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Using Markets to Measure Pre-War Threat Assessments: The Nordic Countries Facing World War II

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Using Markets to Measure Pre-War Threat Assessments: The Nordic Countries facing World War II*

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Abstract

The conventional Nordic historiography of World War II states that there were few, if any, in the Nordic countries who perceived a significantly increased threat of war between 1938 and early 1940. At the same time, historical methods face problems when it comes to characterizing often unexpressed beliefs of a large number of people living in the past. In this paper, we present an alternative way to estimate these assessments by analyzing sudden changes in sovereign debt yields collected from the Nordic bond markets of this time. Our results suggest that the Nordic contemporaries indeed perceived significant war risk increases around the time of major war-related geopolitical events. While these findings hence question some – but not all – of the standard Nordic World War II historiography, they also demonstrate the value of analyzing historical market prices to reassess the often tacit views and opinions of large groups of people in the past.

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1 Introduction

The question of whether people in the Nordic countries perceived an increased threat of war during the turbulent period between 1938 and early 1940 has been intensely discussed among Nordic historians during the entire postwar era. According to the conventional Nordic historiography, there were few, if any, in these countries who believed in such an increased war threat. This result has important implications as it, e.g., squares with the fact that the Nordic countries, possibly with exception for Finland, was relatively militarily unprepared when three of them were attacked in late 1939 (Finland) and early 1940 (Denmark and Norway).[1]

There are, however, some problems with the way that conventional historiography has described these historical widely held pre-war threat assessments. For example, historians primarily rely on in-depth analyses of recorded sources whereas popularly held threat assessments in the past were hardly written down to allow such a study. Moreover, historians have since long (see, e.g., Carr, 1961 or Marwick, 1970) been aware of the risk that historians are influenced by their own social and political context in such way that it may influence their analysis of historical events, e.g., in the selection and interpretation of issues, angles or even particular sources.[2]

In the present paper, we present an alternative way to gain insight into the war threat assessments of people in the Nordic countries that can be compared with the ones in the history books. This method is based on estimating sudden changes in yields of government bonds that were traded continuously at the time of the war outbreak and link them to major geopolitical pre-war events. We argue that this will show if and when significant war risk increases occurred as reflected by market prices. The underlying idea is that wars put extraordinary pressures on countries' fiscal balances and may even provoke governments to

[1] For example, Lidegaard (2005, p. 152) shows that the Danish government regarded a small and obviously insufficient military defense as a credible signal to Germany of peaceful Danish intentions. Jakobson (1961, pp 139ff) shows how Finland was fully mobilized in October 1939 but then started demobilizing in mid-November, a few weeks before the Soviet attack. On the poorly prepared Norwegian defense, see Skodvin (1991, p. 309). On the insufficient level of Swedish armament and military preparations before the late spring of 1940, see (Åhslund (1982) and Olsson (1977, p. 12).

[2] Historians are themselves well aware of this problem. For example, Carr (1961) emphasized the interference of historian with the historical writing behind the historical writing has been well understood. There are many examples of the biased historical writing resulting from winners writing the history of wars. Bryld (2003, pp. 14–29), e.g., argues that the official Danish postwar account of the country's resistance movement during the war is a highly patriotic product in which historians have given in to contemporary pressures for a history of legitimization and national unification.

repudiate their sovereign debt. An increased risk of war will thus translate into an increased sovereign risk or, equivalently, higher yields on traded sovereign debt.[3]

Our study specifically analyzes the (possible) occurrence of increased pre-war threat assessments in the Nordic countries before and around the time of the outbreak of World War II.[4] We use newly assembled sovereign yields from the financial markets in Copenhagen, Oslo, Helsinki and Stockholm quoted in 1938–1940.[5] The empirical method is based on estimating structural breaks in the yield means using the well-known method of Bai and Perron (1998, 2003) which select the breaks endogenously, using only the time series properties of the yields and no prior historical information. These breaks reflect the contemporaneously updated sovereign risk assessments of the historical financial market actors. If they coincided with important political or military pre-war events, we argue that the sovereign yield changes were in fact driven by shifts in widely perceived threats of war.

In a second part of our analysis, we compare these new market-based estimates of war threat assessments with the corresponding estimates in the Nordic historiography. This is done by first providing an outline of the "conventional" historical view, drawing on our reading of a large number of writings by well-known and reputed Nordic World War II historians. Of course, this representation is neither perfect nor complete, but we try to minimize the errors by supporting all statements by making explicit references and even citations to the underlying texts. Besides shedding new light on an interesting part of the modern history of the Nordic countries, this comparative analysis also addresses the important question whether conventional historiography is robust to alternative assessments of the same historical phenomena.

The study connects with a growing literature that uses financial market data to analyze the impact of political and institutional change. In the groundbreaking analysis of Willard et al. (1996), events taking place during the U.S. civil war are analyzed based on their impact on the market for "greenbacks", a special currency issued by the Union. Following their

[3] Naturally, this also requires 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, we estimated the breaks using yield spreads (subtracting the Swedish yields) and hence canceling out market-specific determinants. These estimations produced essentially the same results and are available from the authors upon request.

[4] 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. Still both the public and the market actors acted to a significant extent on publicly available information. Hence, one should expect their views and expectations about the future to be roughly identical. As for the political and military leaders, however, they partly possessed non-public information from the secret services, and to the extent that their views differed from those of the public this will be discussed .

[5] Note that the fifth Nordic country, Iceland, is left out because of a lack of Icelandic government bond data.

approach, Frey and Kucher (2000, 2001) analyze how the events before and during World War II affected domestic and foreign government bond prices at the Zurich stock exchange. They find that these events consistently reflect many of the historically important events, such as the annexation of Austria by the Germans, the outbreak of the war, the German defeat at Stalingrad and the Yalta conference. Similar analyses of bond prices during World War II have been undertaken by Oosterlinck (2003) on France, Brown and Burdekin (2002) on German bonds traded in Britain, and by Frey and Waldenström (2004) on Belgian and German bonds traded simultaneously in Switzerland and Sweden. Focusing on more contemporary war experiences and the forward-looking elements of financial markets, Rigobon and Sack (2005) find a considerable war risk premium in the returns of several common financial assets during the build-up before the U.S. war in Iraq 2003. With a similar focus, Wolfers and Zitzewitz (2005) find that the war probabilities during the same pre-Iraq war period derived from prices at so-called prediction markets, which are electronic venues trading securities with payoffs contingent on specific political or economic outcomes, were highly consistent with the flow of war-related news and events.

The rest of the paper is organized as follows. Section 2 describes how the conventional Nordic historiography has pictured pre-war threat assessments of the general public and some of the methodological problems it is associated with. Section 3 presents the data used and some of the institutional features of the Nordic bond markets around the time of the study. Section 4 discusses the empirical method. In Section 5, the main results of the study are presented and in Section 6 their robustness are analyzed. Section 7 summarizes the evidence and concludes.

2 Nordic historiography on pre-World War II threats and its problems

When historians characterize past sentiments among the general public, they face some important methodological problems. For example, public opinions are basically never explicit and, hence, documented in written form which makes them almost unobservable to historians in their written source-based analysis. Another, and perhaps more severe, problem is that historians, and in particular war historians, may be influenced by their own postwar political and social context when selecting and interpreting the historical facts at hand. This potential sample selection bias has been noted before by well-known historians (see, e.g., Carr, 1961 or Marwick, 1970) but it still seems to have prevailed in parts of the official Nordic World War II historiography.[6]

[6] For example, Bryld (2001) describes the Danish historiography of World War II as a "history of legitimization" (p. 14). He states further: "The official history of the occupation was made up in 1945, a story of political and pragmatic art which satisfied the needs for political unity and ethical consistency of the elites [...] and the majority of the population. [...] The main element of this story telling was patriotism." (p. 29). In the

Below is an outline of the "conventional" Nordic World War II historiography of people's war threat assessments in the Nordic countries during 1938–1940. The outline consists of citations and references from texts by nineteen well-known and reputed Danish, Finnish, Norwegian and Swedish historians, most of them specializing on World War II history.[7] Our focus on Nordic historians is motivated partly because we believe them to be best suited to capture past assessments of the Nordic citizens, but partly also as they correspond the most to the Nordic market actors whose assessments we derive below from bond market prices. Naturally, we do not claim to have a complete coverage of the Nordic historical writing on this topic although we have tried to minimize the problems with interpretation and selection by making explicit references and citations to as many works as possible.

