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## Using Financial Markets to Analyze History: The Case of the Second World War

*Bruno S. Frey & Daniel Waldenström\**

**Abstract:** »Vom Nutzen der Analyse von Finanzmärkten für die Geschichtswissenschaft. Eine Untersuchung anhand des 2. Weltkrieges«. This article presents the analysis of financial markets as a supplementary method to the traditional historiographic approach by investigating the perception of events before and during World War II. This approach constitutes an alternative to written sources, which are often biased and commonly do not represent the opinions held in the wider public. In the following, the financial markets approach is used to analyse the perception and anticipation of events before and during the World War II in France, Germany, Denmark, and Norway. Thereby, price data of long-term government bonds for these countries traded in Zurich and Stockholm are used. The presented evidence challenges some common held views, e.g., it can be shown that the invasion of Norway was in part anticipated by contemporaries. Although both methods rely on interpretation the financial markets approach is based on a fundamentally different type of source. Therefore, it can be used as a supplement to the traditional approach.

### 1. How are countries affected by wars?

A central aspect of historical research is to provide explanations for the causes and effects of events that occurred in the past. In order to be more concrete, a

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major war, in particular the Second World War, will be considered such a historical event. History can be analyzed and explained from different perspectives. This paper considers two such perspectives, the first being the *traditional historiographic* approach, in which the main emphasis is on the qualitative analysis of various kinds of historical sources and documents, and the second being what we call the *financial market approach*, a recent methodology for linking significant changes in historical market prices to simultaneously occurring geopolitical events. This study seeks to identify the fundamental characteristics of the two approaches and how they compare in answering some important historical questions concerning the Second World War.

Historians of the Second World War generally ask many important questions in order to comprehend the main causes of war and its impact on societies and their citizens. This study focuses on three of these questions, which are suitable for analysis using historical financial market data. The first question is: *How are countries affected by wars?* This is a broad, descriptive question, aimed at characterizing the war's main course of events, with special attention given to the idiosyncratic elements in the histories of different countries. The second question is: *Did the contemporaries anticipate the outbreak of the war?* This question does not focus on the actual war, but rather on the period just before its outbreak and, more precisely, on the existence of threat assessments among the contemporaries. There are many possible answers, depending what groups in society are targeted. For example, the perceived threat of war on the part of political and military leaders might (for informational or other reasons) differ from the threat of war perceived by the general public. Both groups are worth considering, particularly the latter, since it constitutes quite an important group in democratic societies when analyzing a country's actions. Our third question is: *What were the important turning points of the war?* This is an issue that all war historiographies like to dwell upon, and the answer could be significant. According to historians, a turning point is typically the first event in a series of incidents that eventually turn out to be important for the outcome of the war. Still, if one wishes to highlight the turning points that were regarded as important *at the time* of the war by the contemporaries actively engaged in it, an entirely unique set of dates may show up as turning points. Even if these events turn out later not to have any lasting impact on the war, they may be crucial in understanding the decisions made by people at the time. Hence, depending on the focus of the research question, it may vary as to which approach is most suitable.

Section II of this paper presents a critical discussion of the two analytical perspectives under comparison in this study: the traditional historiography approach and the financial market approach. Specific emphasis will be put on describing the latter, since the former has been the conventional standard among historians for a long time and needs no further introduction. Section III exemplifies the financial market approach for the case of the Second World

War as reflected in the secondary market for government bonds, which is studied for various countries. Section IV presents the results from the empirical analysis of bond market prices, and Section V presents a comparison between these results and the conventional historiographic approach. The final Section VI offers conclusions. It will be argued that both approaches rely heavily on interpretation – but in different ways. They therefore complement each other in a useful way. The analysis of financial markets for highlighting historical events is seen as a useful addition to the historians’ tools. It certainly cannot substitute for standard analysis, but constitutes an interesting new way of analyzing history.

## 2. Two Analytical Approaches

History may be analyzed from several perspectives. This study considers two such perspectives. First, in the dominant *traditional historiography*, which we will outline only briefly (for more thorough investigations, see, e.g., Garraghan, 1946 or Howell and Prevenier, 2001), we point out the problems it has with providing answers to some of the war questions asked in the introduction. Second, we present the more recent methodology, based on analyzing prices recorded on historical *financial markets*. This section identifies the fundamental distinguishing characteristics.

