



## Asset Prices and History: The Case of Austria

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**Abstract.** Historical events are reflected in asset prices. Looking at Austrian government bond prices traded on the Swiss stock exchange during WWII provides therefore a useful way of interpreting the importance the thousands of people directly and indirectly engaged in stock markets attributed to various war events. An econometric analysis of the relationship between government bond values and events in Austrian history reveals that some generally considered crucial events connected with WWII are clearly reflected in Austrian government bond prices. This holds, in particular for the beginning and the end of the war. The annexation of Austria by Germany in 1938 which seemingly looked as being overwhelmingly and passionately welcomed by the Austrian population negatively affected the evaluation of Austrian government bonds, i.e. it was considered to be to the disadvantage of Austria by the people who put their own personal fortune at risk.

**Key words:** Financial markets, economic history, WWII, Austria, cliometrics

**JEL codes:** G1, N24, Z00

### I. Why Look at Financial Markets?

Historians carefully collect facts and interpret them in the light of their general knowledge of their field and the particular circumstances obtaining. A major problem is that such interpretation necessarily is *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-emphasized 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 analyze why the decision-makers of the country engaged in the war at all. To simply refer to a misjudgment is unsatisfactory because it would have to be explained how such an error occurred. 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.

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They thus have to make an effort to avoid the 'curse of knowledge', a well-known psychological anomaly (see e.g. Thaler, 1992).

Historians are, of course, well aware of this problem. They make a great effort to capture the information, views, sentiments and feelings existing at the respective time. One possibility is to turn to written sources, another to surveys. Both may be biased by strategic considerations of the writers and speakers. Surveys may be especially unreliable because the respondents have little incentive to answer truthfully, in particular if it is risky to do so. Outright lying in many cases is not the major problem because people have got used to uttering their 'public' preferences when asked by outsiders.

Economists can offer a quite different approach for capturing the 'sentiments' existing at a particular point of time. It is the price movements on financial markets, and in particular the value of stocks and private and public bonds on stock exchanges. Economic and political events are reflected on such financial markets because they affect current returns (and interest payments) as well as the probability that the capital sum is paid back at the due date.

That financial markets and historical events are linked is well known. The story of Rothschild making huge gains by speculating on the change of bond prices induced by the outcome of one of Napoleon's decisive battles is famous. Recently, this relationship has been systematically exploited by applying advanced econometric techniques to identify break points in financial values.<sup>1</sup> Willard et al. (1996) demonstrated in particular that events which occurred in the US Civil War (1862–1866) systematically affected a very special financial market, the rate of exchange of Greenbacks relative to the gold dollar. In some instances the events identified by break points in the exchange rate have not been noticed by traditional historians, and conversely, in hindsight they have taken different war events as crucial.

Financial markets reflect historical events in a *special way*. It is useful to differentiate two aspects.

1. A chosen group of people, the *traders*, act on financial markets. They are far from representative of the population. But they have strong monetary incentives to take into account the evaluations of other traders in the market. A mistaken forecast, for example, directly affects their own income and wealth. This strong *incentive* constitutes a major difference to surveys.

The traders deal only partly for themselves but mostly for investors i.e. a much wider group of persons. They comprise not only private capital owners but also people 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 affected by an event but also by the expectations of those further away. This is another major difference to most surveys where the set of respondents is well determined and where usually only people from the region or country affected by an event are questioned.

2. 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 restriction prohibits the repatriation of the funds invested). Financial markets thus are *not per se* related to the *nation* and *population* historians are typically interested in. A nation may disappear but the respective financial assets may survive. An example is the Anschluß of Austria to Großdeutschland in March 1938. The government of the Reich honored the Austrian government debt but Austria disappeared as a nation.

Often, there is, of course, a strong correlation between the fate of a population and/or nation and 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 which the financial markets reflect by a drop in value to zero (if there is no hope that the debt will ever be honored). 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.

This separation between the fate of the population and of the nation as reflected in financial markets may be an advantage or a disadvantage, depending on the question one is interested in. To take up again the example used above – Austria's Anschluß – the possible changes in the value of the public debt are of interest as far as the fate of the Austrian population and not the fate of Austria as a nation is concerned. As this example shows one must be very careful when establishing a possible relationship between historical events and movements on financial markets. It may be fickle, or change over time, so that interferences from one side to the other may be misleading.

The analysis of financial markets is certainly *no substitute* for the traditional inquiries undertaken by historians. But it is a challenging *complementary* method to evaluate particular sentiments existing at a given moment of time. They have the advantage of being quantitative, i.e. they are in the tradition of the new economic history or cliometrics (see, e.g., North, 1981).