Denmark: Historians agree that the Danes felt quite safe from being involved in any of the war activities taking place on the European continent and that the German invasion of Denmark on April 9, 1940, came as a total surprise. However, the Danes were well aware of their geographical proximity to Germany and when they, as the only Scandinavian country, signed a non-aggression pact with Germany in mid-1939 this was regarded as "ensuring peace and stability" (Nissen, 1988, p. 353f).[8] There is surprisingly little said about the reactions to the outbreak of war in Poland and Finland. There seems to have been some increased level of uncertainty after the Danish Prime Minister's New Year's speech in January 1940, in which he stated that Denmark would hardly be able to resist a foreign invasion, if it were to come about. People were infuriated by this defeatism, but according to Wendt (1966, pp. 41f) "All their worries disappeared entirely" when all parties in Parliament immediately thereafter openly declared that Danish neutrality stood firm. One historian, Lidegaard (2005, p. 152), claims that Danish politicians were confident about their policy of passiveness and that it would minimize the risk of war: "the less Denmark did to attract [Hitler's] attention the better". Finally, when the German invasion came, Gram (1986, p. 15) asserts that it came as a surprise: "With the greater part of Norwegian and Danish political and public concerns focused on the British laying of mines, the German strategic plan for a command of Norway – and the occupation of Denmark it would require – achieved in creating a complete surprise."

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case of Norway, Skodvin (1991, pp. 309f) describes that there were many postwar forces interested in influencing the war history so that "their own people" came out as favorable as possible in the descriptions.

[7] It should be noted, however, that behind these nineteen researchers are a scanning of the works of at least twice as many Nordic historians but whose writings say nothing about the public sentiments at this time. One comprehensive listing of the Nordic World War II literature is Nøkleby (2003). Although the Finnish historian Max Jakobson, lacks a formal academic background, his works are widely cited and used by professional historians in all Nordic countries.

[8] Note that all citations of Nordic historians (except Jakobson, 1961) are translations from their original languages made by us.

Finland: Most Finnish historians describe the Soviet Union as being perceived as a latent threat by the Finns in the 1930's. There was even open mutual distrust between the two countries' politicians (Zetterberg, 1991, p. 56). Yet Jakobson (1961, p. 99) writes that "there was no sense of immediate danger in Finland during the beautiful late summer of August and September 1939". Interestingly, the views from the Swedish horizon were more pessimistic: "The German-Russo pact [publicly announced on August 23] placed Finland in an awkward position: Everybody could see that it offered Russia its best chance to re-conquer Finland since 1920" (Thulstrup, 1950, p. 8). Later on, however, also the Finns perceived an increased Soviet threat. Jakobson (1961, p. 139) writes that although Foreign Minister Paasikivi in mid-November believed that Stalin would leave Finland in peace, "The majority, however, held a different view of Stalin's intensions". Finally, it is not clear if the Finns really anticipated the Soviet attack which eventually came on November 30 or if the did not. On the one hand, Finland was fully mobilized already in early October but, on the other hand, the government started to send troops home from the front from mid-November onwards. Perhaps this is explained by the evidence found after the war which says that in late November "most diplomatic observers" in Finland and in Moscow thought that "the Soviet Union would not try to enforce its claims on Finland or Romania by force of arms" (Jakobson, 1961, p. 142).

Norway: Historians agree that of all Northerners the Norwegians felt the most safe from becoming involved in a war on the European continent. The German invasion in April 1940, therefore, is described as a complete surprise. As in the Danish case, very little is said about the public's reaction to the wars on the continent and in Finland. Not even the *Altmark* incident on February 16, 1940 is described as having affected the Norwegians. During this incident, British troops boarded a German destroyer in Norwegian waters. This launched a fierce German protests against Norway which resulted in a sharp Norwegian protest against Britain (Skodvin, 1991, pp. 38f). The German invasion, finally, came as a surprise. Bull (1979, pp. 342f) states that its "surprise tactics was a success" and that many citizens of Oslo, "woken up in the night by the sirens warning for an airborne attack were annoyed since they believed it to be just another practice exercise". Furthermore, Jensen (1965, p. 113) writes: "On the basis of what everyone knew [at the time], the situation was so serious that it now seems unimaginable that we did not react any differently than we did. It only shows how deeply rooted the belief had generally become among the Norwegians, that we could manage to keep out of the conflict. The parliament and government were representatives of a view that was general."

Sweden: As for the Swedish public, most – but not all – historians describe them has having felt quite sure of remaining outside the war. Åberg (1992, p. 522) states that "In the

beginning of the war, none of the governments in Sweden, Norway and Denmark seems to have worried about a German attack on Scandinavia". Carlgren (1989, p. 150) asserts that "there is a striking contrast between the confidence shown [after the outbreak of World War II] and the widespread popular worries that followed the outbreak of World War I". By contrast, Johansson (1982, p. 138) offers a somewhat different picture when he argues that the Finnish war made the Swedes more aware of the external military threats: "When the world war broke out the Nordic countries did not seem threatened. Many people regarded the Pact in Moscow as assuring peace to the Baltic region. [...] The war between Finland and the Soviet Union, however, was a severe blow that stunned Sweden." He continues: "There was a general agreement among the overwhelming majority of the population that Sweden must use each day still in peace to arm its military defense. The dominating sentiment was that Sweden enjoyed a respite under the gallows which had to be exploited." (Johansson, 1982, p. 139). In his important work on the ideological underpinnings of the Swedish newspaper editorialists during 1938–1939, Åmark (1973, pp. 155ff) argues while there were a public awareness of a military threat towards Sweden, it was limited. For example, he states that "there was agreement on that Sweden faced a small risk of war as long as there was no war in the rest of Europe" and, similarly, that "An outbreak of war in Europe was hence a necessary but no sufficient condition for an attack on Sweden" (p. 155). An interesting example of how contemporary ideology could influence written statements is that the editorialists often "deliberately exaggerated the risk of war in order to pursue their own [politico-ideological] agenda in the foreign and defense policy" (p. 160). Perhaps a sign of Sweden nevertheless demobilized its already limited number of military forces on a broad frontier after Germany's invasion of Denmark and Norway, which according to Norborg (1981, pp. 249ff) signifies a firm belief that Sweden would not be drawn into the war activities.[9] On balance, it is fair to say that historians would describe the Swedish threat assessments as practically nonexistent during most of this period, perhaps with exception for the time of the Finnish-Soviet war (November 30, 1939 – March 12, 1940).

3 Data and institutional setting

Our main dataset consists of secondary market yields of government bonds of the four Nordic countries Denmark, Finland, Norway and Sweden. These yields to maturity were computed from newly assembled daily and weekly bid prices quoted at the bond markets

[9] Two much more imminent threats of war to Sweden, according to Norborg (1981, p. 255) and Johansson (2002), were the "Midsummer Crisis" in June 1941, when the Swedish government considered refusing the Germans to ship troops across Swedish territory, and the "February Crisis" in February 1942 when the Swedes sent large numbers of troops to the Norwegian border in order to meet an expected German invasion based on cracked German secret messages.

in Copenhagen, Helsinki, Oslo and Stockholm during January 1938–December 1940. We hence restrict our analysis to the absolute end of the peaceful interwar era since we otherwise would risk capturing numerous other (mostly unobservable) sovereign yield shifts not necessarily related to the immediate risk of war. A supplementary dataset with weekly U.S. yields on long-term government bonds and 3-5 year Treasury notes as well as monthly yields on British and Swiss sovereign debt was also collected for the robustness analysis in Section 6.[10] Detailed information on these individual bond loans and their sources is listed in Table 1. The slight variation in data coverage across markets is primarily due to a general difficulty of finding good data sources, but in the case of Helsinki Stock Exchange all bond trading was stopped from October 11, 1939.