### 2.1 Traditional historiography

Historians deal with past economic and political events in a certain way. Typically, they carefully collect facts and interpret them in the light of their general knowledge of the field and the particular circumstances prevailing. A major problem with this approach is that the interpretation of historians is necessarily *ex post facto*, i.e., with knowledge of later events. This knowledge may bias the evaluation of the events, and may lead to “facts” being overlooked or overemphasized, as the case may be. This problem is most obvious in the case of wars. Once the outcome is known, resulting, for example, in the crushing defeat of the country being considered, it is difficult to objectively analyze why the decision-makers of the country engaged in the war in the first place. To simply refer to a misjudgment is unsatisfactory, because it would require an explanation of how such an error could occur. In order to evaluate the historical situation existing at any given moment in time, historians have to take care not to impute information to the decision-makers of that time, the true nature of which was only revealed by later developments.

Historians are, of course, well aware of this problem and they make a big effort to capture the information, views, sentiments and feelings existing at a given point in time.<sup>1</sup> Written documents are a major source, but sometimes surveys are used (oral history). Both approaches may be biased by the strategic considerations of the writers and orators. In many cases, the sources have been written or spoken in support of a particular cause, and are therefore far from reflecting the reality of the situation. In other cases, the authors of documents or interviews made a special effort to get themselves into a more prominent position, or place themselves in a more beneficial light, again not reflecting the true situation.

Historians tend to focus almost exclusively on various kinds of qualitative methods and written sources, such as letters, memoirs, diaries, newspaper articles etc. Since most of these written pieces of historical evidence reflect the views of the individuals who have written them, focusing on this method is not really suitable for drawing conclusions about views and opinions of the general public in the past. In fact, historians cannot even analyze the views of smaller groups in the population in the absence of comparable and contemporaneous statements of all the individuals in question. Hence, by mainly focusing on making careful in-depth analyses of recorded source materials, historians will have a hard time of robustly reproducing the widely held views of people in the past concerning various interesting phenomena, such as the existence of pre-war threats or the credibility of a government's policies in the eyes of its constituency.

## 2.2 The financial markets approach

In recent years, there has been a growing literature on analyzing political and institutional change using historical financial market data. Treating financial markets primarily as markets for the dissemination and distribution of information, it is possible to derive measures of the impact of political, economic and institutional changes on the prices of financial assets. A path-breaking analysis shows how events during the U.S. civil war affected the market for "greenbacks", a special currency issued by the Union (Willard et al. 1996). A number of subsequent studies applied this approach to the prices of government bonds being traded during the Second World War. Frey and Kucher (2000, 2001) made the first studies, analyzing prices in the neutral country of Switzerland. Following them, Brown and Burdekin (2002) studied German bonds being traded in wartime Britain, and Frey and Waldenström (2004) compared the prices of German and Belgian bonds traded simultaneously on the neutral Zu-

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<sup>1</sup> For example, in his famous treatise on history, E. H. Carr describes the writing of history as a "continuous process of interaction between the historian and his facts" (Carr 1961: ch. 1).

rich and Stockholm stock exchanges. Oosterlinck (2003) analyzed the French government bond market during the same period, comparing the prices of pre-war bonds with bonds issued by the Vichy regime in order to infer the timing of the turning point of the war according to French bond traders. Wolfers and Zitzewitz (2005) studied the case of the Iraq war.

The basic methodology followed in all of these papers is to link significant changes, called structural break points (see the technical discussion below), in the market prices of these financial assets to simultaneously occurring political or military events, from which an inference can be made about the impact of these events on contemporary society.<sup>2</sup> The financial assets that have been most commonly analyzed in the literature are government bond prices and yields. The underlying idea is that wars put extraordinary pressure on a country's fiscal balances and may, in the worst case, provoke sovereign repudiations or defaults. This, in turn, increases the default risk of these government bonds, which implies that they should trade at lower prices on the secondary markets.<sup>3</sup>

The use of capital market data for these analyses has several advantages. Market actors have always had to carefully evaluate the prevailing situation, as well as likely future developments, because errors directly affect them in monetary terms. This distinguishes capital market data from other types of data, in particular surveys and questionnaires, where errors do not generally affect the persons committing them. Financial markets usually have 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, even one such trader can drive the market price to the underlying equilibrium price.

Financial markets thus are *not per se* related to the *nation* and *population*. A nation may disappear, but the respective financial assets may survive. Normally, there is a strong correlation between the fate of a population and/or nation and the values of assets traded. In most cases, when a nation ceases to exist, its public debt is no longer serviced nor paid back at maturity, a fact reflected in the financial markets by a drop in value to zero (if there is no hope

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<sup>2</sup> The overlap between, on one hand, the general public and political and military decision makers and, on the other, the bond traders and investors, is admittedly far from perfect. Yet both the public and the market participants acted to a significant extent on publicly available information, and one would expect their views and expectations about the future to be roughly the same. As the political and military leaders had partial access to information from the secret services that was not available to the general public, it will be discussed to what extent their views differed from those of the public.

