CESifo *Working Paper Series*

WARS AND MARKETS: HOW BOND VALUES REFLECT WORLD WAR II

Bruno S. Frey
Marcel Kucher*

Working Paper No. 221

December 1999

CESifo
Poschingerstr. 5
81679 Munich
Germany
Phone: +49 (89) 9224-1410/1425
Fax: +49 (89) 9224-1409
http://www.CESifo.de

---

* We are grateful to Knut Borchardt, Gary S. Becker, Robert Chirinko, Werner De Bondt, Reiner Eichenberger, Lars Feld, Lorenz Goette, Timothy Guinnane, Jakob de Haan, Gebhard Kirchgaessner, Felix Oberholzer-Gee, Jan Osterloh, Juerg de Spindler, Peter Stolz and Isabelle Vautravers for their helpful comments.

CESifo *Working Paper No. 221*
December 1999

WARS AND MARKETS: HOW BOND VALUES REFLECT WORLD WAR II

Abstract

Historical events are reflected in asset prices. In this paper, we analyse government bond prices of Germany and Austria traded on the Swiss bourse during *WWII*. Some war events that are generally considered crucial are clearly reflected in government bond prices. This holds, in particular, for the *official outbreak* of the war and the loss and gain of *national sovereignty*. Other events to which historians attach great importance are *not* reflected in bond prices: The most prominent example is Germany's *capitulation* in 1945. The analysis of financial markets provides a fruitful method to evaluate the importance contemporaries attached to historical events.

Keywords: Financial markets, economic history, WWII, Europe, cliometrics

JEL Classification: G1, N24, Z00

Bruno S. Frey
University of Zurich
Institute for Empirical Economic Research
Bluemlisalpstr. 10
8006 Zurich
Switzerland
email: bsfrey@iew.unizh.ch

Marcel Kucher
University of Zurich
Institute for Empirical Economic Research
Bluemlisalpstr. 10
8006 Zurich
Switzerland
email: kucher@iew.unizh.ch

WARS AND MARKETS:

HOW BOND VALUES REFLECT WORLD WAR II

by

BRUNO S. FREY AND MARCEL KUCHER

UNIVERSITY OF ZURICH

INTRODUCTION

Political events are reflected in asset prices. A good example would be the impact of the United Nations' peacekeeping-policy on exchange rates: while the missions in Lebanon resulted in a long-lasting positive effect on the exchange rate, no systematic changes induced by the UN sanctions could be identified in the South African exchange rates (Sobel, 1998). As for wars, important events during the US Civil War have been shown to systematically affect the exchange rate of Greenbacks relative to the gold dollar (Willard *et al.*, 1996).

This paper empirically analyses the relationship between financial markets and history for particular assets and for a particular period. We are interested in knowing how far major events of World War II are reflected on capital markets, and to which extent fluctuations of capital market values can be related to major events in that War. We concentrate on the two main actors of the side of the axes, Germany and Austria. While in the eyes of most historians, the former was mainly responsible for the outbreak of WWII, the latter was annexed by Germany in 1938. From then on, the two countries formed *Grossdeutschland*, and in that capacity became a main actor in WWII.

Bond values can be hypothesised to reflect war events. In particular, traders are interested in knowing the likelihood of, say, a German defeat in the war, with a concomitant loss of interest payments and the capital sum at maturity. Hence, we predict a fall in the bond prices should

any war event negatively affect that probability, *ceteris paribus*. For Austria, the situation is somewhat different. Though the Germans formally acknowledged the Austrian public debt when they annexed it, at the same time, they applied tight German foreign currency regulation to Austrian bonds (Schwab, 1948). We therefore predict that the Austrian government bonds ceteris paribus experience a fall in value with an extension of the Nazi rule, i.e. the war, and a rise when its end becomes more likely.

For both, Germany and Austria, we find systematic effects of major war events on asset prices. The outbreak of WWII on September 1, 1939 (German attack on Poland) is reflected in a major downturn of the bond values of Germany and Austria. The traders on the stock market were thus pessimistic about the success of the Nazi war machine from the very beginning. German bond prices also fell drastically when the United States entered the war in December 1941. In Austria, bond prices exhibited a downward break when Germany annexed it (March 13, 1938). The German 6th army capitulated at Stalingrad on February 2, 1943. Traditional historians attribute great attention to this event, often characterising it as *the* turning point of the war (see, e.g., Cartier, 1978). However, the bond market foresaw the disaster much earlier: the data shows a significant negative structural break in November 1942 when the Russian army undertook a large counteroffensive against the Germans and encircled the 6th army at Stalingrad. The analysis of the asset market thus suggests that November 1942 is a more appropriate turning point of the war in the East.