The quality and consistency of the quoted bond prices require that the quality of underlying market institutions as well as the level of trading activity were sufficiently high. Historical bond markets have been shown to be highly sophisticated relative to today's market places in terms of information dissemination and market thickness. For example, Mauro et al. (2006) convincingly argue that this was indeed the case for the sovereign debt market in London during 1870–1914. While no such information exists about the Nordic sovereign debt markets of the late 1930s, we have collected some pieces of evidence suggesting that also these markets functioned sufficiently well in order for their prices to hold for meaningful scrutiny. Specifically, a sample of daily trading volumes from the Stockholm Stock Exchange price lists during March, June, September and December in 1938 and 1940 show that there was trading in all four Nordic government bonds at all times, except for Norwegian bonds that were sparsely traded after April 1940. Furthermore, estimates of bond transaction volumes at the over-the-counter market indicate that the OTC market was between three and five times larger than the exchange-based trading.[11]

Government interventions in the bond markets surely took place given that borrowing governments usually are interested in keeping market interest rates, i.e., their cost of capital, as low as possible. Available anecdotal evidence from the Danish and Stockholm markets, however, suggests that these initiatives were both relatively few and had probably a limited long-run effect on market yields.[12] Since our analysis of sovereign yield changes

[10] It should be noted that the U.S. weekly yields are weekly averages dated on each Friday whereas the Nordic yields in Stockholm are quoted on the Tuesday of the corresponding week.

[11] OTC trading volumes are estimated using securities transaction tax receipts, which by law were to be reported for all transfers regardless of market place. Data only exist for the first half-year 1926 in a survey by the Swedish Banking Inspection reported in a government proposal (Prop. 1927:56 p. 13) and for 1948 onwards from the Banking Inspection's recurrent official publication *Uppgifter om bankerna samt uppgifter om fondkommissionärerna och fondbörs*.

[12] Kock (1943) argues that the Swedish Riksbank had almost no effect on market interest rates in 1939-1940. The Danish central bank, *Nationalbanken*, only increased its bond portfolio marginally between June and December 1939, and even decreased during the most critical period, December 1939 and June 1940 (Svend-

focus on very large and lasting yield shifts, moreover, we do not expect any government-led market operations to significantly influence our main findings.

The identity of the bond market actors is of high interest to a study like ours. The overlap between, on one hand, the general public and, on the other, the bond traders and investors is probably not perfect. Financial institutions such as commercial banks, insurance companies and stock brokers most likely represented most of the trading on the stock exchange. Still, households held about 6% of all Swedish government bonds in 1940 which, if one assumes an average bond amount equal to twice the average income, implies that more than 33,000 households owned, bought and sold Swedish government bonds.[13] More importantly, both market traders and households acted on the same, publicly available information and one should therefore expect their views and expectations about the future to be roughly identical. Moreover,

One of the problems with the data from the Stockholm market is that there are missing values in the Finnish yields (in December 1939) and the Norwegian yields (in April-May 1940). Since our econometric methodology requires the analyzed series to be continuous we linearly interpolate all gaps. Missing could indicate severe problems with, e.g., low levels of trading or the price reporting. By consequently using bid and not sell prices we at least diminish the risk of having individual traders influencing prices. More importantly, most gaps appear after the outbreak of wars in the respective Nordic countries and since our focus primarily lies on the behavior of pre-war yields we feel confident that this problem has no significant impact on the basic findings of this study.

4 Empirical methodology

Our basic methodology is to link major shifts in sovereign yields with simultaneous geopolitical events and thereby get a notion of changes in widely held war threat perceptions as reflected in bond markets. We focus on shifts rather than levels of the yields since there are many influences of a sovereign bond's yield level whereas a large and, in particular, sudden shift does more likely reflect a shock to the continuously update sovereign risk-assessments made by market actors.

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sen, 1968, p. 16). Furthermore, the monetary policy issues addressed by *Nationalbanken* itself in the early war years rather concerned how to prevent interest rates from falling too much in the light of the abundant liquidity levels in the Danish economy. In other words, the Danish central bank worked to raise, not reduce, market interest rates during the war period.

[13] According to the Swedish Riksbank's Statistical Yearbook of 1942 (pp. 62f), 6 percent of the outstanding Swedish government debt in 1940 was about SEK 165 million. The average annual income of all Swedes in 1940 was SEK 2,293 (Roine and Waldenström, 2006). If predominantly middle- and upper-class people invested in bonds at an average amount of SEK 5,000 (i.e., more than twice the average annual income), one gets a guesstimate of there being some 33,000 household investors in Swedish government bonds in 1940.

We employ a standard econometric methodology for testing for and estimating unknown multiple structural breaks in univariate time series, developed by Bai and Perron (1998, 2003).[14] Among the many advantages of using this methodology is that it does not require any prior information about the existence or timing of breaks. Instead it estimates them endogenously, using only the information contained in the time series, i.e., letting the data speak. While this technique has been shown to be important to ensure consistency of the estimated breaks (Perron, 2006), it also removes any possibility of a researcher influence in picking the significant shifts that are to be evaluated against the contemporaneous political development.

We estimate the breaks by fitting the following system of linear regressions:

$$y_t = c_j + \varepsilon_t, \qquad t = T_{j-1}+1, \ldots, T_j. \tag{1}$$

where subscript j ($j = 1,\ldots, m + 1$) denotes segments separated by m structural breaks, y_t is a country's nominal sovereign yield at time t expressed in basis points, c_j is an estimated intercept (the average yield in each segment) and ε_t is a white noise error term.[15] The procedure of the method is, in brief, to begin by testing for existence of breaks using two types of Wald tests. If these indicate that breaks exist, the method continues by estimating their exact number and then their size. One important parameter to decide before the estimations is how long the shortest allowed segment length can be in order for breaks to be called "structural". We follow the conventions and require breaks to be at least ten percent of the total sequence length (denoted as "T" in Table 1). Specifically, our segments are about 20 days in the daily series and 16 weeks in our weekly series.[16]

Our motivation for using a relatively simplistic model as in equation (1) is that this mean model produces intuitive and easily interpreted estimates of the structural breaks; the break size, $\hat{c}_j - \hat{c}_{j-1}$, is the number of basis points with which the yields increase or decrease.

[14] For details of the method's inferential setup, we refer the reader to the papers by Bai and Perron (1998, 2003). All estimations use the GAUSS program available from Pierre Perron's web page.
[15] We follow the convention of using $T_0 = 1$ and $T_{m+1} = T$ (total length of sequence).
[16] Ideally, one would have liked the shortest segments to be the same across all markets, i.e., that we used shorter segments in the weekly Stockholm series. But in order for there to be enough number of observations within each segment we had to settle at 10 percent. Technically, we set the *trimming parameter* π to be 0.10 (10 percent), i.e., that $T_j \geq \pi \cdot T$.segment lengths hence being at least. Bai and Perron (2005) recommend having at least 18 observations in each segment for the calculation of variance-covariance matrices.

Two potentially problematic modeling issues arise. First, most high-frequency financial variables exhibit some degree of persistency which are not fully accounted for in (1). The Bai and Perron methodology has an apparatus for dealing with a wide range of error distributions, however, and it alleviates most such modeling concerns. Moreover, simulations by Paye and Timmerman (2006) suggest that persistency has limited effect on the ability of Bai and Perron's method to consistently pick the correct break points, especially when break magnitudes are large (which they are indeed in our analysis)

A second modeling issue of importance is that nominal sovereign yields also pick up influences from factors other than the default risk, predominantly various macroeconomic fluctuations such as inflation or market interest rates and expectations about them. We address this influence in a number of robustness tests reported in Section 6. Specifically, we replaced the yields in equation (1) with yield *spreads* calculated as the Nordic yields divided by yields of U.S., British, Swiss and Swedish (for the non-Swedish Nordic countries) in a variety of ways. The yield spreads should, in principle, cancel out all common macroeconomic influences and leave the sovereign risk as sole determinant. The results are basically identical with the main results of the paper, which again indicates a satisfactory robustness of our method and findings.

