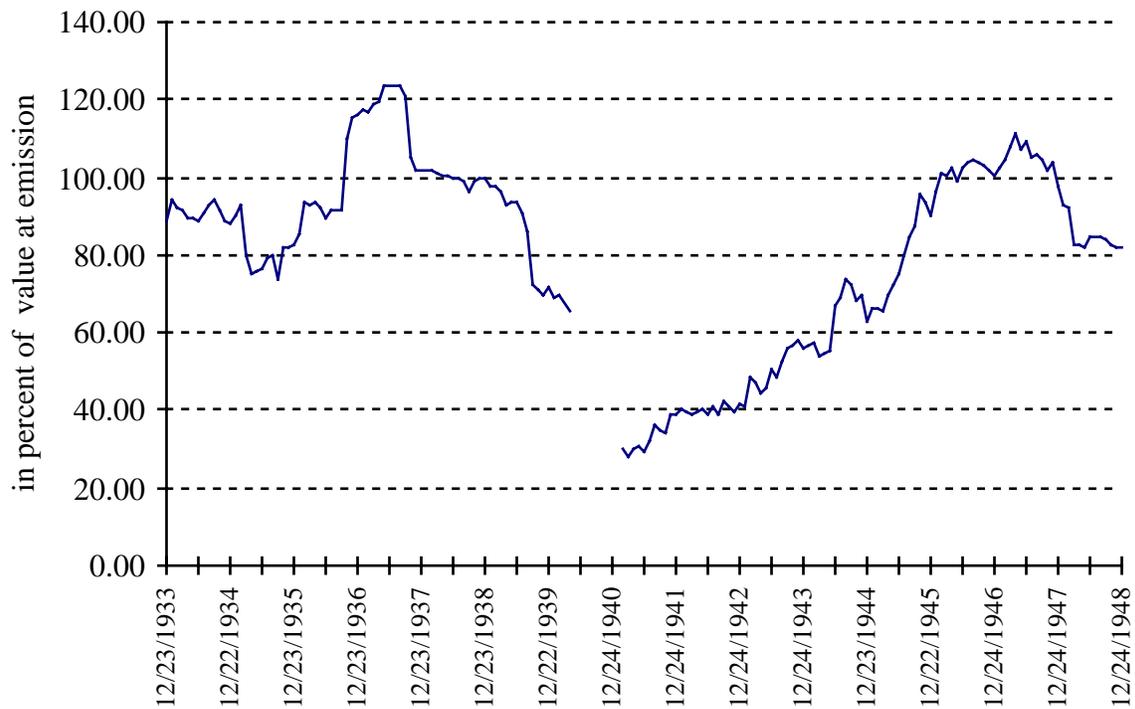
Source: Monthly Publication of the Swiss National Bank (SNB) 1933 - 1948

Our econometric analysis identifies six break points of Belgium government bonds traded in Switzerland (table 5).

Table 5: Structural Break Points and corresponding

Historical Events for Belgium

| Date	Percentage change in Belgian Bond Index	Major events
September 1937	- 3 %*	Not identified
August 1939	- 10 %**	Outbreak of W.W. II
May 1940	[- 35 %]	German Invasion of Belgium, France, Holland
February 1943	+ 10 %*	German Capitulation in Stalingrad
June 1944	+ 6 %*	Allied Invasion in Normandy
April 1945	+ 7 %*	German Capitulation

Notes: see table 4.

The "official" start of the war in September 1939, and, to a much larger extent, Belgium's invasion by the Germans in May 1940, sent its government bond values plummeting down. The allied victories in Stalingrad (February 1943), on the beaches of Normandy (June 1944), and at the very end of the war (April 1945), predictably pushed up the values of the Belgian government bonds.

6. Switzerland

The value of Swiss government bonds shows an overall long-term rise of about 30% over the twenty-year period 1928-1948 (Figure 6). Values tended to fall in the 30s. The strong increase in value in 1936 can be attributed to a devaluation of the Swiss currency by approximately 30 percent (27 September 1936). However, this economic event does not show up in a statistically significant break in the data, most likely because it also affected values of all other (government) bonds traded in Switzerland. The Swiss government bonds experienced a marked drop in the three years before the "official" outbreak of the war, until the invasion of the Benelux countries and France in May 1940. After trading was resumed later that year, Swiss government bonds increased in value till they regained the pre-war level of 1936/37.