As a *complementary* method to evaluate particular sentiments existing at a given moment of time, analysing data from financial markets has at least three advantages:

1. By analysing financial markets we direct our attention towards the actual *behaviour* of thousands of people directly and indirectly engaged in stock markets (compared to only *intentions*, *ideas* or *comments* of the writers of historical documents). This of course greatly reduces the incentives to behave strategically.

2. People who are active on financial markets bear a high monetary *risk*. This, of course, gives them a strong incentive to gather all the relevant *information*.

3. Financial markets usually exhibit a high predictive power. It results from the existence of so-called *marginal traders*. This type of traders decides on a relatively unbiased basis and collects the important information carefully. In the extreme case, only one such trader could

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).

The remainder of this paper is organised as follows: Section I investigates the relationship between financial markets and historical events. A description and overview of the data is given in section II; the following section presents the econometric methods used. Section IV discusses the break points identified as well as the corresponding changes in government bond values for Germany and Austria. Section V analyses break points in the *difference* between the German and the Austrian bond indices in order to formally test the hypothesis that the two kinds of bonds were 'politically' merged. The final section draws conclusions.

I. Financial Markets and History

Financial markets reflect the actual and expected future development of the *assets* in question, in particular the probability that they are serviced, paid back (in the case of bonds), and remain tradable (for instance that no currency restrictions prohibit the repatriation of the funds invested). Financial markets are therefore *not per se* related to the fate of a *nation* or *population*. A nation may disappear but the respective *financial assets* may survive. Normally however, there is a strong correlation of the fate of a population and/or nation with the values of traded assets. In most cases, when a nation is destroyed, its public debt is neither serviced any longer nor paid back at maturity, a fact that the financial markets reflect by a drop in value to zero (if there is no hope that the debt will ever be honoured). Similarly, if the population of a country is negatively affected (say by natural catastrophes or a war), the respective government may be unable to service its public debt, so that the population's fate is again reflected in the financial market.

Financial markets do not act by themselves; rather, they reflect the evaluation of historical events as well as the expectations of a particular group of persons, the *traders*. They are far from representative of the population. Nevertheless, they have strong monetary *incentives* to take into account the judgements of other traders in the market. A mistaken forecast, for example, directly affects their own income and wealth.

The traders only partly deal for themselves but mostly for investors, i.e. a much wider group of persons. They comprise not only private capital owners but also persons acting for institutional investors such as firms and pension funds. In most cases it is unknown who the investors are; in

principle the final actors may be situated anywhere in the world. Movements on financial markets are therefore driven not only by expectations of the people directly engaged in trading but also actors less directly affected.

One problem that may arise by analysing financial markets, is that a historical fact may have been predicted in advance by the people active on the financial markets in which 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 much 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 did adjust accordingly, a break in the price series can still be identified.

Historians deal with past economic and political events in a quite different way. They carefully collect and select facts and interpret them in the light of their general knowledge of their field and the particular circumstances obtaining (see e.g. Carr, 1961, Handlin, 1954 or Marwick, 1970, who gives extensive references to the literature). Such interpretation is necessarily *ex post facto*, i.e. after the consequent development is known. This knowledge may bias the evaluation of the events, and may lead to "facts" being overlooked or over-emphasised as the case may be. This problem is most obvious in the case of wars. Once the outcome is known, say a crashing defeat of the country considered, it is difficult to objectively analyse why the decision-makers of the country have engaged in the war at all. To simply refer to a misjudgement is unsatisfactory because it would have to be explained why such error was possible to occur. In order to evaluate the historical situation existing at a given moment of time, historians have to take care not to impute information to the then decision-makers which was revealed by subsequent developments only.

The analysis of financial markets is certainly *no substitute* to the traditional inquiries undertaken by historians. But as a *complementary* method it has the advantage of being quantitative, i.e. it is in the tradition of the new economic history or cliometrics (see e.g. Goldin, 1995, North, 1977 and critically Davis, 1968).

II. THE ASSET MARKET

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 with a strong influence on capital markets were either introduced or tightened up soon after the Nazi-takeover, i.e. in 1933[1]. The only relevant market on which government bonds of the countries considered were freely traded was the Swiss stock exchange. For reasons of neutrality, the Swiss government did neither control price movements nor the extent of trading and there were almost no restrictions for foreign investors. Trading was stopped during May and June 1940 only, when it was unclear whether the German forces would outflank the Maginot line in the North, i.e. by invading Belgium and the Netherlands or in the South (i.e. march 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. As already mentioned, we concentrate on the two main players on the side of the Axes, Germany and Austria. Converted into today's Swiss Francs, the value at emission of the 31 German government bonds equalled roughly 3 billion Swiss Francs[2], while Austria borrowed about 590 million Swiss Francs. Our analysis considers a weighted index of the values of all government bonds issued in Switzerland after 1922 for each of the two countries.