Finally, what is the expected impact of a war on a country's sovereign yields and how should one interpret the magnitudes of a structural break in terms of changes in the perceived threat of war? Unfortunately, there are no clear-cut answers to these questions in either asset pricing theory or financial history. In principle, borrowing countries balance their expected costs of a default (reputational losses resulting in costlier future borrowing) with their benefits (retained cash that is not paid out to lenders). Wars may alter both costs and benefits in different directions due to many factors, e.g., the fiscal status and credit histories of countries, the extent and length of the war and the setup of existing debt contracts (e.g., presence of gold clauses). Looking at history, Suter (1992, pp. 61–83) provides several examples of belligerent countries that were either defaulters or that kept on servicing their debt. In an attempt to determine the effect on sovereign yields by the arrival of news of wars, Mauro et al. (2006, ch. 5) show that emerging market yields quoted in London in 1870–1914 increased by on average 300 basis points (which is almost a doubling of yields) as a result of war news. Additional evidence on the robustness of interwar bond investors is the remarkable cases of government bonds issued by countries that formally had ceased to exist, e.g., Tsarist Russia after 1917 or Austria after 1938, that kept on being

traded and quoted at almost normal yield levels for years.[17] Hence, historical evidence suggests that while wars did not automatically imply that belligerent countries defaulted on their debt there seem to have been fears of this eventuality as shown by significantly increased market yields.

5 Results and comparative analysis

5.1 Structural breaks in Nordic sovereign yields

Table 2 presents the estimated structural breaks in the Nordic sovereign yields before the outbreak of World War II in the respective countries.[18] Consider first the Danish yields quoted in Copenhagen (Figures 1 and 2). They exhibit several positive breaks at the time of major war events, clearly indicating that Danes perceived an increased level of sovereign risk well before the German invasion in early April 1940. The first two breaks, amounting to a combined increase of 120 basis points, occurred around the time of the outbreak of World War II. The third break occurred in mid-February 1940, coinciding with the *Altmark* incident off the Norwegian coast (discussed above). Looking at the Danish yields in Stockholm (Figure 3), we see similar, but even stronger indications of increased war threats in 1939. There is a very small, and seemingly politically insignificant break in late 1938, but then there is a notable break in late March 1939, shortly after the German annexation of Czechoslovakia. A third break occurred in late August 1939, simultaneously with the first break in Copenhagen. The fourth break is recorded in early December 1939, just after the Soviet attack on Finland. This break increased Danish yields by 215 basis points. Finally, the German invasion of Denmark on April 9, 1940, which had been recorded in Stockholm since Sweden was still neutral and at peace, produced a significant break of +361 basis points, but the initial spike during the first week after the invasion amounted to +1,900 basis points! Hence, these results show that the traders in Denmark and Sweden perceived a clearly increased war threat on Denmark well ahead of the German invasion. The invasion spike in the Stockholm yields, reflecting the yield under realization of war, however, suggests that the Swedish investors still believed that a continued peace was more likely than the outbreak of war in Denmark.[19]

[17] Oosterlinck and Landon-Lane (2006) show that Tsarist Russian bonds kept being traded in Paris in 1918–1919 on yields averaging at no more than 8 percent! Similarly, Austrian bonds traded in Zurich throughout World War II at about a 15 percent yield (Frey and Kucher, 2000).

[18] There are additional results from the estimations that do not appear in the table, including the $\mathrm{Sup}F_T(\ell|0)$- and $\max_{1\geq\ell\geq L}\mathrm{Sup}F_T(\ell|0)$-tests for existence as well as the sequential $\mathrm{Sup}F_T(\ell+1|\ell)$-test for the number of breaks. These are available upon request.

[19] An "assessed war probability", calculated as the Stockholm yields right before the war divided by the tip of the yield spike right after the war outbreak, for Denmark is 40% (750 bp / 1,150 bp = 0.395).

Consider now the Finnish government bonds at home and abroad. The Finnish yields in Helsinki (Figure 4) exhibit two very small, and unimportant, breaks recorded during February-March 1939. By contrast, a third break on September 6, of +62 basis points suggests that the outbreak of war on the continent was clearly perceived as affecting Finland in a negative way. Since the Helsinki Stock Exchange closed down all bond trading on October 11, we cannot tell from the yields how the Finns reacted to the continued development although the closure of the stock exchange by itself indicates increasing fears of a substantially increased political turbulence. The Finnish yields in Stockholm (Figure 5) contain three structural breaks, the first one in early September 1939, i.e., at the same time as in Helsinki but much larger, of +862 basis points. The second break was in early December, i.e., after the Soviet attack on Finland, which increased the yields by an additional 2,083 basis points! The third break occurred in mid-March 1940, immediately after the Soviet-Finnish truce, and interestingly it was by –1,298 basis points. In other words, while both Finns and Swedes interpreted the German-Russo anti-aggression pact and the outbreak of war in Poland as strongly increased external threats to Finland, the actual outbreak of war in Finland further increased the sovereign risk (in Sweden).

Consider, thirdly, the Norwegian government bonds. The Norwegian yields in Oslo (Figure 6) experienced five structural breaks. Of these, the first four in early September, mid-October, early December 1939, and one in late January 1940 were significant increases of 132 basis points in total. While the September and December breaks are clearly associated with war events in Poland and Finland, the other two are less obviously related with the war developments. The last break occurred in mid-March 1940, directly in relation to the announced truce in Finland and, interestingly, it was a yield cut by 55 basis points indicating a lowered perceived threat after this peace event. As for the Norwegian yields in Stockholm (Figure 7), they portray a much more homogenous picture. The first break in early September 1939 was a 201 basis points increase and the second +176 basis point break in late December clearly indicate increased war threats to Norway, as perceived by traders in Sweden. Then there was a third break recorded just after the German invasion, in April 1940, measuring +333 basis points and hence indicating that the eventuality of war was not entirely capitalized by the Swedish market actors. Later in 1940 there is a fourth break of –243 basis points, which most likely signals the resolved uncertainty about the effects of the German occupation on Norway's economy and, perhaps, even status as a sovereign nation.

Finally, consider the Swedish government bonds. The Swedish yields recorded in Stockholm (Figure 8) experienced five structural breaks between 1938 and 1940. Three of these were significant yield increases occurring right at the time of several major war events: the

outbreak of the war in early September 1939 (+66 basis points), the Finnish-Soviet war in December 1939 (+44 basis points) and the German invasion of Denmark and Norway in early April 1940 (+15 basis points). An interesting observation is that the yield increases get smaller the closer the war gets to Scandinavia. This could signal that Swedes regarded the risk of an attack on Sweden as being independent of the risk of attacks on the other Nordic countries. Given the vast importance of the Swedish iron ore exports to, in particular, the German war industry such a conjecture may actually have been plausible at the time.

A general finding of these estimations is the interesting distribution of responses to the events across geographical borders. While foreign and domestic traders react almost identically in time to the same major political events, the magnitude of their reactions in terms of basis point changes differ by a factor of between five and fifteen. The Molotov-Ribbentrop Pact, for example, boosted the Danish government yields by 51 basis points in Copenhagen but by 136 basis points in Stockholm. Similarly, the Soviet invasion of Finland raised Norwegian sovereign yields by 48 basis points in Oslo but 176 basis points in Stockholm. The reasons for this heterogeneity has been studied by Waldenström (2006), who looks at the specific case of the Danish sovereign debt traded in Copenhagen and Stockholm in the late 1930s and the entire 1940s. The single most important explanation for this discrepancy is that governments tend to discriminate against foreign investors vis-à-vis their domestic counterparts and that this is mainly driven by political power concerns.[20]

5.2 Comparing the views of historians and markets

We now go on to compare the estimates of pre-war threat assessments made by historians (discussed in Section 2) and bond markets (discussed in Section 5.1). Neither approach is free from methodological and data-related problems and this exercise is hence not about any version being “right” or “wrong” or “better” or “worse”. Rather, we wish to shed light on whether they differ at all and, if so, why and in what way. In Table 3, we summarize the findings from previous sections by periodically classifying the assessed threat levels by country and methodological approach. A first result is that there is agreement on that Nordic people perceived little external threat before late August 1939. Although the Danish yields rose in March of that year, the substantial yield increases came right after the Molotov-Ribbentrop pact or the German attack on Poland one week later. This also suggests that the Nordic people did not compare themselves to Austria and Czechoslovakia in

[20] Competing hypotheses rejected by Waldenström (2006) are local government (or central bank) interference in bond market to keep yields low, institutional differences in market regulations and microstructure, and different degrees of risk aversion across the national markets.

terms of foreign policy relations with "big neighbor" Germany, at least judging from the lack of major threat increases recorded after their annexations in 1938 and 1939, respectively.