Figure 6: Index of 12 major Swiss Government Bonds, 1928 - 1948.
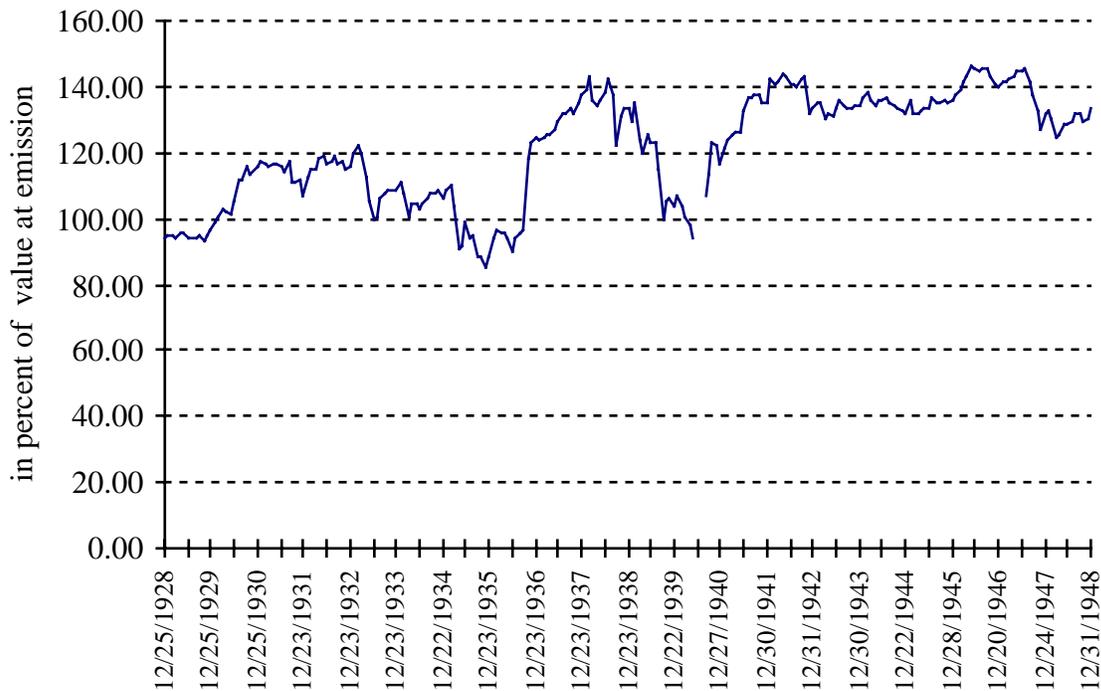
Source: Monthly Publication of the Swiss National Bank (SNB) 1928 - 1948

The econometric analysis reveals six dates for statistically significant break points, as summarized in table 6.

The rise of Hitler to dictatorial power in spring 1933, as well as the reintroduction of the general draft in March 1935, were considered to be a negative event from the point of view of investors in Swiss government bonds. The Olympic Games in August 1936 gave the Nazi government a convenient forum for making propaganda. It raised Swiss bond values in September 1936, which *may* be interpreted as a sign that Hitler's government was able to gain some goodwill with financial investors (as well as with many British, French and Italian politicians). In view of Switzerland's neutrality, the "official" outbreak of the war in September 1939 increased Swiss government bond values in October 1939. It's most likely that investments were shifted into Swiss government bonds, which seemed to be safer than those of the four other countries considered here (all of whose government bond values fell).

Table 6: Structural Break Points and corresponding

Historical Events for Switzerland

Date	Percentage change in Swiss Bond Index	Major events
April 1933	- 4 %**	Nazi Takeover and „Ermächtigungsgesetz" (30 Jan. and 24 March)
March 1935	- 6 %**	Allgemeine "Wehrpflicht" (general draft) in Germany
September 1936	+ 7 %**	Olympic Games in Berlin
October 1939	+ 3 %*	Outbreak of W.W. II
June 1940	+ 4 %**	German Invasion of Belgium, Holland and France
June 1941	+ 4 %**	German Invasion of the Soviet Union

Notes: see table 2.

A similar reaction on the part of financial investors occurred in June 1940, when first the Benelux countries and France were invaded by German forces, and then in June 1941, the Soviet Union. In both cases, the attacks were directed at countries other than Switzerland, so that this country's position as a safe haven improved. In particular, the decision by Hitler to outflank the Maginot line in the north by moving through Belgium and the Netherlands, instead of in the south by moving through Switzerland, was a lucky event for Switzerland.

D. Historical Facts and Government Bond Values

This section analyzes (1) *whether* historical "facts" related to World War II, and generally considered to be important by historians, show up as statistically significant break points in the government bonds of the five countries considered, and if so *when*; (2) in *what direction*, and by *how much,* the bond values changed. As pointed out in the introduction, it is also important to consider (3) what historical "facts" are *not reflected* as break points in government bond values. After consulting literature[11] on the Second World War, we take the following seven "facts" to be crucial[12]:

(1) The "official" outbreak of the war on 1 September 1939, when German forces attacked Poland.

(2) The invasion of Belgium, the Netherlands, Luxembourg and France by Germany in May 1940.

(3) The invasion of the Soviet Union by the Germans in June 1941.

(4) The war entry of the United States following the attack of Japan against Pearl Harbor in December 1941.

(5) The defeat of the German Army at Stalingrad in February 1943.

(6) The invasion of the Allied forces in Normandy in June 1944.

(7) The capitulation of Germany in May 1945, marking the "official" end of the war.

One of the interesting features of an analysis based on capital markets is whether the "official" dates marking the beginning (1 September 1939) and the end (7 and 9 May 1945) correspond to the evaluations of capital market participants. As World War II was, according to the virtually unanimous opinion of all historians, initiated by the Nazis, we include the following seven important historical events occurring in Germany in the period before the war "officially" broke out:

(1) Nazi takeover of power in January 1933, and the "Ermächtigungsgesetz" of March 1933, giving Hitler essentially unlimited power.

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[11] A comprehensive overview can be found in Weinberg (1994) .

[12] In view of the capital market data available, we restrict our attention to the Western theatre of World War II.

(2) The "Röhm Putsch" of June/July 1934, whereby Hitler removed the SA as a relevant power and reestablished the Wehrmacht as the only military force.

(3) The introduction of the general draft for military service in March 1935.

(4) The invasion of the Germans into the demilitarized Rheinland in March 1936.

(5) The Olympic Games in Berlin in July and August 1936.

(6) The annexation ("Anschluss") by Germany of Austria in March 1938, thereafter forming "Grossdeutschland".

(7) The invasion of the remaining parts of the Czech Republic in March 1939, whereby Hitler broke his formal promise given at the Munich conference that the Sudentenland was the last territorial demand of Germany.