It is important to note that the bonds of both countries 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

---

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

[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.

changing the cost to the respective government of servicing the debt. But since exchange rates of the German Mark as well as of most other 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.

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'.

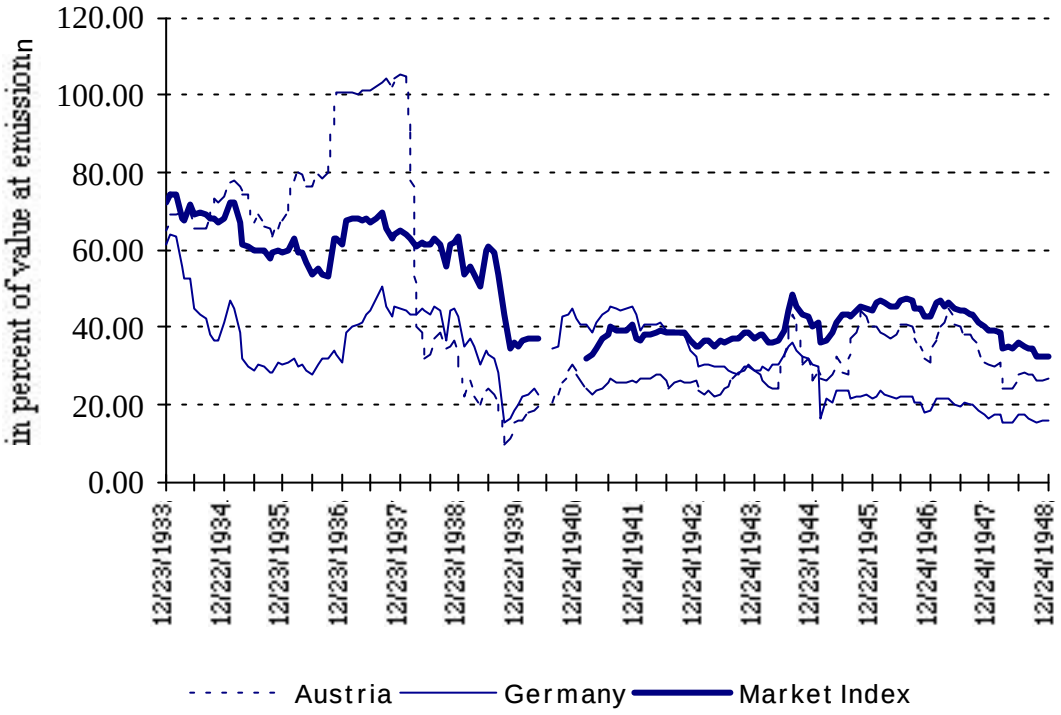
There is, however, limited information available concerning the *extent of trading* in government bonds on the Swiss stock exchange. Unfortunately, the Swiss National Bank did not keep any records regarding the turnover in stocks or bonds. Turnover was, however, taxed by the Swiss government and the 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 in Switzerland 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 government bonds each accounted for roughly 30 percent of the annual turnover, whereas the respective share of Austria stood at six percent.

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 of the remainders 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 analyse 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 1933 to December 1948. Due to lack of data we can not go back any further even though it would be interesting to analyse the effects of the Nazi takeover. The data were

collected from the '*Monatsberichte der Schweizerischen Nationalbank* (monthly publication of the Swiss National Bank), January 1929 - January 1949[3].

Figure 1

Index of the German and Austrian Government Bonds traded in Switzerland



Source: Monthly Publication of the Swiss National Bank (SNB) 1933 - 1948

Bond prices are affected by war events that cause investors to believe that the respective government might default on the coupons or the capital sum at maturity, as well as the time value of money. Hence, any conditions that affect the interest rate in money markets should also affect bond prices. In our econometric work we therefore control for general market movements by introducing an index of all traded government bonds traded in Zurich as an explanatory variable (for details, see section III below). Figure 1 shows the monthly index of the German and the Austrian government bonds traded at the Swiss stock exchange, as well as the market index. Roughly 50 percent of the market index consists of foreign government bonds, of which Germany and Austria hold a share of about 30 percent and seven percent, respectively.