The most significant result from the comparison is the discrepancy in perceived threats between the two versions. In short, the financial markets signal substantially higher war risk expectations than historians do. For example, whereas historians report that the Danes and Norwegians felt largely secure up to the German invasion, the markets display several dramatic yield increases following some of the most important war-related events: the German-Russo Pact, the outbreak of World War II, the war between Finland and the Soviet Union as well as some minor events in early 1940. In the case of the Finns, both the Finnish and Swedish financial markets reflect significant war threats after the German-Russo Pact and the outbreak of war, whereas historians suggest there were none. Interestingly, not even the Finnish political and military leaders, who were arguably better informed than the Finnish people, perceived a larger war threat more in line with the bond markets before the Soviet attack. In fact, our historical outline in section 2 showed that while the Finnish people in October 1939 started feeling seriously uneasy with the Soviet intentions after having observed the Soviet annexations of the Baltic states, the Finnish government continued to put their trust into the benevolence of Stalin and even withdrew troops from the front in late November.

There are, however, several points of agreement between the historians and the markets. One such instance is the fact that the Norwegian yields in Oslo actually decreased after the announcement of the Moscow truce in March 1940, which hence was interpreted as lowering the risk of war on Norwegian soil. It should be noted, however, that the Swedes did not seem to have reached the same conclusions as the Norwegian yields in Stockholm stayed at their relatively high pre-invasion level through March. Another example of concurrence is the fact that the realization of war in Finland, Denmark and Norway gave rise to yield spikes in the respective countries' bonds traded in Stockholm. If anything, this indicates that there was no one who fully anticipated the wars, which hence supports the claims of historians. Judging from the magnitudes of the estimated breaks relative the short-term spikes, which reflect the prospected yield under the realization of war, the market actors viewed the probability of war in Denmark, Finland and Norway as being somewhere around 50 percent.[21]

[21] The "assessed war probabilities", calculated as the pre-war yields (just before the outbreak of war) divided by the tip of the yield spike right after the war outbreak, are for Denmark 40% (recall the previous section), for Finland 35% (1,100 bp / 3,200 bp = 0.344) and for Norway 54% (700 bp / 1,300 bp = 0.538).

6 Robustness analysis

As we highlighted in Section 4 when discussing the estimation of structural breaks in sovereign yields, there is a risk that the sudden mean-shifts may be partly, or wholly, driven by an unobserved simultaneous shock to some nominal macroeconomic variable (e.g., inflation or market interest rates) which, in turn, would have a first-order impact on the nominal bond yield. In order to control for such exogenous effects, we rerun the structural breaks analysis but now use sovereign yield *spreads* on the left hand side. Yield spreads should, at least in principle, cancel out all common macroeconomic influences and leave the spread being solely determined by the sovereign risk. Unfortunately, any common elements of sovereign risk across certain types of countries, which we also would like to capture in our breaks, would also be eliminated when using spreads. For example, if there would be an increased risk of attack directed specifically to all neutral countries, Nordic spreads over, say, Swiss sovereign yields would not be able to contain this risk component.

If we find that the breaks estimated when using spreads are different from those using yields in terms of a) the occurrence and timing of break dates and b) the magnitudes of the estimated breaks, we would be inclined to seriously doubt the robustness of our previous findings. In particular, if the spreads do not contain any statistically significant positive *pre-war* breaks around the time of the major geopolitical shocks, our prime identifier of increased war threat assessments of the general public, our core results would be more or less rejected. We compute spreads by subtracting from each Nordic yield an equivalent government yield of different reference countries as follows:

$$y_{Nordic\ country,t} - y_{Reference\ country,t} = c_j + \varepsilon_t, \qquad t = T_{j-1}+1, \ldots, T_j. \qquad (2)$$

The two subsequent sections present robustness analyses of two variants of spreads.

6.1 Nordic spreads in the Stockholm market

First we estimate structural breaks in weekly yield spreads using Nordic yields in Stockholm and one of three reference yields: U.S. long-term (12 years) government bonds, U.S. short-term (3-5 year) Treasury notes, and the Swedish government yields. Obviously, the latter only allows robustness tests of the breaks in Danish, Finnish and Norwegian yields. The spreads over the Swedish yields are conceptually the best since they are denominated in the same currency and thereby best able to separate out macroeconomic shocks to nominal returns. While the U.S. yields only do this for globally common trends or shocks, they are still relatively suitable as the U.S. and the Nordic countries were similar in other respects: they were both outside the war at this period and yet their national economies

(and hence the forces driving nominal fluctuations) were highly affected by the wartime turbulence.

Table 4 presents the findings of the robustness break analysis. Overall, the pre-war breaks in the basic yield analysis appear also in the spread analysis. In fact, there are even some earlier minor sovereign risk increases picked up in the spread breaks. The differences in timing ("Datediff.") of the estimated breaks are mostly small (0 or 1 weeks), except in the Swedish case where the timing is more affected but still in the pre-war period. The size difference of the breaks ("Sizediff.") is somewhat larger, with spreads mostly generating smaller breaks. In no instance, however, do the size switch sign which further reassures us regarding the robustness of the baseline findings of our yield analysis.

6.2 Danish and Norwegian spreads in the Copenhagen and Oslo markets

In a second set of robustness tests, we analyze Danish and Norwegian spreads in their home markets, subtracting one of the following reference yields: British 2.5% consol yields, Swiss confederate state and railway bonds, the U.S. long-term government yield, and the Swedish yield. Due to data availability we only have monthly series, and therefore we focus on spread changes over some specific pre-war time periods. Finland is left out because of its lack of domestic yields after early October 1939.

In Figures 9 and 10, the different Danish and Norwegian spreads are displayed over the years 1938–1940. Looking at spread changes between the early pre-war period (1938–early 1939) and the late pre-war period (1939/early 1940), that Danish spreads over U.S. and British yields increased markedly whereas they increased only moderately, and even decreased, over Swiss and Swedish yields, respectively. Over the same period, all Norwegian yield spreads increased, three of them substantially and one of them (the Swedish) moderately. These results indicate that the significant pre-war threats observed in our basic break analysis remain in most yield spread definitions. Interestingly, the spreads over U.S. and British yields consequently increased more during 1939 than the Swiss, and especially the Swedish spreads did. The reasons for this heterogeneity are not obvious. While both Sweden and Switzerland were the only neutral countries, Britain was the only one to enter the war in 1939, Sweden was much more integrated economically than any of the other three and the U.S. is the only non-European country. Regardless of what, however, the main message is that the spreads contain much of the pre-war threats previously found.

7 Concluding remarks

Did the people in the Nordic countries expect that their own countries would be drawn into war activities during the turbulent years 1938–1940? We have in this paper examined two

different empirical methodologies and their answers to this question. In the first one, "conventional" Nordic World War II historical writing has argued that there were few, if any, in these countries who strongly believed in an attack on their countries. The second approach, by contrast, focuses on large shifts in Nordic government bond yields during 1938–1940 and the fact that changes in these yields that coincide with important war events reflect changes in war risks that were assessed *in real time* by the contemporaries.

Our main finding is that there are several instances of disagreement between the two interpretations of history. While historians claim that the Nordic peoples felt safe until the autumn of 1939 (in the case of Finland), the winter of 1939 (Sweden) and early April, 1940 (Denmark and Norway), the prices of these countries' sovereign debt fell considerably several months before these conjectured dates. In most cases, the yield shifts were direct responses to major war-related events such as the announcement of the Molotov-Ribbentrop in late August 1939 or the Soviet attack on Finland in late November that year.