In the same vein, the following two historical events are included in order to test whether the "official" end of the war on 7/9 May 1945 also marks the end according to capital market data:

(1) The Yalta Conference, where the principle of the *total* capitulation of Germany, and the division into three sectors of occupation, was decided. This Conference took place in February 1945, i.e. before capitulation, but it referred to post-war arrangements.

(2) The Potsdam Conference of August 1945, where (among other issues) the rebirth of Austria as a nation was decided.

Table 7 lists the 16 historical events just mentioned and indicates the statistically significant changes in the government bond values of the Axes powers (Germany, Austria), the neutral countries (Switzerland, Belgium), and one Allied nation (France). The table speaks for itself and it suffices therefore to concentrate on the most important aspects.

Only one event, the "official" outbreak of the Second World War, produced a statistically significant break point in all five countries in our sample. It greatly reduced the value of the government bonds on *both sides* of the conflict, i.e. "Grossdeutschland" (Germany and Austria), but also France. The bond investors thus did not "pick a winner" but considered the war to be a threat for their assets. Neutral Belgium was also negatively affected, probably because investors thought it likely that it would be drawn into a military conflict between Germany and France, a prediction which turned out to be correct. The decrease in the government bond values of the

nations directly involved in the war is reflected by a corresponding increase in value of Swiss government bonds, because that country was considered a (relatively) safe haven.

Table 7: From "War-Events" to Break Points in Government Bond Series

	Germany	Austria	Switzerland	Belgium	France
Prewar					
1. Nazi Takeover, January 1933 and „Ermächtigungsgesetz", March 1933	n.d.	n.d.	-4%	n.d.	n.d.
2. Röhm Putsch, June/July 1934					
3. „Allgemeine Wehrpflicht" (general draft), March 1935			-6%		
4. Occupation of Rheinland, March 1936					-4%
5. Olympic Games in Berlin, July/August 1936	+8%		+7%		
6. Anschluss of Austria, March 1938		-46%			
7. Invasion of the Czechoslovak Republic, March 1939	-17%				
War					
1. Outbreak of WWII, September 1939	-39%	-46%	+3%	-10%	-25%
2. Invasion Belgium, Netherlands and France, May 1940*	+8%		+4%	[-35%]	[-31%]
3. Invasion of the Soviet Union, June 1941			+4%		
4. War entry of the United States, December 1941	-5%				
5. Russian Offensive at Stalingrad, November 1942	-7%				
German Capitulation at Stalingrad, February 1943				+10%	
6. Allied Invasion in Normandy, June 1944				+6%	+16%
7. Unconditional Capitulation of the Wehrmacht, May 1945				+7%	
Postwar Arrangements					
1. Yalta Conference, February 1945	-37%				
2. Potsdam Conference, August 1945		+12%			

n.d. = no data available

* The Swiss Stock Exchange was closed May 10th through July 8th 1940 and there was no trade with French or Belgian Bonds between May '40 and Feb. '41

[..] means the difference in the bond values between the day when trading was stopped and when it was resumed. For methodological reasons it not possible to identify such 'breaks' by the econometric techniques used.

The significant break points in bond values accompanying the "official" outbreak of the war (1 September 1939) speaks for the choice of that date as the beginning of WWII. The analysis of the capital market thus leads to the same evaluation as in historical research. It is worth noting, however, that major events before that date are also clearly reflected on the bond market, most importantly the German invasions of Rheinland and of the remainder of the Czechoslovak Republic.

Another historical "fact" clearly reflected on capital markets are major changes in national sovereignty. When a nation disappears (Austria in 1938, the Czechoslovak Republic in 1939 and Germany in 1945) or is occupied (Belgium and France), the respective government bond values experience a very marked drop. When the nation re-emerges (Austria in 1945), its bond values rise sharply.

Several war events considered important by historians are reflected as significant break points in bond values. In addition to German invasions (Rheinland, Austria, Czechoslovak Republic, Benelux, France and the Soviet Union), this also holds true for two military battles generally considered decisive: Stalingrad, which marked the turning point of the war in Russia, and the Allied invasion of Normandy, which signaled the defeat of the Germans on the western front.

The end of WWII is less defined by the capitulation of the military forces (it affects Belgian bond values only) than by the Conferences, where the fate of the defeated countries was decided (Yalta and Potsdam Conferences).

E.   Post War Fate of Bond Prices

The reader might wonder what happened to the bond prices after the war. Was the markets' assessment correct and most European countries actually did not pay for a considerable time span (as is suggested by the very low value of the bond prices at the end of the war)?

Table 8 depicts the value of the government bonds for the four European countries being considered. Switzerland is not being considered because the Swiss government never stopped interest payments, and values for the Swiss government bonds remained above par almost throughout the war. The most obvious feature of the post war fate of the bond prices is that the four countries' bond prices developed very differently. While Belgium resumed interest payments almost immediately after the war (with the effect that the Belgian bonds already reached par in 1946), Germany, for example, ceased servicing most of its foreign debt until 1954.

Common to all countries under consideration is the fact that their post war governments did acknowledge all of the foreign debt and that they did eventually resume servicing it. However, none of the countries offered investors compensation for the foregone interest payments during the war.