[3] The data can be found in table 14 (1934 -1938 and 1941 - 1946), table 18 (1939), table 17(1940) and table 12 (1947 -1949) of the '*Monatsberichte der Schweizerischen Nationalbank* '(Monthly publication of the Swiss National Bank), January 1934 - January 1949.

In the long run, there is a strong downturn in the German government bonds, which was especially marked between 1933-1936. This is rather surprising as the rise of Hitler to power has often been attributed to the "capitalists" who considered him a stronghold against Communism (see, e.g., Bracher 1964). The capital market offers quite a different evaluation. The bond values strongly recovered in 1937/38 but fell drastically from the middle of 1938 to the end of 1939 when WWII broke out. There was again a rise in the value of German government bonds after the successful *Blitzkrieg* in the beginning of 1940. But it did not last long: From the second half of 1941 on there is a permanent fall in German bond values indicating that the stock market soon predicted that the Nazis would lose the war, the debt would no longer be serviced and the capital would be lost.

In contrast to Germany, the index for Austria shows a marked increase in value between 1933-1937. There was a huge drop with the *Anschluss* (annexation) by Germany in 1938, and the index remained significantly below the German index until 1943. Starting in mid-1944, the Austrian government bonds recovered slightly and outperformed the German index until the end of the sample period.

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* - a 'fact' which the markets obviously did not accept.

III. Econometric Techniques of Analysis

Our approach is designed to find structural breaks in the series of bond prices. To address this task, we follow a sequential test procedure based on Banerjee *et al.* (1992)[4].

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

$$(1) \qquad \ln p_t = b_0 + b_1 \ln p_{t-1} + b_2 \ln \bar{p}_t + e_t$$

[4] A similar procedure were applied by Sobel, (1998) or Willard, *et al.* (1996) in their analyses of the Greenback market.

for each of the two 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 measure of the market performance as a whole), the $b's$ are the parameters to be estimated and e_t is a white noise error term. A Wald test associated with the hypothesis that there was a structural break in the middle of the window is then calculated. The idea behind step one is to estimate an autoregressive process and then check for changes in the constant; this is the procedure followed in most recent stock-market studies. It implies that bond prices follow an exponential Brownian motion (an overview can be found in Duffie, 1996)[5]. 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 correct for factors that might influence the value of all bonds traded (like changing real interest rates, inflation, etc ...).

The regression is estimated again in a second step, this time using a 36-month window that begins one month later, that is January 1934. Step two is then repeated over and over, each time moving the window by one month, until the entire period has been covered. The F-statistics from all the Wald tests can be seen in the following section. By searching for peaks in the series of F-statistics the first two steps identify the dates where the null hypothesis of no structural breaks is most strongly questioned.

The third stage of the econometric procedure constitutes of picking the windows around the dates for possible structural breaks found in step one and two.

In the last stage, 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):

$$(2) \qquad \ln p_t = b_0 + b_1 \ln p_{t-1} + b_2 \ln \overline{p}_t + g_s D_{st} + e_t \qquad \text{with s = 6, ... , 42}$$

where D_{st} = 1 if date *t* is on or after date *s* and zero otherwise. The parameter g_s measures a change in the conditional mean (i.e. a shift in the mean price index *ceteris paribus*) that occurs at date *s*. Since all the prices are in logs, g_s can be interpreted as the percentage change in the

[5] In fact, we also did run regression with autoregressive processes of up to sixth order but did not find any

conditional mean. We estimate equation (2) repeatedly each time moving *s* by one month. For each resulting equation it is tested whether g_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 add six observations at the beginning and at the end of the windows examined in this last step. So for the first equation estimated in step four, *s* is set at date six of the new window (which equalled date one in the original window).

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 were a second shift that reversed the first, the algorithm described in step four may very well miss both shifts. To address the problem we look for mean shifts in rather 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. Critical values for the F-tests of no breaks were approximated with 5000 Monte Carlo simulations of the equation $\ln p_t = c + \ln p_{t-1} + e_t$, with c=0.1 and se(e_t)=0.1. The resulting 90-, 95- and 99-percent critical values are 3.14, 4.32 and 8.00 respectively.

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 $\ln p_t - \ln \bar{p}_t = b_0 + b_1 \ln p_{t-1} + b_2 \ln \bar{p}_{t-1} + e_t$. Such a specification would seem to be more in line with the excess return literature frequently used in finance studies (see, for example, Campbell *et al.*, 1997). We did, however, find the same breakpoints as we did with the procedure first 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, we will in the following present results only from this first specification. In order to formally test the hypothesis that German and Austrian bonds

---

different results.