Two kinds of questions may be posed when using financial market data:

- (a) Are the historically established "facts" reflected by financial markets? And if so, did a specific event raise or lower asset values?
- (b) Are breaks in the series of asset prices related to historical "facts"? If so, the analysis corroborates the findings by historians. If not, it provides a good reason to look for the possible causes for the break empirically identified. It may be that historians have overlooked or at least insufficiently emphasized an historical event.

For both types of questions care must be taken to allow for traders' expectations. A historical fact may have been predicted in advance by the people active on the

financial markets. If this is the case the break should be visible before the event or 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 which in many cases is foreseen much in advance. It should be noted however that financial markets tend to overreact to the arrival of news (see, e.g., DeBondt and Thaler, 1985). The overreaction hypothesis implies that even though 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.

In this paper we apply financial market analysis to Austria in the period of World War II. To capture the events leading up to the war, as well as its aftermath, the period 1933–1948 is considered. We look at breaks in the value of *Austrian government bonds*. Unlike all the nations at war, the stock market in Switzerland where Austrian public bonds were traded was not controlled by government intervention. Not being historians but economists we focus on the direction leading from breaks in the value of these bonds to historical events. In a more limited way, we also analyze whether particular historical events such as the *Anschluß*, the outbreak of the war, victories and defeats in the war, and the end of the war are visible as breaks in the series of public bond values.

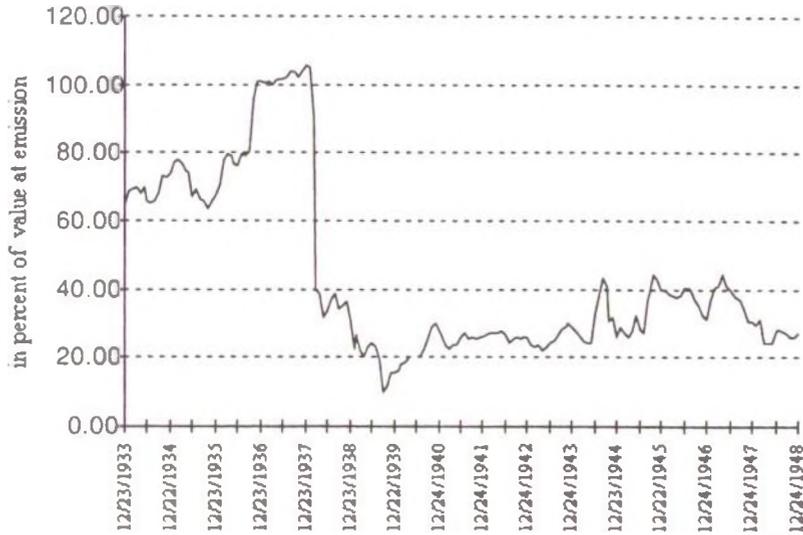
Section II shortly describes the data used. In Section III the econometric approach identifying the breaks is sketched, and Section IV presents the results of our analysis. Conclusions are drawn in Section V.

## II. Data

During WWII, all governments directly or indirectly involved intervened in economic markets, including stock markets. The only relevant market on which Austrian government bonds were freely traded was the Swiss stock exchange.<sup>2</sup> For reasons of neutrality the government did not control it. Trading was stopped only during May and June 1940 when it was unknown whether the German forces would outflank the Maginot line in the South (i.e. march through Switzerland), or in the North (which they did by invading Belgium and the Netherlands). In order to see WWII in perspective, we use monthly data extending from December, 1933 to December, 1948.

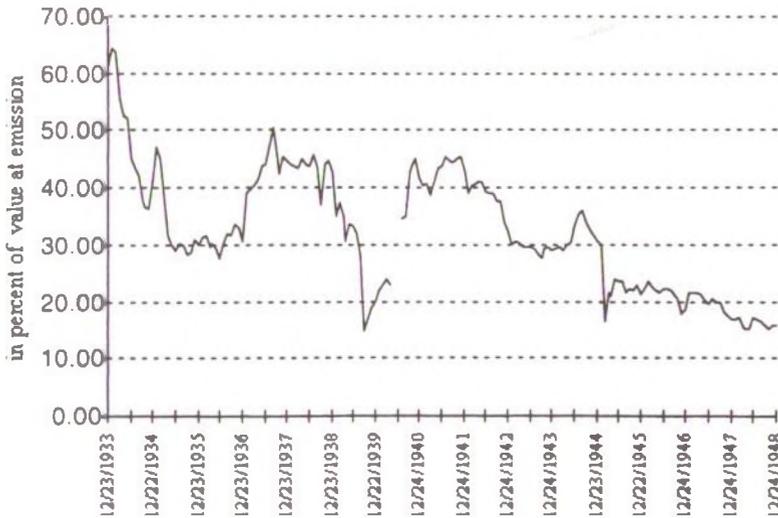
Figure 1 shows the monthly index of the 9 Austrian government bonds traded in Switzerland during WWII. The data were collected from the '*Monatsberichte der Schweizerischen Nationalbank*' (Monthly publication of the Swiss National Bank), January 1934–January 1949.<sup>3</sup> It shows a marked increase in value between 1933–1937. There was a huge drop with the *Anschluß* to Germany in March 1938. Though the Germans formally acknowledged the Austrian public debt, at the same time they applied tight German foreign currency regulation to Austrian bonds (Schwab, 1948). Austrian government bonds remained much depressed thereafter.