Table 8: Values of Government Bonds of Four European
Countries traded in Switzerland after WWII

Date	Germany	Austria	France	Belgium
December 1945	21.18	39.99	59.67	90.45
December 1947	16.72	30.40	40.41	97.97
December 1949	39.50	49.03	44.65	101.52
December 1951	48.15	64.09	73.72	99.37
December 1953	89.89	102.95	78.70	104.77
December 1955	99.84	108.54	83.89	103.85

Source: '*Monatsberichte'* of the Swiss National Bank (SNB), 1948-1956

There is a large amount of literature on when and why governments repudiate debts (for a good survey on how debts were repudiated in the 30's, see Eichengreen and Portes, 1986). There are several models asking under what conditions regimes decide to repudiate debt run up by either earlier regimes or in the service of aims for which they do not think their people should pay (like fighting back the Nazis). In the light of these models, it seems quite clear that those countries that relied most heavily on new foreign credits tried to resume payments as soon as possible. In our sample, this was the case especially for Belgium and (to a lesser degree) for Austria. As a consequence, Belgian government bonds already reached par in 1947 and Austrian bonds in 1951.

As is well known, Germany faced the destruction of practically all production capacity after 1945. Hyperinflation and rationing followed. While a currency reform was performed in 1948 to cope with the first problem, the latter couldn't be totally lifted until 1950. Until the currency reform in 1948, it was totally unclear whether Germany would pay its (foreign) debt. As a consequence, the price of the German government bonds fell to as low as 15 percent of par. It was only in 1953 that Germany signed the London as well as the Swiss treaty under which it began to service English and Swiss foreign debt in August 1953. Full servicing of all foreign debts was resumed in the third quarter of 1954 (see e.g. Die Wirtschaftslage, 1953-1954).

In France, government debt had tripled between 1939 and 1945 while industrial production fell by 80 percent. In order to cope with the resulting high inflation, the French government conducted a currency reform in 1946, accompanied by the introduction of heavy taxes on capital. The result was a deep recession in 1947/48. The French government tried to combat it by heavy state interventions financed through new credits from the US, as well as through the European Recovery Program (ERP). The French government only resumed servicing its existing foreign debt at the end of 1949. As can be seen from table 8 above, the actors in the financial markets nevertheless remained quite pessimistic about France's long term capacity to service its (foreign) debt until the end of 1955.

F.   Concluding Remarks

The approach suggested here focuses on the capital market and seeks to identify statistically significant break points, reflecting historical events, by employing econometric techniques. This allows us to quantitatively study the evaluations of actors at a particular point of time in history, unaffected by later events, which might otherwise influence the evaluation.

The capital market approach is applied to an important recent period in history, the Second World War in Europe, and the events preceding it. This has been made possible by the fact that the Swiss market for government bonds of various countries involved in this war essentially functioned without regulatory interventions during the whole period. Analyzing break points in

the values of government bonds obviously focuses on a very specific area, and can therefore only capture a selected part of the world war events. The analysis suffers also from a lack of information on who the buyers and sellers of the government bonds traded in Switzerland during the war were. But this does not necessarily mean that the capital market data provide a systematically distorted picture. The persons and institutions active on capital markets have a direct monetary incentive to evaluate the prospects of the bonds of the various governments as "objectively" as possible. They cannot afford (at least not in the long run) to follow their own political preferences with respect to the countries involved in the war, because such action would result in systematic losses.

We have analyzed the development of the value of government bonds of five countries directly involved in the war over the period 1933-1948: the axis powers Germany and (annexed) Austria on the one hand, and France as the major allied power on the Continent on the other hand. Neutral Belgium was drawn into the war, while neutral Switzerland (for which we have data to analyze the longer period 1928-1948) was spared this fate. We find that the statistically significant break points identified by the econometric technique (described in the Appendix) reflect historical events also considered important by historical research based on more conventional techniques. We find, in particular, that the invasion of Poland by Germany on 1 September 1939 prompted a major downward shift in the bond values of all four countries directly involved in the War while Switzerland's position was considered relatively safer. The actors considered it more likely that the Swiss government would be able to serve, and at maturity pay back, its bonds than would be for Germany, Austria, France and Belgium.

Significant changes in the value of government bonds also occurred when a nation was invaded, as happened to Austria in March 1938, Czechoslovakia in March 1939, Belgium and France in May 1940, the Soviet Union in June 1941, as well as the Allied Invasion of Normandy in June 1944. The final capitulation of the Wehrmacht in May 1945 did not affect government bond values (except for Belgium), which suggests that the German defeat was predicted much earlier by the traders, and was therefore already included in the bond prices in May 1945. From the perspective of capital markets, the end of WWII, which historians conventionally associate with the unconditional surrender on 7 and 9 May 1945, is of lesser importance. More relevant was the

decision of the Allied Powers to accept a total capitulation on all fronts (taken at the Yalta Conference in February 1945). The post-war arrangement giving Austria back its statehood (Potsdam Conference in August 1945) was predictably associated with a significant rise in Austrian government bonds.

Analyzing breaks in capital market data are of most use when considered along with the events, as they are identified and interpreted by more conventional historical research. This paper follows two different directions - from the break points determined by the econometric methods to historical events, and from the major historical events to break points. In both cases, there is no complete correspondence, i.e. some break points and their sign (increase or decrease in bond market values) remain difficult to link with historical „facts". There are several reasons why such a deviation may occur:

(i) Economists, in this case ourselves, have insufficient historical knowledge to find the connecting "fact".

(ii) While a significant break point exists from the point of view of the financial market (relating to servicing and payback), there is no occurrence of special interest from the historians' point of view.

(iii) An important historical fact exists, but historical research has not yet identified it or, what is more likely, "accepted" historical writing has not paid sufficient attention to it (but there will always be some historians, possibly outsiders, who have observed the fact).

Conversely, there are a number of reasons why historical „facts" do not show up as break points:

(i) The quality of the bond market data is lacking, e.g. because there are too few transactions.

(ii) Governments have intervened in the bond market either as buyers or sellers, or by imposing controls of one sort or another. An important case in point occurs when governments want to prevent the reflection of a political (or economic) event on the financial market. What might particularly affect our analysis are *changes* in capital market restrictions imposed by governments.