'politically' merged after the Anschluss, we did, however, analyse the differences in price movements between German and Austrian government bonds in a way similar to the one suggested above. Details are presented in section V below.

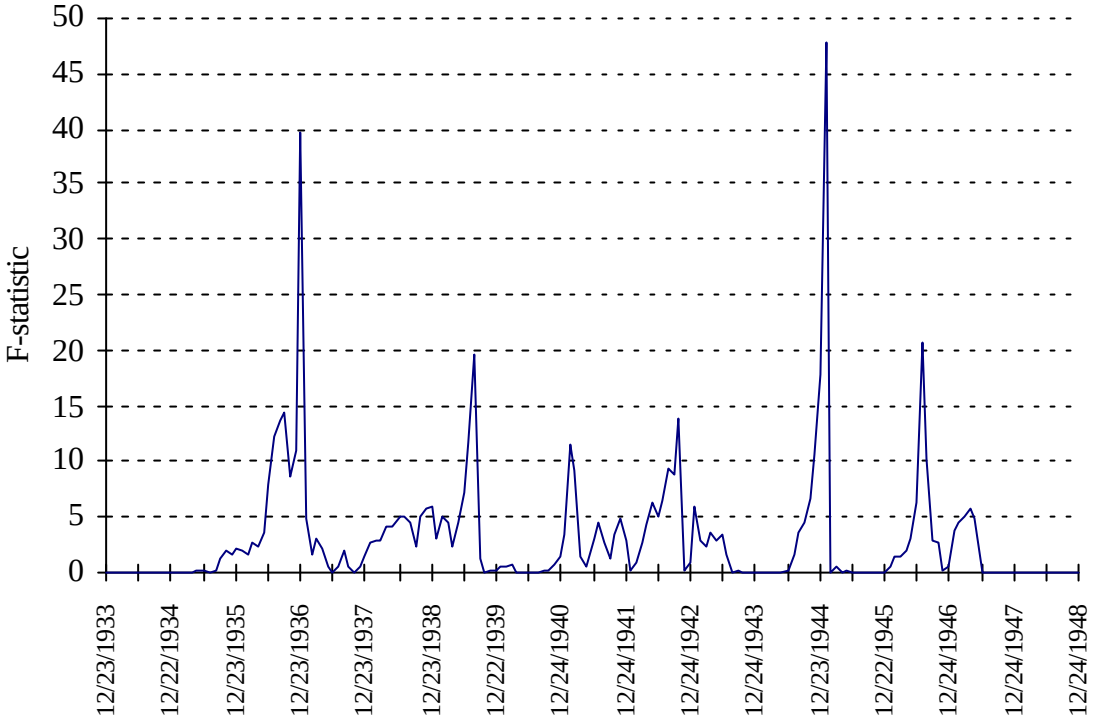
IV. RESULTS

A. Germany

Steps one to three of our econometric analysis identified six possible break points for Germany (as exhibited in figure 2 showing the F-statistics). Table 1 gives a survey of the resulting break points and the corresponding percent changes in the conditional mean price index.

Figure 2

F-Tests for Structural Breaks in the Index of Government Prices, Germany 1933 - 1948



German government bonds experienced a strong upward surge beginning in summer and fall of 1936. In July/August of that year, the conditional average index rose by more than 7%. This can be attributed to the Olympic Games in Berlin, which took place in August 1936 and which made the Nazi regime look peaceful to many. Thus the French delegation, for example, used the fascist salute upon entering the stadium at the opening ceremony. The market was bullish until January 1937 when it 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 was initiated on September 1, 1939 when German troops invaded Poland but the stock market interpreted the systematic sable rattling by the Nazi government in a strongly negative way already at the end of 1938 when the average index fell by around 16%. The actual start of the war sent it down by 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 effects of the German Blitzkrieg - victories are not reflected in our data. But figure 1 shows clearly that the average level of the German government bond values rose back to a level similar to the one 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 1

Structural Break Points and corresponding Events for Germany

Date	Percentage change in German Bond Index	Major events
July 1936	+7.9 %*	Olympic Games in Berlin (July 30 - August 16)
March 1939	-17 %**	Invasion of Czech Republic (March 15-16)
Sept. 1939	-38.7 %**	Outbreak of WW II (Sept. 1)
Dec. 1941	- 4.7 %**	Pearl Harbor, War-Entry of USA (Dec 7-11)
Nov. 1942	- 5.5 %***	Russian offensive at Stalingrad (Nov - Feb 2)
Feb. 1945	- 34.0 %***	Jalta Conference (February 4 - 11)