<sup>3</sup> These developments may be accompanied by minor changes in other standard bond yield determinants, such as the coupon rate, the time to maturity, tax status of cash flows, redemption clauses and the discount rate. Although these were mostly constant, the breaks estimated use yield spreads (subtracting the Swedish yields), hence cancelling out market-specific determinants. These estimations produced essentially the same results, and are available from the authors upon request.

that the debt will ever be repaid). 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.

The possible split between the fate of the population and the nation, as reflected on financial markets, may be advantageous or disadvantageous, depending on the question asked. In any case, one must be very careful when establishing a relationship between historical events and movements on financial markets. It may be spurious, or change over time, so that any interventions may be misleading.

We hasten to emphasize that we have never considered the analysis of financial markets to be a *substitute* for the traditional inquiries undertaken by historians. But it is a challenging *complementary* method of evaluating the situation at a given moment in time. In particular, care must be taken to allow for time delays. Thus, a historical fact may have been predicted in advance by the people active on the financial markets, in which case the break should be visible before the event, or be completely absent, depending on the speed of adjustment. Either way, no break is visible at the time of the event itself. Examples are the outbreak and end of a war, which in many cases are foreseen well in advance. It should be noted, however, that financial markets tend to overreact to news reaching them. The overreaction hypothesis implies that, even though many investors predicted an event way in advance, and financial markets adjusted accordingly, a break in the price series can still be identified.

There are a number of technical considerations to be taken into account when using financial market data. The most important of these are the choice of econometric method used to statistically estimate so-called structural breaks in the time series of each financial asset, and the specific model of asset prices chosen for the computations. There are a large number of statistical methods for estimating structural breaks in time series.<sup>4</sup> The results in this study are based on two of the most common methods in the literature for the estimation of multiple structural breaks in univariate time series: Banerjee et al. (1992) and Bai and Perron (1998, 2003). Technically, a structural break is defined as a lasting significant mean-shift in the series analyzed. Both the researcher and the total length of the series determine exactly how long the structural breaks should be.<sup>5</sup> The great advantage of these methods is that they estimate the breaks, using only the information contained in the time series properties and not the prior knowledge of what historical events historians consider impor-

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<sup>4</sup> For comprehensive overviews of the time series econometrics of estimating structural breaks, see Perron (2006).

<sup>5</sup> Determining the required length of a structural break is associated with the trade-off of avoiding both short fluctuations and too long breaks that run the risk of containing more than one "true" break.

tant.<sup>6</sup> This means that the financial market approach is particularly suitable for analyzing the true forward-looking assessments of the contemporaries, before the subsequent realization of the course of events that later became historical.

We now turn to the second technical consideration mentioned above: the specification of a model of asset prices. The results presented below are based on modeling structural breaks in nominal bond prices or bond yields that are *conditional* on shifts in other nominal prices or yields. The term “conditional” has to be emphasized since the procedure corrects for effects that influence all government bonds traded in a similar way. Therefore, we will not find breaks in, say, the German government bond prices as a result of changing inflation or real interest rates. This also holds for mean differences: we only test for significant structural mean breaks of the bond prices *conditional* on price movements of all government bonds traded in Switzerland. This means that an (historical) event with the same effect on the bond prices of all countries will not be recognized by the econometric method used. It also means that an event that leads to, say, a ten percent increase in the Swiss government bond prices, and to a five percent increase in the prices of all government bonds, will be shown to increase the *conditional* mean of the Swiss government prices by five percent only.

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

The financial market approach is based on the premise that “facts” considered important by historians are reflected in changing values on capital markets, in particular by bond prices. However, there are a number of reasons why historical “facts” may not show up as break points:

- A “fact” may be important from the historian’s 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.
- The contemporary actors do not evaluate a particular event in the same way as historians do decades later. This difference between *ex ante* and

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<sup>6</sup> The methods distinguish themselves from so-called “Chow tests” for structural breaks, in which a break point is determined beforehand and evaluated accordingly. Perron (2006) shows how this approach to the estimation of structural breaks yields invalid and inconsistent results.



*ex post* assessments is a natural characteristic of all kinds of human action, but few methods are able to capture it.

- A “fact” does not exist, nor is it as important as the historians believe. Here, the quality of historical research is called into question. However, it would be misleading to assume that all historians identify the same “facts” as being important. So the issue is *which* historical school or *which* individual historian has identified what historical “fact”, as well as the actual importance attributed to it.
- The bond market data lacks quality, e.g. because there are too few transactions.
- Governments have intervened in the bond market, either as buyers or sellers, or by imposing controls of some sort. An important case occurs when governments want to prevent the reflection of a political (or economic) event on financial markets.
- The econometric analysis is unable to identify break points relating to historical events, even though they are in the data.