(iii) The econometric technique applied is unable to identify break points relating to historical events, even though they are in the data.

(iv) A "fact" may be important from the historians' point of view (it relates to the fate of a nation, country or population), but does not affect the servicing and payback of the government bonds.

(v) The "fact" does not exist, nor is it as important as historians would believe. Here the quality of historical research is in question. However, it would be misleading to assume that all historians identify the same "facts" as important. So the issue is *which* historical school or *which* individual historians have identified which historical "fact", as well as the importance attributed to it (see e.g. Kozicki 1993).

One of the next steps in research should be to identify which of these reasons are relevant, and under which circumstances. The purpose of this paper is to suggest that such an interaction, between quantitative and qualitative historical research, and between capital market data and events derived from source studies, is capable of providing new insight into historical processes.

G.   Appendix

1.   *The Econometric Estimation Procedure*

Our approach is designed to find structural breaks in the series of bond prices[13]. To address this task, we follow a sequential test procedure based on Banerjee, Lumsdaine and Stock (1992)[14].

In order to find all possible structural breaks, a four step procedure is applied. Using data from a 36-month window, starting in December 1933, we first estimate the regression

$$(1) \qquad \ln p_t = \beta_0 + \beta_1 \ln p_{t-1} + \beta_2 \ln \overline{p}_{t-1} + \varepsilon_t$$

for each of the five countries, where p_t stands for the index-value of all government bonds of the country considered on date t, $\overline{p}_t$ is the index of all government bonds traded in Zurich (which we use as a measurement of the market performance as a whole), the $\beta's$ are the parameters to be estimated and ε_t is a white noise error term. A Wald test associated with the hypothesis that there is a structural break in the middle of the window is then calculated. The idea behind step one is to estimate a random walk and then check for changes in the constant, which is the procedure followed in recent stock-market studies. It implies that bond prices follow an exponential Brownian motion (an overview can be found in Duffie, 1996)[15]. The inclusion of a measure of market performance as a right hand variable allows us to estimate the random walk ceteris paribus, e.g. we allow for factors that might influence the value of all bonds traded (like changing real interest rates, inflation, etc ...).

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[13] In what follows, we will only discuss technical details of the second method applied, i.e. the *conditional* tests. For the unconditional estimation, we adapted the procedure by simply not correcting for the overall index. All other steps involved remain the same.

[14] A similar procedure is also applied by Sobel (1998) or Willard, Guinnane and Rosen (1996) in their analyses of the Greenback market.

[15] In fact, we also ran regression with autoregressive processes of up to the sixth order, but did not find different results.

In a second step, we estimate the regression again, this time using a 36-month window that begins one month later, that is in January 1934. Step two is then repeated over and over again, each time moving the window by one month, until the entire period has been covered. An example is given in figure 7, which depicts the F-statistics from all the Wald tests for Germany. F-statistics for all the other countries being considered can be seen from the figures in section 2 of the appendix. By searching for peaks in the series of F-statistics, the first two steps identify seven dates for Germany, five for Austria, seven for Switzerland, six for Belgium and five for France, where the null hypothesis of no structural breaks is most strongly questioned. The third stage of the econometric procedure consists of choosing the windows around these dates. As an example, a time window around February 1945 is marked in figure 8.

Figure 8: F-Tests for Structural Breaks in the Index of
Government Bond Prices, Germany 1933 - 1948
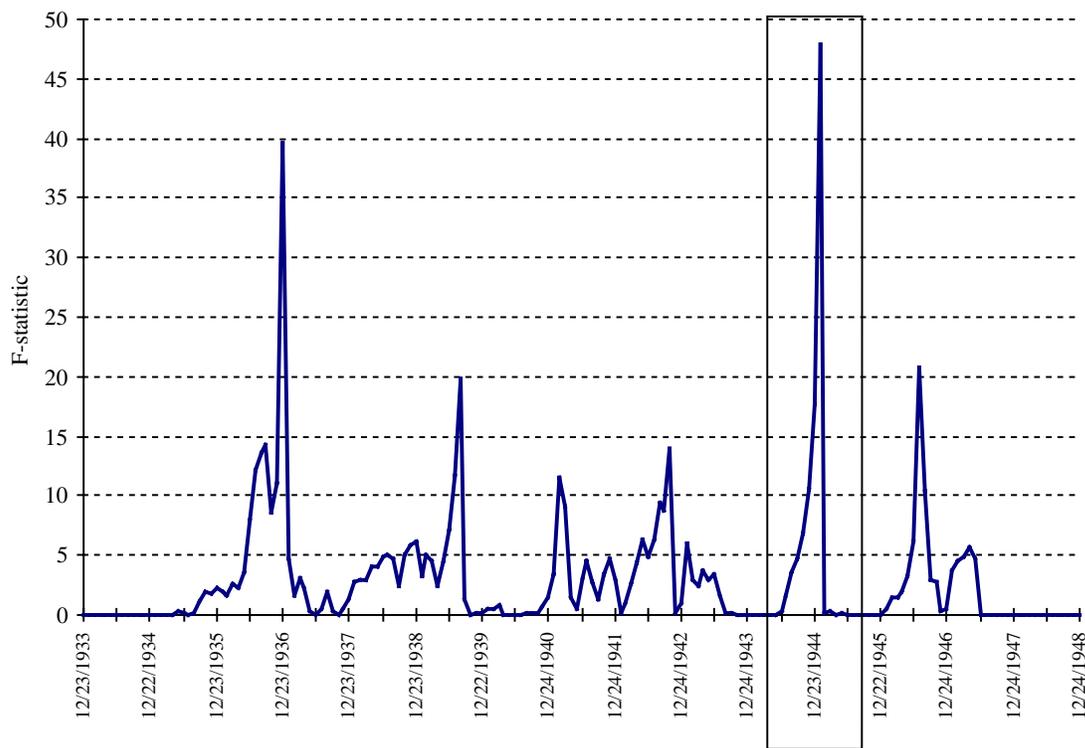
In the fourth step, we test for statistically significant structural breaks within each of the windows isolated in step three. We do this by estimating a series of the following equations, which in