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

The fourth structural break is identified in December 1941 but the decline of average bond prices is rather small (around 5%). It reflects a major war event which was unpredictable,

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 (again by about 5%) occurred in November 1942. In that month, the Soviet army started a large counteroffensive against the German 6th army and parts of the 4th panzer army. More than 300,000 German troops were encircled at Stalingrad. The capital market considered the launching of the offensive to be more significant than the capitulation by field marshal Friedrich Paulus three months later (2 February, 1943). The traders thus predicted the actual defeat when its first signs were visible, and not when it was consummated. There is actually a significant *positive* break in the index in February 1943 of about 8% which is but very sensible to small movements of the estimation-window. Since this break was not very stable, we do not show it in the table above. It may however indicate that while the German defeat was clearly discounted in the German bond values, the unexpectedly large-scale capitulation of the German troops engaged was seen as improving the chance of shortening the war.

The last break point indicated by the data took place towards the end of the war. Average bond prices fell by 34 percent in February 1945 when the Allied forces took the Ruhr and reached the Rhine, and the Soviets invaded East Prussia. The capitulation of all German troops in Rheims and Berlin (7 and 9 May, 1945) was obviously foreseen by the capital market when the Allied forces entered the heartland of the Reich.

B. Austria

The econometric analysis of the Austrian government bonds identifies five dates for possible structural breaks of which three proved to be statistically significant in the fourth step of the econometric procedure (see figure 3 for the F-tests and table 2 for a survey of the results).

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).

In tandem with Germany, the outbreak of the war strongly depressed average Austrian government bond values (again minus 46% in September 1939).

Figure 3

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

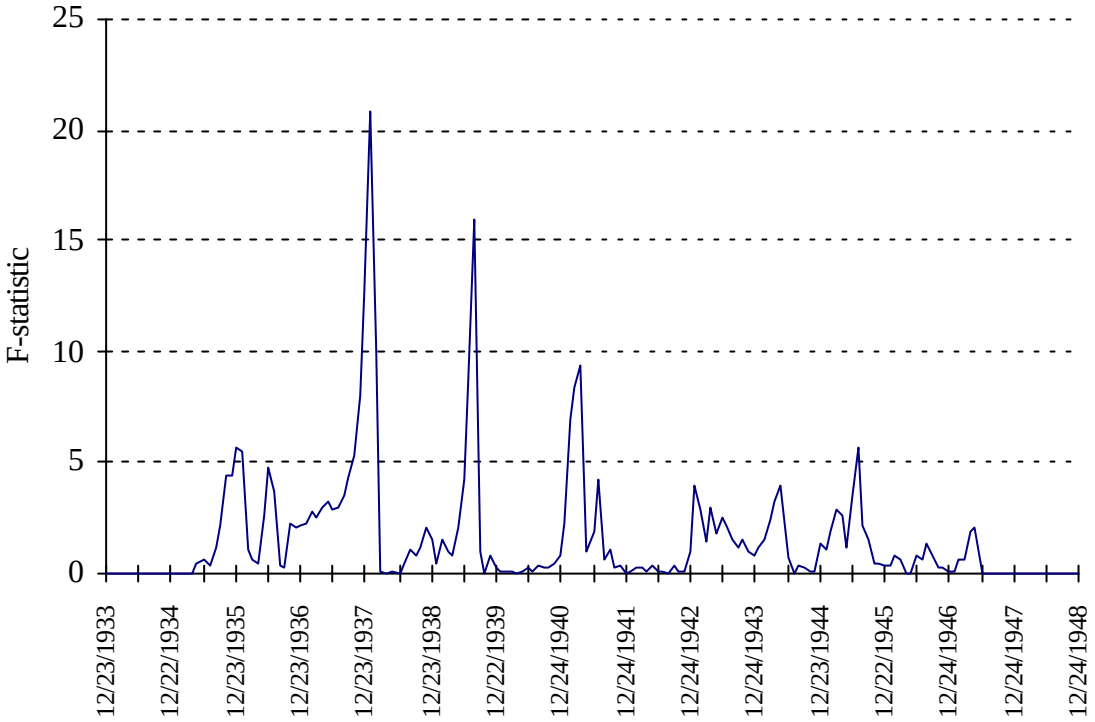


Table 2

Structural Break Points and corresponding Events for Austria

Date	Percentage change in Austrian Bond Index	Major events
March 1938	- 45.7 %**	Annexation of Austria (
Sept. 1939	- 46.2 %**	Outbreak of W.W. II
Aug. 1945	+ 11.5 %*	Potsdam Conference

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

The capitulation of the German forces (May 1945) does not appear in the data for Austria. One reason for this might be that the future of Austria was taken to be uncertain and traders could not clearly predict how it affected 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 of its own, which is reflected in an increase in average bond prices of 12%.