We also find, however, points of agreement between historians and markets. For example, Norwegian yields in Oslo dropped after the truce between Finland and the Soviet Union, thereby somewhat reinforcing the widely held sentiments of reassurance described by historians. Furthermore, all Nordic yields traded in Stockholm spiked one the outbreak of war was realized, i.e., in Finland in December 1939 and Denmark and Norway in April 1940. This clearly indicates that market traders had not fully anticipated the wars but only regarded them as likely to some degree (we propose assessed war probabilities in the range of 35%–54%).

Although there are notable discrepancies between the two versions of history, our comparative analysis says little about any of them being either "right" or "wrong". Both approaches suffer from methodological and data-related problems. For example, historians predominantly use text-based sources while past public opinions may hardly be evident in such data material. Historians' selection and interpretation of the historical facts may also reflect views of their own political and social context, which might bias their conjectured war historiographies. On the other hand, the financial market-based analysis relies on the quality of the historical statistical data, which can often be questionable. Furthermore, the econometric method used relies on modeling choices and various assumptions that could be discussed. In other words, there are pros and cons with both approaches and we would therefore recommend a broad methodological approach when analyzing subtle issues concerning the mind sets of large populations from in the past.

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Table 1: Nordic government bond loans analyzed in the study.

Bond, loan period, coupon	Freq.	T	Ave.	Cur.	Analysis period	Source
Stockholm market:						
Danish gov., 1936–56, 4%	Weekly	157	550	SEK	1/4/38–12/31/40	*Affärsvärlden*
Finnish gov., 1934–44, 5%	Weekly	157	1160	SEK	1/4/38–12/31/40	*Affärsvärlden*
Norwegian gov., 1934–59, 4%	Weekly	157	580	SEK	1/4/38–12/31/40	*Affärsvärlden*
Swedish gov., consol, 3%	Weekly	157	330	SEK	1/4/38–12/31/40	*Affärsvärlden*
Copenhagen market:						
Danish gov., 1934–59, 4%	Weekly	78	5460	DKK	10/1/38–4/5/40	*Finanstidende*
Danish gov., 1934–59, 4%	Daily	189	4930	DKK	7/3/39–4/8/40	*Berglinske Tidende*
Oslo market:						
Norwegian gov., 1937–68, 4.5%	Daily	212	510	NOK	8/2/39–4/8/40	*Morgenbladet, Aftenposten*
Helsinki market:						
Finnish gov., 1935–60, 5%	Daily	238	510	FIM	1/3/39–10/10/39	*Hufvudstads-bladet*
U.S. market:						
U.S. gov., 1938-40, 12-yrs	Weekly	36	237	USD	1/4/38–12/31/40	*Fed. Reserve*[a]
U.S. T-Note, 1938–40, 3-5-yrs	Weekly	36	63	USD	1/4/38–12/31/40	*Fed. Reserve*[b]
British market:						
British consol, 1938–40, 2.5%	Daily	36	352	GBP	1/38–12/40	*LN*[c]
Swiss market:						
Swiss gov., 1938-40.	Monthly	36	372	SWF	1/38–12/40	*LN*[c]

Note: "Freq." denotes trading frequency, "T" is the number of observations, "Ave." is the average mean level of the series used, "Cur." is the currency in which the bond loan is denominated, "Period" is the period for which each bond is analyzed, restricted either by the time focus of the study or data availability.
[a] Federal Reserve Board (1943), Table 129: Bond yields, by type of security, weekly, 1934–1941.
[b] Federal Reserve Board (1943), Table 121: Short-term open-market rates in New York City, weekly, 1934–1941.
c League of Nations, Table 109 (1938–39), 105 (1940-41): Percentage Yields of Bonds.

Table 2: Structural breaks in Nordic sovereign yields. Stockholm market, 1938-1940.

Country, Break No.	Break date	Confidence interval (periods)	Break size (basis points)	Contemporaneous war event
Denmark	*Copenhagen market, Daily series,* Jul.1939–Apr.1940			
No. 1	8/25/1939	[–2, +1]	+51	German-Soviet anti-aggression pact
No. 2	9/26/1939	[–4, +1]	+71	Outbreak of World War II
No. 3	2/14/1940	[–1, +6]	+54	*Altmark* incident (?)
	Copenhagen market, Weekly series, Oct.1938–Apr.1940			
No. 1	9/22/1939	[–1, +1]	+120	Outbreak of World War II
No. 2	2/16/1940	[–1, +2]	+54	*Altmark* incident (?)
	Stockholm market, Weekly series, Jan.1938–Dec.1940			
No. 1	12/13/1938	[–6, +6]	+13	
No. 2	3/28/1939	[–19, +1]	+40	Germany annexes Czechoslovakia
No. 3	8/22/1939	[–6, +2]	+136	German-Soviet anti-aggression pact
No. 4	12/5/1939	[-2, +3]	+215	Soviet Union attacks Finland
No. 5	4/9/1940	[–38, +1]	+361	Germany invades Denmark
Finland	*Helsinki market, Daily series,* Jan.1939–Oct.1939			
No. 1	2/2/1939	[–4, +1]	–5	
No. 2	3/30/1939	[–27, +1]	+6	
No. 3	9/6/1939	[–1, +1]	+62	Outbreak of World War II
	Stockholm market, Weekly series, Jan.1938–Dec.1940			
No. 1	9/5/1939	[–6, +6]	+864	Outbreak of World War II
No. 2	12/9/1939	[–19, +1]	+2,083	Soviet Union attacks Finland
No. 3	4/2/1940	[–6, +2]	–1,298	Finnish-Soviet peace treaty
Norway	*Oslo market, Daily series,* Aug.1939–Apr.1940			
No. 1	9/8/1939	[–3, 0]	+38	Outbreak of World War II
No. 2	10/16/1939	[–2, +13]	+17	
No. 3	12/11/1939	[–1, +1]	+48	Soviet Union attacks Finland
No. 4	1/29/1939	[–1, +3]	+29	
No. 5	3/13/1939	[–1, +1]	–55	Outbreak of World War II
	Stockholm market, Weekly series, Jan.1938–Dec.1940			
No. 1	9/5/1939	[–1, +2]	+201	Outbreak of World War II
No. 2	12/26/1939	[–1, +1]	+176	Soviet Union attacks Finland
No. 3	4/30/1940	[–1, +1]	+333	Germany invades Norway
No. 4	9/10/1940	[–1, +2]	–243	Norwegian resistance ends (Aug.)
Sweden	*Stockholm market, Weekly series,* Jan.1938–Dec.1940			
No. 1	4/18/1939	[–26, +1]	+8	
No. 2	9/12/1939	[–2, +1]	+60	Outbreak of World War II
No. 3	12/26/1939	[–1, +3]	+44	Soviet Union attacks Finland
No. 4	4/9/1940	[–15, +3]	+15	Germany attacks Denmark/Norway
No. 5	7/30/1940	[–1, +2]	–49	

Note: The table shows the number of breaks selected by the procedure of Bai and Perron (1998, 2003), their 95% confidence interval in brackets showing the number of periods (days or weeks) surrounding the break date, the size of the break in numbers of basis points (the difference between average yields in the segments before and after the break), and a political or military event coinciding with the break.

Table 3: Nordic government bond loans analyzed in the study.

Country	Time period	Public pre-war threat assessments according to...		
		Historians[a]	Bond markets[b]	Agreement?
Denmark	– Mar. 1939	None	None	Yes
	Apr. 1939 – Aug. 25, 1939	None	Some	No
	Aug. 25, 1939 – Apr. 1940	None	Some/Large	No
Finland	– Aug. 23, 1939	None	None	Yes
	Aug. 23, 1939 – Sep. 1939	None	Some/Large	No
	Oct. 1939 – Nov. 1939	Some	Large	No
Norway	– Aug. 1939	None	None	Yes
	Sep. 1939 – Mar. 13, 1940	None	Some/Large	No
	Mar. 13, 1940 – Apr. 9, 1940	None	Some	No
Sweden	1938 – Aug. 30, 1939	None	None	Yes
	Sep. 1, 1939 – Nov. 30, 1939	None	Some	No
	Dec. 1, 1939 –	Some	Some	Yes

Note: When the market-based assessment says "Some/Large" this refers to the fact that the domestic yields reflected smaller threat increases than the foreign yields did in response to the same political events.