The evaluation of Austrian bond values differs significantly from the German government bonds traded in Switzerland (Figure 2).



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

Figure 1. Index of the 9 Austrian government bonds traded in Switzerland.



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

Figure 2. Index of the 31 German government bonds traded in Switzerland

There is a strong downturn in the index of German government bonds between 1933–1936. This is rather surprising as the rise of Hitler to power has often been attributed to the “capitalists” who considered him to be a stronghold against Communism (see, e.g., Bracher 1964). It seems the capital market had a different evaluation. The German government 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 was a permanent fall in German bond values indicating that the stock market traders assumed that the Nazis would lose the war.

The divergence between the Austrian and German government bond values is an interesting fact because after 1938, the two countries formally merged into one, Großdeutschland, a ‘fact’ which the markets obviously did not appreciate.

### III. Econometric Analysis

Our approach is designed to find structural breaks in the series of bond prices. For that purpose an econometric procedure based on Perron (1989) is used.<sup>4</sup>

To address this task we could simply introduce a dummy variable consisting of 0's up to a specific date  $s$  and 1 thereafter, representing thus a structural break which took place at date  $s$ . This could be done for all possible dates  $s$ . Applying such a procedure to the data would, however, yield inappropriate results since it would imply that there is only one break point in the series. If there were a second shift which reversed the first, the algorithm described may very well miss both shifts. To address the problem we look for mean shifts in rather short ‘windows’ only. Hence we first need a procedure to determine which periods to look at.

In order to find all possible turning points, we apply a four step procedure. First we estimate a pure random walk which is the procedure followed in recent stock-market studies and implies that bond prices follow an exponential Brownian motion (a good overview can be found in Duffie, 1996). Using data from a 36-month window starting December 1933 we first estimate the regression

$$\ln p_t = \beta_0 + \beta_1 \ln p_{t-1} + \beta_2 \ln \bar{p}_{t-1} + \epsilon_t \quad (1)$$

where  $p_t$  stands for the index-value of all German government bonds traded at the Zurich stock exchange on date  $t$ ,  $\bar{p}_t$  is the index of all government bonds traded in Zurich (which we use as a measure of the market performance as a whole), the  $\beta$ 's are the parameters to be estimated and  $\epsilon_t$  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 regression is estimated again in a second step, 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, 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

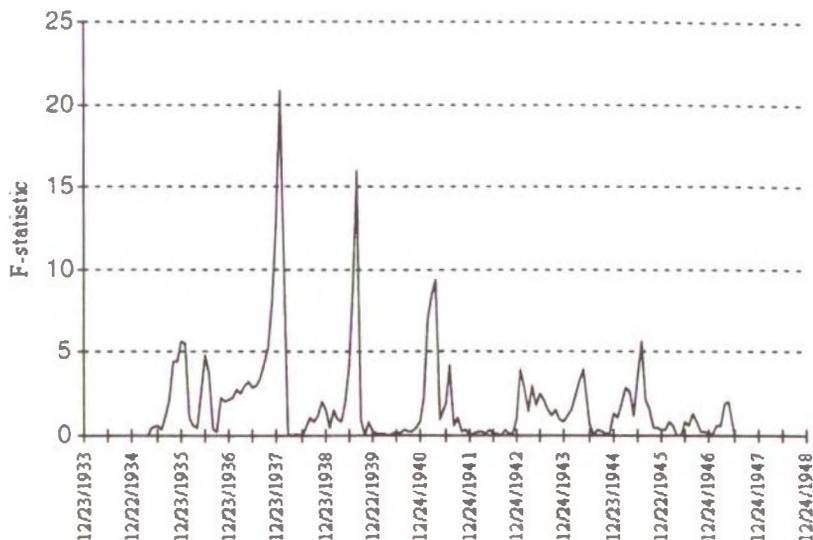


Figure 3. *F*-Tests for structural breaks in the index of Austrian government prices, 1933–1948.

in Figure 3. By searching for peaks in the series of *F*-statistics the first two steps identify four dates for Austria where the null hypothesis of no structural breaks is most strongly questioned (see Figure 3).