comparison with equation (1) have been extended by a dummy-variable as suggested by Perron (1989):

$$(2) \qquad \ln p_t = \beta_0 + \beta_1 \ln p_{t-1} + \beta_2 \ln \overline{p}_{t-1} + \gamma_s D_{st} + \varepsilon_t \quad \text{with s} = 6, \ldots, 42$$

where $D_{st} = 1$ if date t is on or after date s and zero otherwise. The parameter γ_s measures a change in the conditional mean (i.e. a shift in the mean price index *ceteris paribus*) that occurs on date s. Since all the prices are in logs, γ_s can be interpreted as the percentage change in the conditional mean. We estimate equation (2) repeatedly, each time moving s by one month. For each resulting equation, it is tested whether γ_s is different from zero using a conventional F-test. The date associated with the highest F-statistic is then designated as the date where the most important mean shift took place within each window. Since sequential break tests cannot identify breaks around the beginning or end of a sample, we added six observations at the beginning and at the end of the windows examined. So, for the first equation estimated in step four, s was set at date six of the new window (which equaled date one in the original window). As an example, the results of step four for the time window isolated in figure 8 are shown in figure 9.

Figure 9: F-Test for time window January 1943 to
December 1946 for Germany
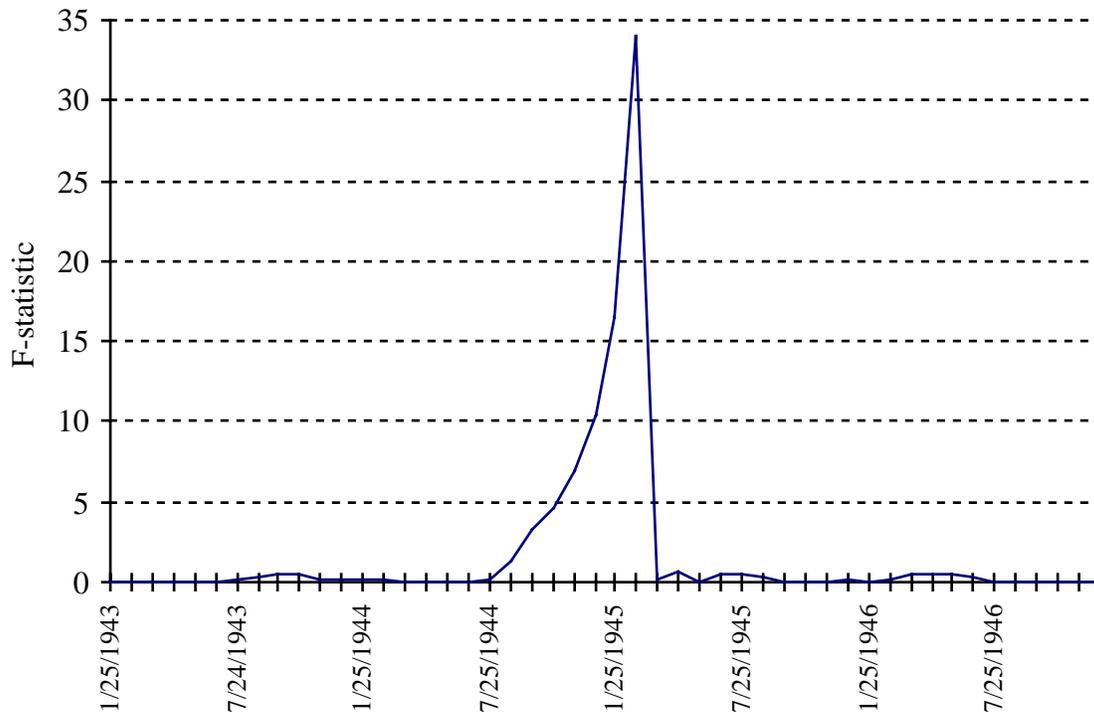
Three further points warrant comment: First, applying only the last step of the procedure to the data would yield inappropriate results, since the last step was developed under the assumption that there is only one break point in the series. If there was a second shift, which reversed the first, the algorithm described in step four might very well miss both shifts. To address the problem, we look for mean shifts in short 'windows' only. Hence we need steps one to three to determine which periods we should look at.

Second, since the bond price series contain a unit root, test statistics based on regression residuals will have a non-standard distribution. For step four, we therefore generated Monte Carlo critical values for the Wald test under the null hypothesis of no structural breaks[16].

Finally, we also tried to test for variations of the bond index of a specific country *relative* to the index of all government bonds traded in Zurich. That is, we rewrote equation (1) as

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[16] Critical values for the F-tests of no breaks were approximated with 5000 Monte Carlo simulations of the equation $\ln p_t = c + \ln p_{t-1} + \varepsilon_t$, with $c=0.1$ and $se(\varepsilon_t)=0.1$. The resulting 90-, 95- and 99-percent critical values are 3.14, 4.32 and 8.00 respectively.