[a] Based on the outlined historical writing in Section 2.

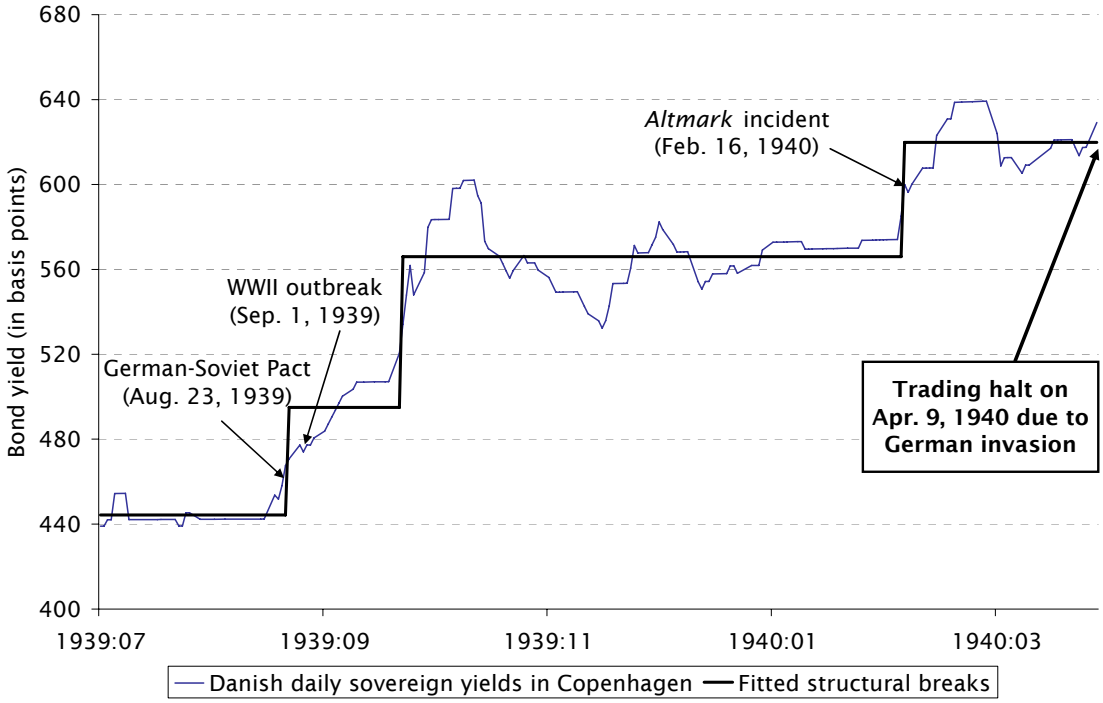
[b] Based on structural break estimates Table 3.

Table 4: Robustness analysis: Structural breaks in Nordic spreads. Stockholm market, 1938-1940.

Bond yield		Spread over Swedish bond yield				Spread over U.S. bond yield				Spread over U.S. Treasury Notes			
Date	Size	Date	Datediff.	Size	Sizediff.	Date	Datediff.	Size	Sizediff.	Date	Datediff.	Size	Sizediff.
Denmark													
						4/12/38		25		4/12/38		40	
12/6/38	13									12/6/38	0	54	41
3/21/39	40	3/21/39	0	80	40	3/14/39	1	77	37				
8/15/39	249					8/15/39	0	229	–20	8/8/39	1	252	3
		11/28/39		212									
4/2/40	458	4/9/40	1	373	–85	4/2/40	0	481	23	4/2/40	0	473	15
Finland													
		1/24/39		–18						4/12/38		43	
8/29/39	864	8/15/39	2	711	–153	8/29/39	0	852	–11	8/15/39	2	739	–124
12/12/39	2083	12/5/39	1	1197	–886	12/12/39	0	2109	26	12/5/39	1	1270	–813
3/26/40	–1298					3/26/40	0	–1287					
Norway													
										4/12/38		46	
		3/7/39		24		3/21/39		65		3/21/39		105	
8/29/39	201	8/29/39	0	123	–79	8/29/39	0	144	–57				
12/19/39	176	12/26/39	1	134	–42	12/19/39	0	202	26	12/5/39	1	281	105
4/23/40	333	4/30/40	1	328	–4	4/23/40	0	329	–4	4/16/40	1	321	–12
9/3/40	243	8/27/40	1	269	26	9/3/40	0	272	30	8/27/40	1	273	31
Sweden													
						9/20/38		15		4/12/38		34	
4/11/39	8					4/11/39	0	35	27	2/21/39	7	28	19
9/5/39	60									10/10/39	5	74	14
12/19/39	44					11/14/39	10	76	32	1/23/40	5	48	5
4/2/40	15					2/27/40	5	33	18				
7/23/40	–49					6/11/40	6	–29		5/21/40	9	–42	7

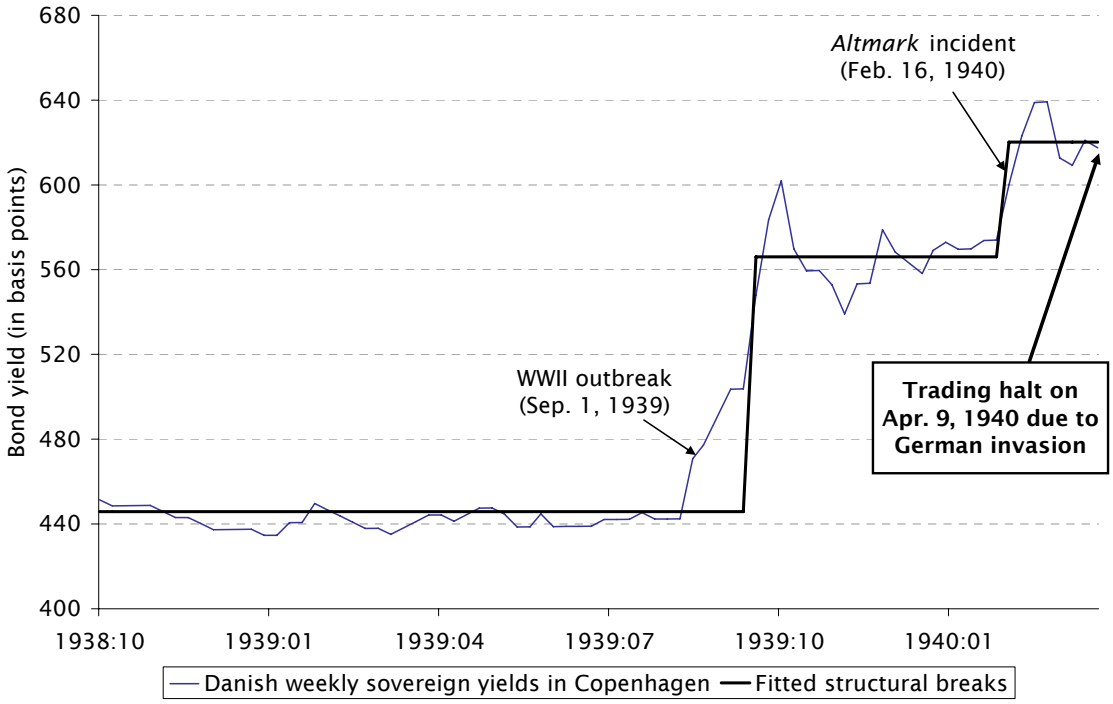
Note: "Bond yield" reproduces parts of the results in Table 2. "Date" denotes break date and "Size" break size (as in Table 3). "Datediff." denotes the number of weeks that differ between the structural breaks estimated for bond yields (eq. (1)) and bond spreads (eq. (2)). "Sizediff." is the corresponding difference in estimated break sizes.

Figure 1: Danish sovereign yields and structural breaks. Copenhagen market (daily data).