The next two sections illustrate the financial market approach by looking at *a particular case*, namely how the Nazis’ rise to power and the Second World War were reflected in the government bonds of France, Germany, Denmark and Norway.

### 3. The Example of World War II

Changes in financial values reflect historical events. The historical events considered here refer to a period starting with Hitler’s rise to power after his appointment as chancellor of the Reich on January 30, 1933 and including the first years of World War II. The analysis is based on newly collected price data of long-term government bonds for France, Germany, Denmark and Norway.<sup>7</sup> These prices were continuously quoted at this time on the financial markets in Stockholm and Zurich. All the nations directly or indirectly involved in the Second World War heavily interfered in, or even closed, their stock and bond exchanges. For reasons of neutrality, however, the Swiss and Swedish governments refrained from doing so and their financial markets therefore remained open and unrestricted for the entire wartime period.<sup>8</sup>

There are some differences between the two data samples. First, they cover somewhat different time periods, with the German and French bonds in Zurich

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<sup>7</sup> For details on the bond data, see Frey and Kucher (2000) for the German and French bonds, and Waldenström and Frey (2007) for the Danish and Norwegian bonds.

<sup>8</sup> The Zurich Stock Exchange remained closed for two months following the German attack on the West in May and June 1940.

being analyzed from 1933 to 1948, and the Danish and Norwegian bonds traded in Stockholm only being analyzed from 1938 to 1940, i.e., the period right before and around the outbreak of the War. Naturally, this difference implies that the two samples allow for different historical questions, with the Nordic bond data primarily being suitable for the study of pre-war threat assessments, and the German and French series allowing for broader inquiry. Moreover, the Zurich data are observed on a monthly basis while the Stockholm data are weekly. This difference in frequency does not matter greatly for the historical analysis, except for the slightly higher amount of detail in the timing of the estimated breaks in the Stockholm sample.

The relationship between historical events and capital market developments is looked at from two different perspectives. On the one hand: To what extent are changes in government bond values related to historical events? Do breaks in such capital values series correspond to what have been established as crucial events in the Second World War? Or are there breaks in the capital values series which cannot (or at least not easily) be related to War events? On the other hand: 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 differentiated way? The answers to these questions may throw new light on the Second World War.

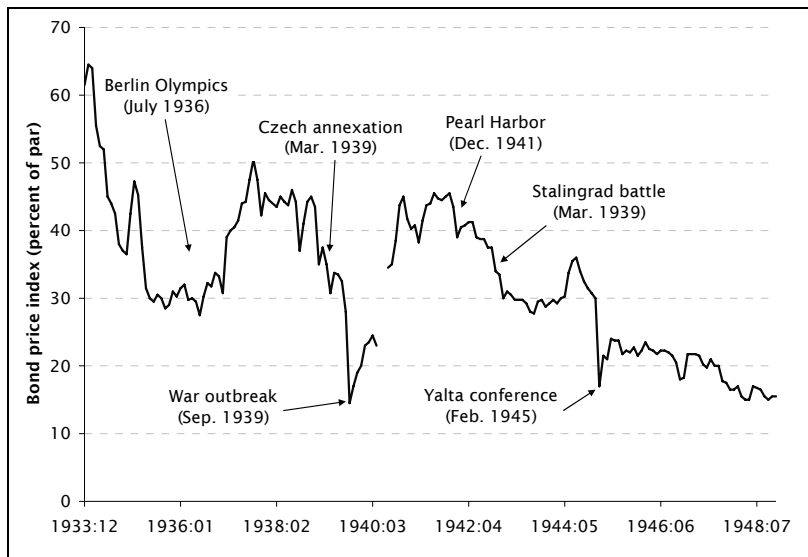
Some historical events are generally undisputed, and their dating creates few problems. In our context, an example would be Hitler's appointment to chancellor, which occurred on January 30, 1933. Similarly, the unconditional capitulation of the *Wehrmacht* took place in Reims on May 7, 1945, and was repeated on May 9, 1945 in Berlin. Great care must nevertheless be taken not to distort the past. In particular, when decisions made by people in the past are evaluated, the much more limited 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 not easy, for instance, 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. Historians are skilled and make an effort to overcome these dangers by carefully studying 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 well known that such documents are already the result of a selection process (with mainly those documents considered "important" being preserved), and some of them are even rewritten after the fact.

## 4. From Structural Breaks to Historical Facts

### 4.1 Germany

Figure 1 displays the German government bond prices for the period 1933-1948. Over the whole period, there is a strong downturn of 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 bond holders may have feared that the Nazis would renegotiate foreign debt, or simply stop repayment. This fear was fuelled by official policy pronouncements advocating extreme autarchy, which indicated that the Nazis would withdraw from the international capital markets (Köllner 1982). In addition, heavy intervention in, and strict regulations imposed on, the capital markets on the part of Hitler's government depressed the expectations of the bond holders, who suffered a decline in their returns (German economic policy in the pre-war and war period is discussed in e.g. Boelcke 1985, Köllner 1982).