$\ln p_t - \ln \overline{p}_t = \beta_0 + \beta_1 \ln p_{t-1} + \beta_2 \ln \overline{p}_{t-1} + \varepsilon_t$. Such a specification would seem to be more in line with the excess return literature frequently used in finance studies (see, for example, Campbell, Lo and MacKinlay, 1997). We did, however, find the same breakpoints as we did with the first procedure suggested, and the size of the effects did not change dramatically (none was reversed). Since we believe that the coefficients of the specification presented in equation (1) are more easily accessible, the first specification only is used.

The capital market is simultaneously influenced by a great number of factors. The econometric method suggested here allows us only to control some of them. Nevertheless, the results of our analysis are encouraging.

2. F-Tests for Structural Breaks for different Countries

Figure 10: F-Tests for Structural Breaks in the Index of
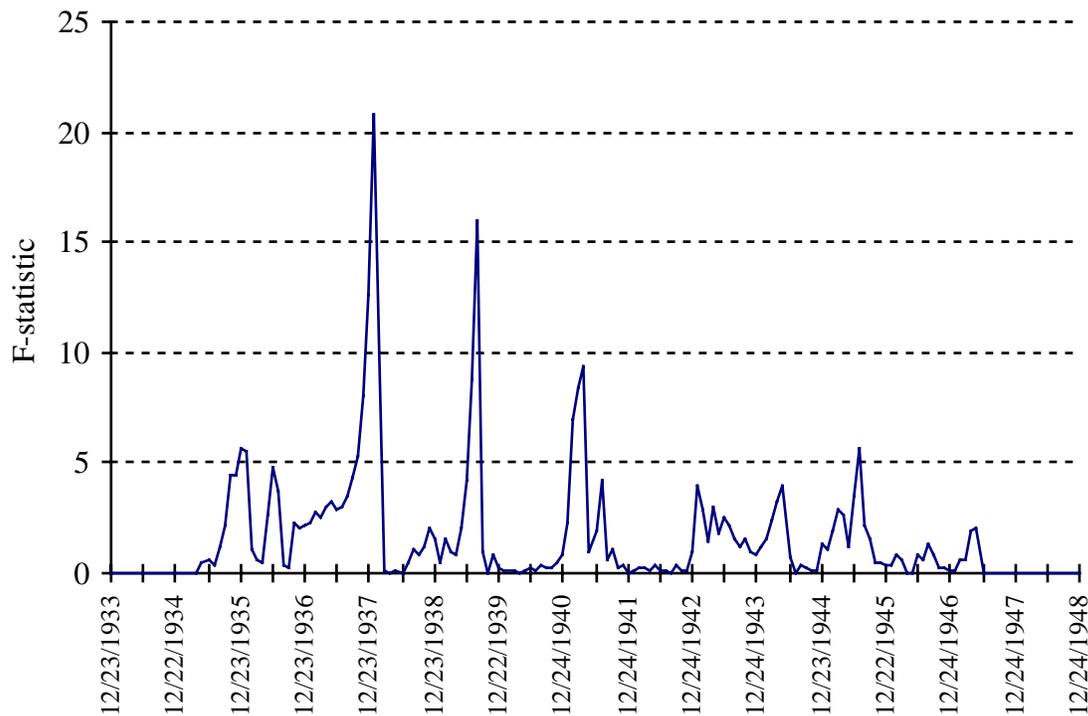Government Bond Prices, Austria 1933 - 1948

Figure 11: F-Tests for Structural Breaks in the Index of
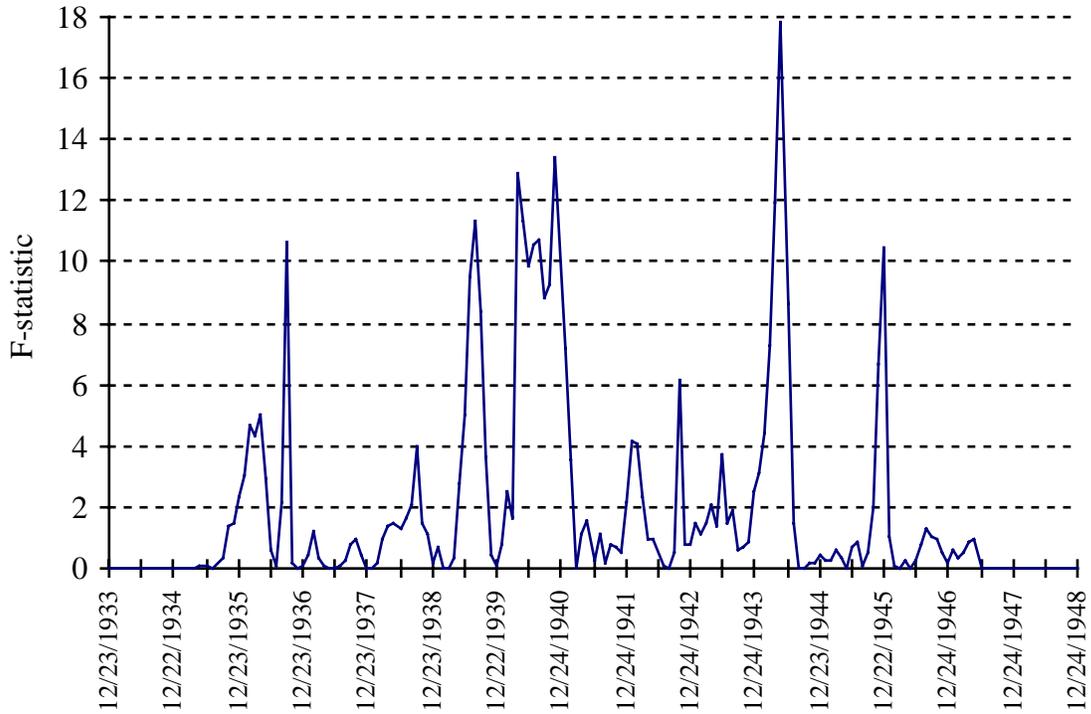Government Bond Prices, France 1933 - 1948