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

In the last stage, we test for statistically significant structural breaks within each of the windows isolated in step three, by estimating a series of the following equations

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

where  $D_{st} = 1$  if date  $t$  is on or after date  $s$  and zero otherwise. The parameter  $\gamma_s$  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,  $\gamma_s$  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  $\gamma_s$  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).

The bond price series contain a unit root. Hence, 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  $\ln p_t = c + \ln p_{t-1} + \varepsilon_t$ , with  $c = 0.1$  and  $\text{se}(\varepsilon_t) = 0.1$ . The resulting 90-, 95- and 99-percent critical values are 3.14, 4.32 and 8.00 respectively.

#### IV. Breaks in Values and Historical Events

Our analysis of the Austrian government bond prices identifies five dates for possible structural breaks of which four proved to be statistically significant in the fourth step of the econometric procedure (see Figure 3 for the  $F$ -tests and Table I for a survey of the results).

Table I. 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 WWII
April 1941	+6.9%*	Unclear
Aug. 1945	+11.5%**	Potsdam Conference

Column 2 is the percent change in the conditional mean (i.e., the parameter  $\gamma$ , from Equation (2)).

\*, \*\* and \*\*\* indicate statistical significance on the 90-, 95- and 99-percent confidence levels respectively.

On 13 March, 1938 Hitler declared the *Anschluß* of Austria to Germany, now forming *Großdeutschland*. The prices for Austrian government bonds fell by no less than 46% in that month. A significant drop is visible from the beginning of the year when the Nazi government prepared for that event. It is noteworthy that the traders on the Swiss stock exchange were not fooled by the seemingly enthusiastic support of the *Anschluß* in Austria during the event. Nor were they fooled by the almost unanimous support for the *Anschluß* in a plebiscite undertaken April 10th of the same year in which approximately 4,453,000 of the 4,484,000 electorate voted 'yes', while only 11,924 dared to vote 'no', and 5,776 had the courage to spoil their papers (Henschy 1989).

The outbreak of the war strongly depressed average Austrian government bond values (again a 46% drop in September 1939). The same break is visible for the German government bond prices (39% drop).

The data indicate a significant *positive* break point for April 1941. In that month, the German troops (including many Austrians) occupied Yugoslavia and Greece, and there were German successes by field marshal Rommel's *Afrika Korps*. In

hindsight, it is not clear why these particular events were considered by asset traders to be so important that it affected average Austrian government bonds.

The capitulation of the German forces (May 1945) does not show in the data for Austria. But less surprisingly, it sent the German government bond values downward by 34 percent. One reason why Austrian bond prices were not affected 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 was reflected in an increase in average bond prices of 12%.

## V. Concluding Remarks

The econometric analysis of the relationship between government bond values and events in Austrian history suggests that looking at asset prices traded on stock markets represents a useful way of interpreting the importance the thousands of people directly and indirectly engaged in stock exchanges attribute to various war events. We have emphasized that this approach does in no way substitute for a historical analysis but it may complement it in a useful way. It constitutes a further step in the direction of a quantitatively oriented history undertaken by economists.

Some generally considered crucial events connected with WWII are clearly reflected in Austrian government bond prices. This holds, in particular for the beginning and the end of the war. For Austria the outbreak of the war strongly depressed asset values as it also did for Germany. Traders thus considered the war to be a very negative event for the countries responsible for it. An interesting contrast is that the end of the war was positive for Austria but negative for Germany. The annexation of Austria by Germany in 1938 which seemingly looked as being overwhelmingly and passionately welcomed by the Austrian population negatively affected the evaluation of Austrian government bonds. One interpretation for this fall in the value of Austrian government bonds is that traders were uncertain whether the Nazi government would honor the Austrian government bonds (though it turned out that it did in fact) and whether the interest and capital payments could indeed be enjoyed in view of possible foreign currency regulations and interventions. Another interpretation of the negative evaluation by the market in Austrian government bonds is that the annexation of Austria into Großdeutschland (Anschluß) was considered to be to the disadvantage of Austria by the people who put their own personal fortune at risk.

## Notes

1. The same has been done in an informal way by various scholars. An example is Schwab (1948).
2. The extent of trading in foreign government bonds at the Swiss stock exchange fell from about 2.8 billion Swiss Francs in the year 1937 to about 0.5 billion in 1943 and rose back to about one billion in 1946. Austrian government bonds accounted for roughly 8% of the annual turnover.
3. The index is to be found in Table 14 (1934–1938 and 1941–1946), Table 18 (1939), Table 17 (1940) and Table 12 (1947–1949).
4. The same approach is used by Willard et al. (1996) in their study of the development of exchange rates during the American Civil War.

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