Figure 1: German government bond price index, 1933-1948



Source: Swiss National Bank, *Monatsberichte*, 1933-1948

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. A morato-

rium on servicing foreign debt was imposed in the summer of 1933, but at the same time the government paid back foreign debts in an effort to become as autarchic as possible against foreign countries (again for military reasons). The Nazi government thereby gained some extent of financial respectability with foreign investors in 1937-38.

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 the Second World War broke out. The bond traders feared that the impending war would reduce Germany's willingness and ability to service and repay its foreign debt. Again there was 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.

The econometric analysis identifies six break points for Germany. Table 1 gives a survey of resulting break points and the corresponding percent changes in the conditional mean price index.

Table 1: Structural break points and corresponding historical events:  
Germany

Date	Price change in percent	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	– 6 %**	Russian offensive at Stalingrad (Nov – 2 Feb)
February 1945	– 34 %**	Yalta Conference (4 – 11 February)

Notes: Percent change in the *conditional* mean is presented (see text for details). \* and \*\* indicate statistical significance at the 95- and 99-percent confidence level, respectively. Breaks are estimated using the method of Banerjee et al. (1992).

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 8 percent 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, which were held in Berlin in August 1936, and which made the Nazi regime look peaceful to many observers.

In mid-March 1939, the Nazis invaded the remaining parts of the Czechoslovak Republic (after the Sudetenland was given to them at the Munich Conference, September 29, 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 percent 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 the "German" borders, 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 would satisfy Hitler's demands. Accordingly, the value of German government bonds dropped only half as much as when the Second World War "officially" began on September 1, 1939 with German troops invading Poland. The actual start of the war sent German government bonds plummeting down 39 percent. The capital market was extremely pessimistic about the prospects of a German victory.

The Swiss stock exchange was closed in May/June 1940, so that the effect of the German *Blitzkrieg*-victories is not reflected in the data.

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

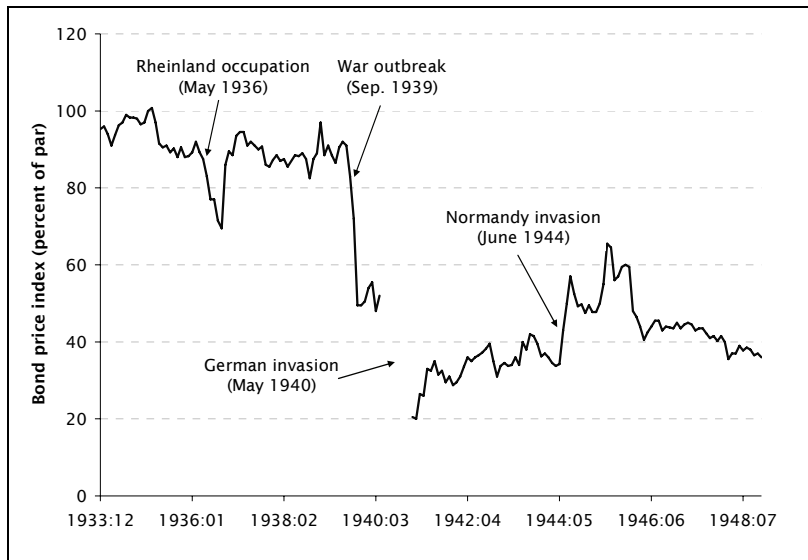
Yet another significant drop in German bond values (again about 6 percent) occurred in November 1942. In that month, the Soviet troops started a large counter-offensive against the German 6th Army and parts of the 4th Panzer Army, encircling more than 300,000 German troops at Stalingrad. Traders on the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

## 4.2 France

The bond prices of French government bonds, displayed in Figure 2, indicate a constant value until the middle of 1938, followed by a huge drop, coinciding with the “official” outbreak of War, invasion by German forces, and capitulation (June 22, 1940). After trading was resumed at the Swiss bourse, the French bonds experienced a continuous increase in value until the end of 1945. The value of the French government bonds remained above 20 percent 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 re-emerge as an independent nation, would pay back its debts by the due date and resume paying interest.

Figure 2: French government bond price index, 1933-1948



Source: Swiss National Bank, Monatsberichte, 1933-1948

The econometric estimates identify five statistically significant break points for France (Table 2).

French government bond values suffered a blow when the Germans occupied the demilitarized Rheinland in May 1936. To some extent, the financial investors may have lost confidence in the ability of the French 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 France 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. The negative break point in January 1946 is not related to any obvious political or military event.