Figure 12: F-Tests for Structural Breaks in the Index of
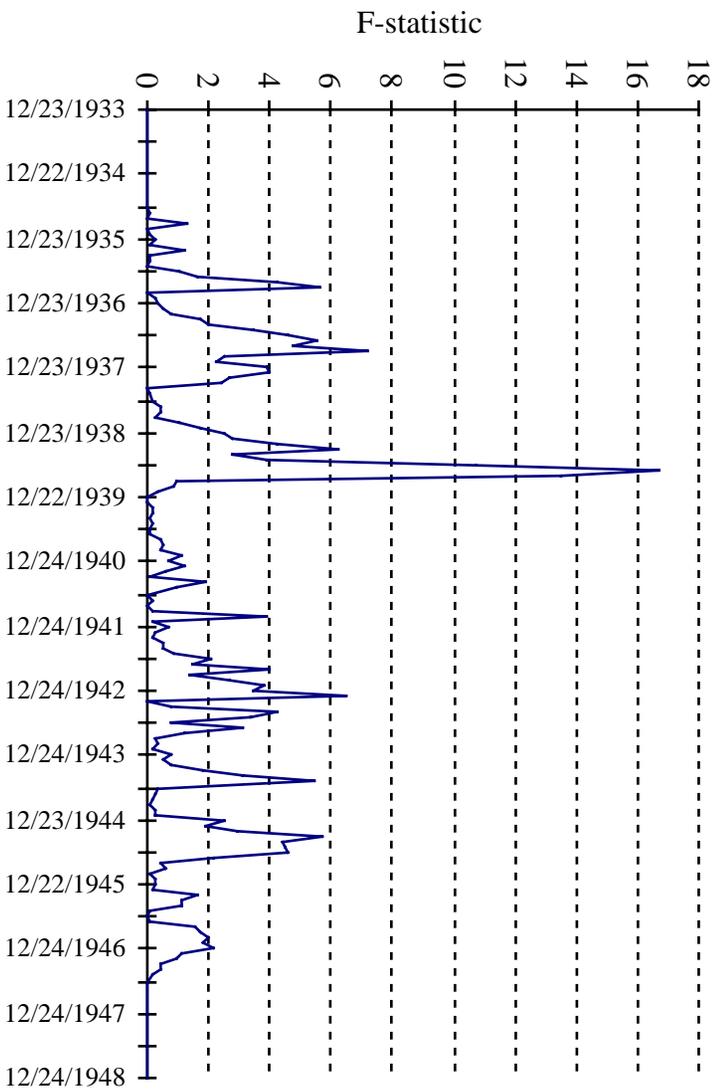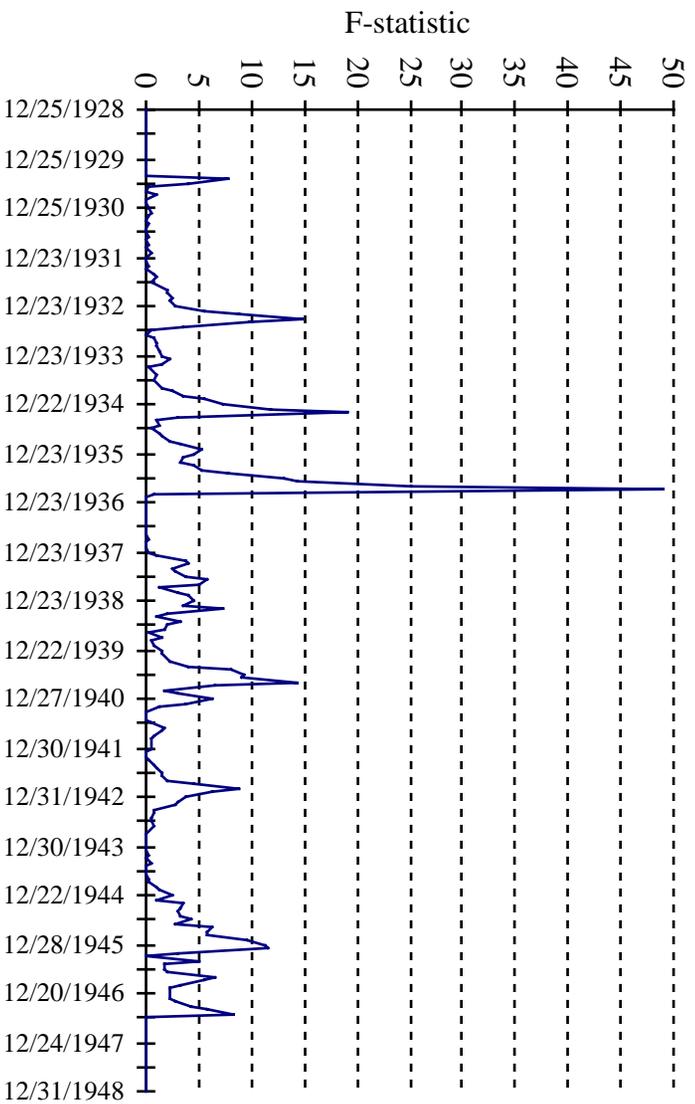Government Bond Prices, Belgium 1933 - 1948

Figure 13: F-Tests for Structural Breaks in the Index of
Government Bond Prices, Switzerland 1928-48

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