V. Did the German-Austrian Unification Affect Financial Markets?

One historically interesting question might be whether financial markets believed that Germany and Austria really were politically merged forever. Had they been fully integrated, the two bond indices should have followed the same data generating process. This would imply that both government bond time series would feature the same break points. As we saw in the preceding section, this was not the case. In this section we will formally test the hypothesis by applying the same econometric technique to the differences between the German and the Austrian bond index. Formally, we rewrote equation (1) as follows:

(1') $$\left[\ln p_t^G - \ln p_t^A\right] = b_0 + b_1\left[\ln p_{t-1}^G - \ln p_{t-1}^A\right] + b_2 \ln \overline{p}_t + e_t$$

where p_t^G and p_t^A now stand for the index -value of all German and Austrian government bonds respectively on date *t*, the index of all government bonds traded in Zurich $\overline{p_t}$ still corrects for the market performance as a whole, the $b's$ are the parameters to be estimated and e_t is a white noise error term. All other steps of the econometric procedure have, of course, been adapted analogously.

As defeat loomed for Germany, changes in the probability of first Austria disappearing and later re-emerging as a sovereign nation that would honour its obligation can be hypothesised to be embodied in the difference between German and Austrian bonds. Thus any events that *diminish* the probability of Austria re-emerging as an independent state should have a negative effect on Austrian bond prices and therefore *enlarge* the difference between the two bond indices. This would result in a *positive sign* of the coefficient of the dummy variable measuring a break. Alternatively, events that *increase* the probability should by the same process reduce the difference between the two bond indices. Events that do not change this probability should not show up as structural breaks. The results from the comparison can be found in table 3.

As expected, events that do not change the probability of Austria losing or regaining national sovereignty do not appear as structural breaks. This is true for a number of events as, e.g. the

outbreak of WWII or the US declaration of war on Germany. There are, however, several events that changed this probability. Most prominently, of course, the *Anschluss* in 1938. In comparison to the German index, the annexation lowered the index of Austrian government bonds by as much as 76 percent. In 1940, the fast Germany victories in the west also made it more likely that Austria would remain part of the German Reich for a long time.

On the other hand, the Jalta conference made it clear that the Allied Forces would only accept an unconditional surrender of Germany. Although Austria was at that time still an integral part of the German Reich, this had a very negative effect on German only, but almost no effect on Austrian government bonds. Capital markets obviously considered it likely that Austria would remerge as a sovereign nation and hence would not be negatively affected by the allied decisions (as can be seen by the 30 percent *gain* of the Austrian index over the German). The re-emergence of Austria as a sovereign nation became a fact on the Potsdam conference. This had a positive effect on Austria but none on Germany – on the capital markets, a thirty percent gain of the Austrian over the German index followed.

These results support the view, that though Austria was officially part of *'Grossdeutschland'*, investors never found the 'political' merger compelling.

Table 3

Structural Break Points and corresponding Events for Differences between Germany and Austria

Date and major historical events	Percentage change in difference of Bond Indices
March 1938, Annexation of Austria	+ 75.9 %***
May 1940, German Invasion of Belgium, France and Holland	+ 7.5 %***
February 1945, Jalta Conference	- 30.8 %***
August 1945 Potsdam Conference	- 29.3 %***

Notes: Column (2) is the percent change in the conditional mean of the difference between the German and the Austrian government bond index. *** indicates statistical significance on the 99-percent confidence level.

The evidence presented in the preceding two sections suggests that mainly two factors are responsible for movements on capital markets: (1) Events that change the probability of a defeat or victory of a country are reflected in statistically significant structural break points. (2) The likely loss or gain of national sovereignty results in structural break points.

VI. Conclusions

Looking at asset prices traded on bond markets "provides a useful way for studying how people in the past responded to various events..." (Willard *et al*., 1996 p. 1017). It represents a new way of interpreting the importance thousands of people directly and indirectly engaged in stock exchanges attributed to various war events. This approach does in no way substitute for a historical analysis but it complements it in a useful way. It thus constitutes a further step in the direction of a quantitatively oriented history undertaken by economists.