Table 2: Structural break points and corresponding historical events: France

Date	Price change in percent	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 %**	unknown

Notes: See Table 1. [...] 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 with the econometric techniques used.

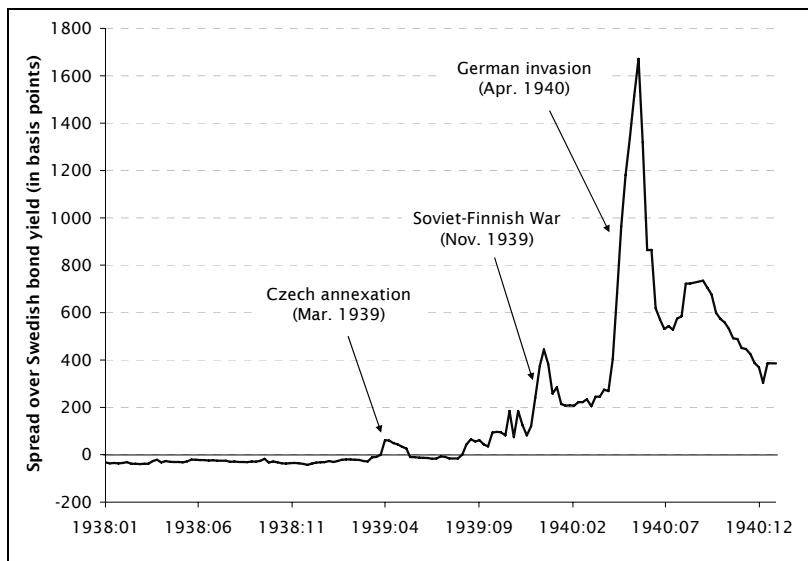
### 4.3 Denmark

Figure 3 shows the spread of the Danish government bond yield over the Swedish government bond yield in the Stockholm bond market around 1938 to 1940. While the figures and tables for Germany and France just reported refer to bond *prices*, the following figures and tables for Denmark (and Norway) refer to bond *yields*. Bond prices and bond yields are inversely related: while an increase in sovereign risk is reflected by a *fall* in bond prices, it is reflected by a *rise* in bond yields. Moreover, the size of breaks is measured by a percent change in bond prices, and by a *percentage* change in yields. The same change in sovereign risk is thus reflected in a lower figure in the case of bond yields than in the case of bond prices. For example, an improvement in sovereign risk, resulting in a doubling of bond prices (+ 100%), means that the bond yield falls by half, say from 10% to 5%, i.e., a fall of 5 percentage points.

Evidently, there were no fears among investors about the repayment of Danish bonds during all of 1938. In March 1939, however, the first sign of disturbance is indicated by a small, yet significant, structural break point, reported in Table 3. This break is recorded immediately after the German annexation of Czechoslovakia, and can be explained when taking into consideration that Germany and Denmark had geographical and historical ties that resembled those between Germany and Czechoslovakia. The actual outbreak of War in September 1939 did not have much effect on the Danish yield spread, mainly because the Swedish yields (i.e., sovereign risk) also increased at that time. What did matter, disproportionately to the assessed war threat to Denmark,

however, was the Soviet attack on Finland in late November the same year. The Danish spreads jumped up by a statistically significant 2.1 percentage points in early December 1939, which coincides closely with the outbreak of the Finnish Winter War. In other words, the Swedish contemporaries perceived the aggression against Finland as a bad sign for the future prospects of the Danish government being able (or willing) to service its debt obligations to foreign bondholders. Given the close connection to wartime events, this can then be interpreted as an increased assessed risk of war to Denmark.

Figure 3: Danish government bond yield spread, 1938-1940



Source: *Affärsvärlden*, 1938-1940.

Table 3: Structural break points and corresponding historical events: Denmark

Date	Spread change in percentage units	Major events
March 1939	+ 0.8 %**	Invasion of the Czech Republic (15 – 16 March)
November 1940	+ 1.3 %**	Soviet attack on Finland (30 Nov)
April 1940	+ 1.6 %**	German invasion of Denmark (9 April)

Notes: A positive sign of the estimated break, i.e., a spread increase, implies increased war risk. Breaks are estimated using the method of Bai and Perron (1998, 2003).

The final significant structural break in the Danish yields is recorded in early April 1940, i.e., at the time of the German invasion of Denmark on April



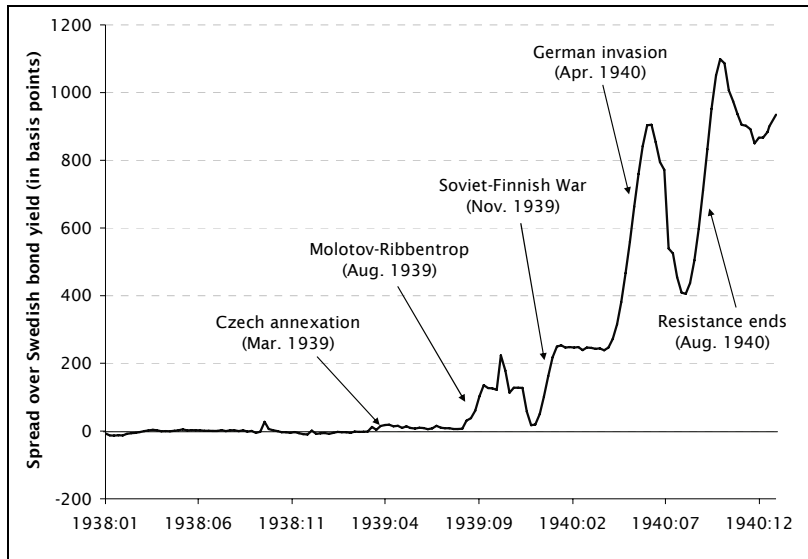
9, 1940. This break point bears a lot of information when compared to the earlier break points in the Danish series. The reason is that, although the contemporaries had perceived notable increases in the war threats on Denmark before the German invasion, they did still not fully believe it would happen. If they had, there would never have been any additional spread increase, i.e., sovereign risk increase, when the war on Denmark eventually broke out. In this way, we can infer the assessed likelihood of a war outbreak in the eyes of the contemporaries during the pre-war era by relating the observed market yields at the time of the outbreak and the pre-war yields (for further details, see Waldenström and Frey, 2007).

#### 4.4 Norway

Figure 4 shows the yield spreads of Norwegian government bonds traded in Stockholm for 1938-1940. Broadly speaking, the evolution of the spreads in Norway in this turbulent era resembles the corresponding evolution in Denmark. Before the German invasion of Norway on April 9, 1940, the financial markets in Stockholm seem to have perceived a constant build-up of war threats to Norway. Three positive structural breaks indicate this, as reported in Table 4. First, in March 1939, there is a small, but significant increase in the Norwegian spread, which may be related to the German annexation of Czechoslovakia. Second, there is a larger significant structural break estimated at the end of August 1939, directly after the non-aggression pact between Germany and the Soviet Union (the Molotov-Ribbentrop Pact) and right before the German attack on Poland. Third, there is a break dated in late December, which coincides in time with recent war activities between Finland and the Soviet Union. In other words, financial markets clearly perceived an increased war threat to Norway well ahead of the actual war outbreak in 1940.

However, the Norwegian yield spreads in Stockholm also contain two significant structural breaks in 1940. The first shows a large positive break, i.e., signaling an increased risk of a Norwegian sovereign default, dated late April 1940. This break is clearly associated with the German invasion of that month. Notably, as in the case of Denmark, this break suggests that the contemporaries were not convinced that Norway would eventually be involved in the War, because that would have implied that yield spreads should not have changed significantly in response to the invasion. A fifth and final break is dated August 1940. The exact date of this break is uncertain due to the volatile bond prices of Norwegian bonds after the German invasion (most likely due to low levels of trading). Still, it coincides with the surrender of the Norwegian military resistance to the invaders, and interestingly it seems as if the bond market actors interpreted this major blow to the Norwegian sovereignty as positive for the likelihood of their bonds being serviced by the Norwegian government.

Figure 4: Norwegian government bond yield spread, 1938-1940



Source: *Affärsvärlden*, 1938-1940.

Table 4: Structural break points and corresponding historical events:  
Norway

Date	Spread change in percentage units	Major events
March 1939	+ 0.2 %*	Invasion of the Czech Republic (15 – 16 March)
August 1939	+ 1.0 %*	Molotov-Ribbentrop Pact (26 Aug)
December 1939	+ 0.1 %**	Soviet attack on Finland (30 Nov)
April 1940	+ 2.0 %**	German invasion of Denmark (9 April)
August 1940	- 0.6 %**	Norwegian resistance surrenders (July/August)

Notes: See Table 3.

## 5. From Historical Facts to Structural Breaks

The above sections present the empirical results of the financial market approach to analyzing history. Several interesting findings are revealed. Some of the events that are generally thought to be crucial are clearly reflected in the German and French government bond prices. This holds, in particular, for the

*official outbreak* of the war from July to September 1939. It markedly reduced the government bond values of Germany (by 39 percent) and France (by 25 percent). The same holds for losses and gains of *national sovereignty*. When Belgium and France were defeated and occupied by German forces in the *Blitzkrieg* of May 1940, the German government bond values rose by 8 percent and those of France fell by no less than 31 percent. The same holds in the case of the two Nordic countries analyzed, Denmark and Norway. The German invasion in April 1940 was clearly noticeable on the bond market, with sharp increases in the perceived risk of a sovereign default, according to falls in the countries' bonds.