We find that some events connected with WWII, and generally taken to be of first rate importance, are clearly reflected in government bond prices. This holds, in particular for the beginning and the end of the war. For both Germany and Austria the outbreak strongly depressed asset values. Traders thus considered the war to be a very negative event for the two countries responsible for it. The end of the war was considered negative for Germany but positive for Austria.

Two further events merit to be singled out. The Olympic Games of 1936 was not only a propaganda scoop but they also positively affected the evaluation of the Nazi-government among stock exchange traders. On the other hand, the annexation of Austria by Germany in 1938 - which looked as if it were overwhelmingly and passionately welcomed by the Austrian population - negatively affected the evaluation of Austrian government bonds; it was considered to be to the disadvantage of Austria by the people who put their own personal fortune at risk on the Swiss bourse. Moreover, we have presented evidence, that – at least from 1943 on – Austria was no longer considered an integral part of *Grossdeutschland* by the bond markets.

The analysis here undertaken suggests that the bond market traders were quite successful in their evaluation of the future course of political and military events. World War II was from the very beginning considered to be a losing enterprise for Germany and a deadly threat to German

public foreign debt - quite in contrast to the gain in land, wealth and power which the Nazi leaders promised their subjects. It also shows that asset markets are able to foresee particular events, such as the defeat of the German forces at Stalingrad, weeks if not months before they actually occurred. This is not all too bad a record which may be of considerable use for the interpretation of history.

References

Banerjee, Anindya, Robin L. Lumsdaine and James H. Stock (1992). „Recursive and Sequential Tests of the Unit Root and Trend Break Hypotheses: Theory and International Evidence.“ *Journal of Business and Economic Statistics* 10(3), 271-287.

Bracher, Karl Dietrich. "*Die Auflösung der Weimarer Republik. Eine Studie zum Problem des Machtzerfalls in der Demokratie. 4th ed."* Villingen: Ring, 1964.

Campbell, John Y., Andrew W. Lo and Craig A. MacKinlay (1997). *The Econometrics of Financial Markets*. Princeton, NJ: Princeton University Press.

Carr, Edvard H. (1961). *What is History?* London: MacMillan.

Cartier, Raymond. "*La seconde guerre mondiale*." Paris: Larousse, 1978

DeBondt, Werner and Richard Thaler. "Does the Stock Market Overreact?" *The Journal of Finance*, July 1985, 40(3), pp. 793-805.

Davis, Lance (1968). „‘And it Will Never Be Literature’: The New Economic History: A Critique“. *Explorations in Economic History*, 6 (Fall): 75 - 92.

Duffie, Darrell (1996) *Dynamic Asset Pricing Theory*. Princeton, NJ: Princeton University Press.

Forsythe, Robert, Forrest Nelson, George R. Neumann and Jack Wright (1992). „Anatomy of an Experimental Political Stock Market“. *American Economic Review*, 82(5): 1142 - 1161.

Goldin, Claudia (1995). „Cliometrics and the Nobel“. *Journal of Economic Perspectives*, 9 (Spring): 191 - 208.

Handlin, Oscar et al. (1954). *The Harvard Guide to American History*. Cambridge: Harvard University Press.

Henschy , Reg. "*Freedom at Midnight: Austria 1938-55: A Story of the Traumatic Years of Occupation.*" Worcester, Billings and Son, 1989.

Jost, Hans-Ulrich (1998). *Politik und Wirtschaft im Krieg: die Schweiz, 1938-1948*. Zürich: Chronos.

Marwick, Arthur (1970). *The Nature of History*. London: MacMillan.

North, Douglass C (1977). “The New Economic History after Twenty Years“. *American Behavioral Scientist*, 21 (December): 187 - 200.

Perron, Pierre. "The Great Crash, the Oil Price Shock and the Unit Root Hypothesis." *Econometrica*, November 1989, 57(6), pp. 1361-401.

Smith, Vernon L. (1982). „Markets as Economizers of Information: Experimental Examination of the ‘Hayek Hypothesis’“. *Economic Inquiry*, 20(2): 165 - 179.

Sobel, Russel S. (1998). „Exchange rate evidence on the effectiveness of United Nations policy“. *Public Choice* 95: 1 - 25.

Schwab, Hubert. "*Der Schweizerische Effektenmarkt 1936 - 1946*." Dissertation at the University of Zurich. University of Zurich, 1948.

Weinberg, Gerhard L. (1994). *A World at Arms: A Global History of World War II*. Cambridge, Cambridge University Press.

Willard, Kristen L., Guinnane, Timothy W. and Rosin, Harvey S. "Turning Points in the Civil War: Views from the Greenback Market". *American Economic Review*, September 1996, 86 (4), pp. 1001-1018.