At the same time, we also note that certain events to which historians attach great importance are *not* reflected in bond prices at all: the most prominent example is the *capitulation* of the *Wehrmacht* in May 1945, which is neither reflected in the German nor French government bond prices. The Allied invasion in Normandy in June 1944 raised the French bond values (by 16 percent) but did not lead to a break in the values for Germany. In the case of Denmark, the non-aggression pact between Germany and Denmark at the end of May 1939 did not influence the bond market's perception concerning war risks on Denmark at all.

Finally, the results indicate situations where the claims of historians may even be *questioned* by the financial market evidence. For example, Nordic historians have regularly argued that the contemporaries in the Nordic countries did not perceive any increased risk of war to their own countries in the period before the war, i.e., in 1939 and early 1940.<sup>9</sup> By contrast, the estimated structural breaks for both Denmark and Norway clearly indicate that the sovereign risk of these countries increased significantly in connection with war-related geopolitical events, and could be clearly interpreted as increasing the military threat against these countries.

## 6. Comparison

The above discussion reveals that the traditional historiography and the financial market method approach history from very different points of view. Despite this fundamental difference, the two approaches share the fact that they both rely on *interpretation – but what must be interpreted differs considerably*.

Standard historical research has to interpret the reliability and meaning of the documents studied and interviews with the decision makers at that time. Historians are trained to do this very carefully in order to understand what was

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<sup>9</sup> For references and quotes of more than a dozen Nordic Second World War historians, see Waldenström and Frey (2007).

thought at the time and not confound the situation with information available only after the fact. This is sometimes extremely difficult, if not impossible. For instance, today's historians must seek to understand why the Nazi government engaged in war, even knowing that they would lose.

The financial market approach is based on data only containing the knowledge available at the respective time; subsequent time only enters into the equation through the expectations of the market participants, again at the respective time. The financial market approach is not faced with the problems of standard historical approach, but has other major problems of interpretation. In addition to the problems common to econometric estimations, the most important ones are:

- Why are some of the break points identified not related to any major political or historical event (such as the negative break point in January 1946 for French government bonds)?
- Why are some important historical facts not visible as break points (such as the capitulation of the *Wehrmacht* in May 1945)?

A handy explanation refers to the notion that financial market values do not show any reactions or breaks if the traders already took the respective historical events into account, i.e. if they are already "priced in". This may, for example, be argued for the German capitulation, which was imminent, and which traders saw coming some considerable time before May 1945. Such an explanation makes sense, but it is somewhat *ad hoc*. The same could be said of other events, such as, for example, the invasion of Normandy. It has still not been explained why this event (positively) affected the value of the French government bonds only, but did not affect the value of the German bonds.

Another issue of interpretation is due to the government bond market capturing the expectations of a special group of people active in these markets. These are not only the actual traders working on these financial markets. The group involved comprises a much larger group of actors influencing the supply and demand of these assets. It is not known who the buyers and sellers on the government bond market were during the period in question. It may well be, of course, that these actors differed substantially from the political and military decision makers, who were responsible for war activity. The approach may allow us to identify not only the motivations of persons interested in financial prosperity, and hence presumably the economic prosperity of a country, but also the motivations of politicians and the military, which might have more narrow interests and might be subject to over-optimism and hubris.

## 7. Conclusion

The two approaches to analyzing history discussed here – the standard historiographic approach and the financial market approach – each have their spe-

cific strengths and weaknesses. Without doubt, a careful study of documents and interviews with the decision makers at the time can reveal important insights. In many cases, it is the only feasible and reasonable method. In the case of the Nazi rise to power and the Second World War, it is indispensable to consider what was written and said at the time by the political and military decision makers. Still, when it comes to representing widely held pre-war threat assessments, an in-depth interpretation of a few written sources is hardly sufficient for capturing the views and opinions of the public at the time.

The financial market approach presented here may, in such cases, be a useful, and perhaps, so far, underutilized, complementary method, offering additional insights. For example, it was found that some of the conventional historiography concerning the widely held pre-war threat assessments in the Nordic countries disagrees with the estimates of the corresponding threat assessments according to the contemporary financial markets. But this approach also suffers from potential methodological problems with, e.g., the econometric methods used, which rely on choices and assumptions that are questionable. Therefore, the two approaches should not be seen as exclusive of each other, but rather as helping us to see specific aspects of history more clearly and in a different light.

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