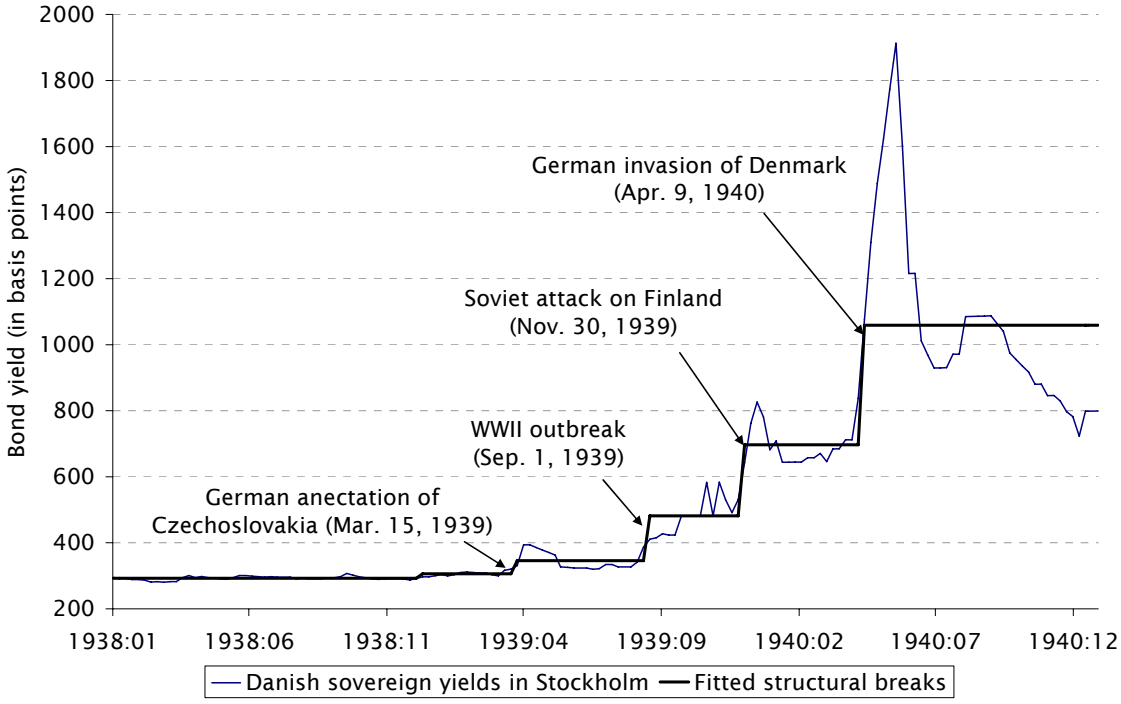
Note: The figure is based on results in Table 2.

Figure 2: Danish sovereign yields and structural breaks. Copenhagen market (weekly data).



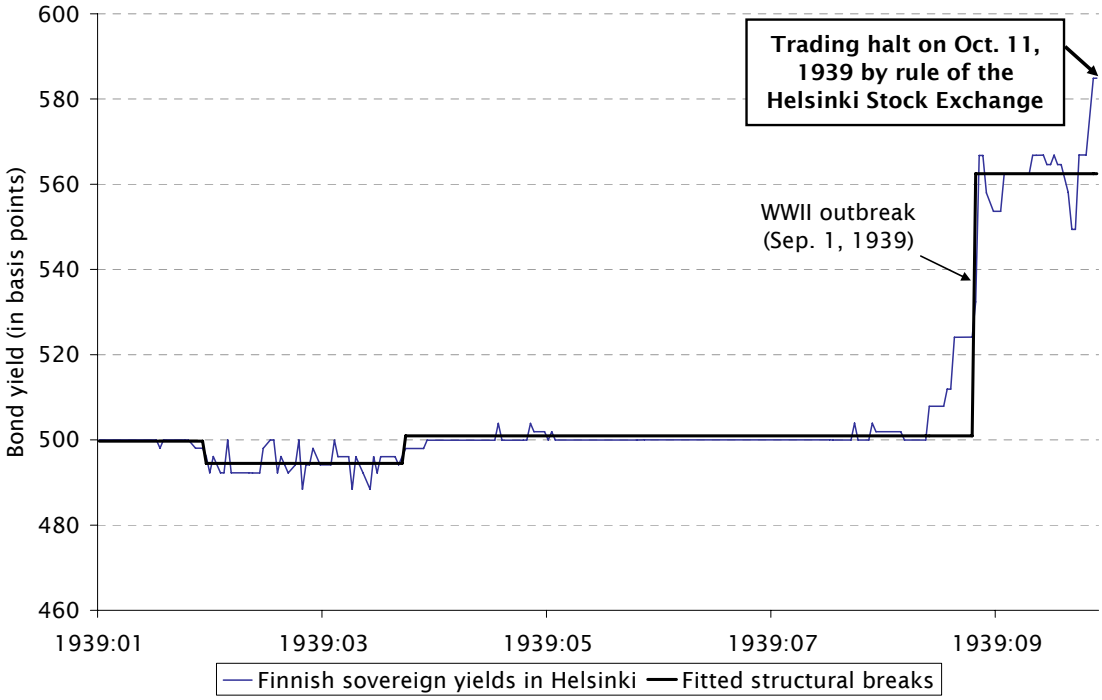
Note: The figure is based on results in Table 2.

Figure 3: Danish sovereign yields and structural breaks. Stockholm market (weekly data).



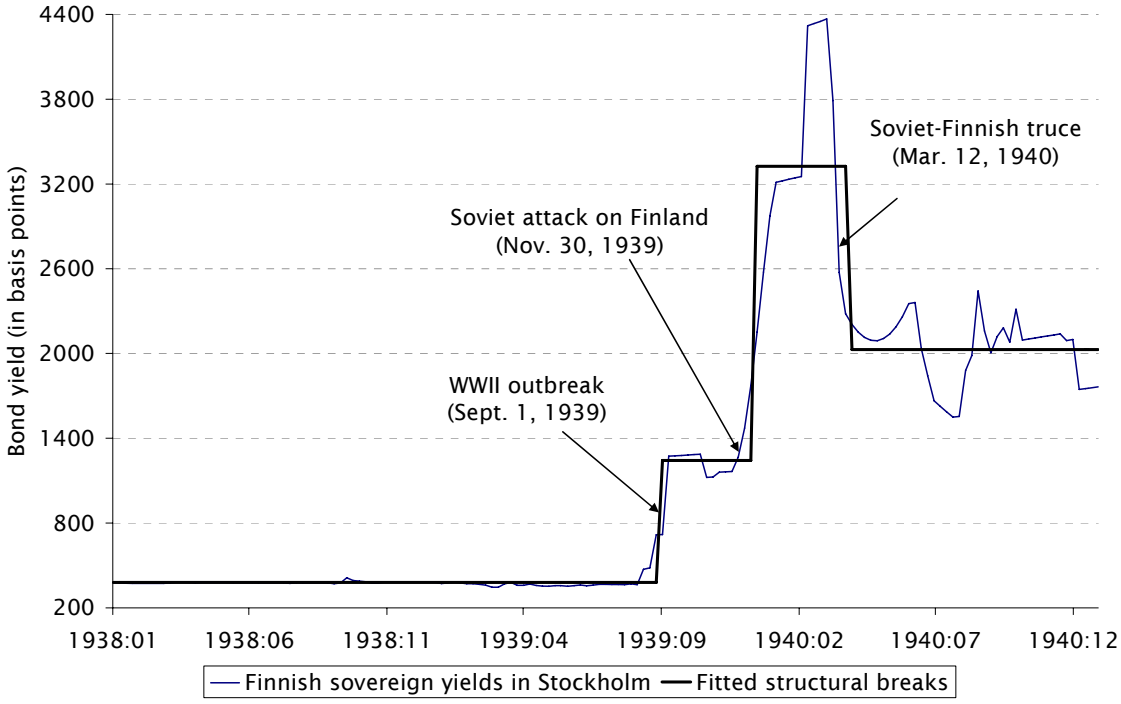
Note: The figure is based on results in Table 2.

Figure 4: Finnish sovereign yields and structural breaks. Helsinki market (daily data).



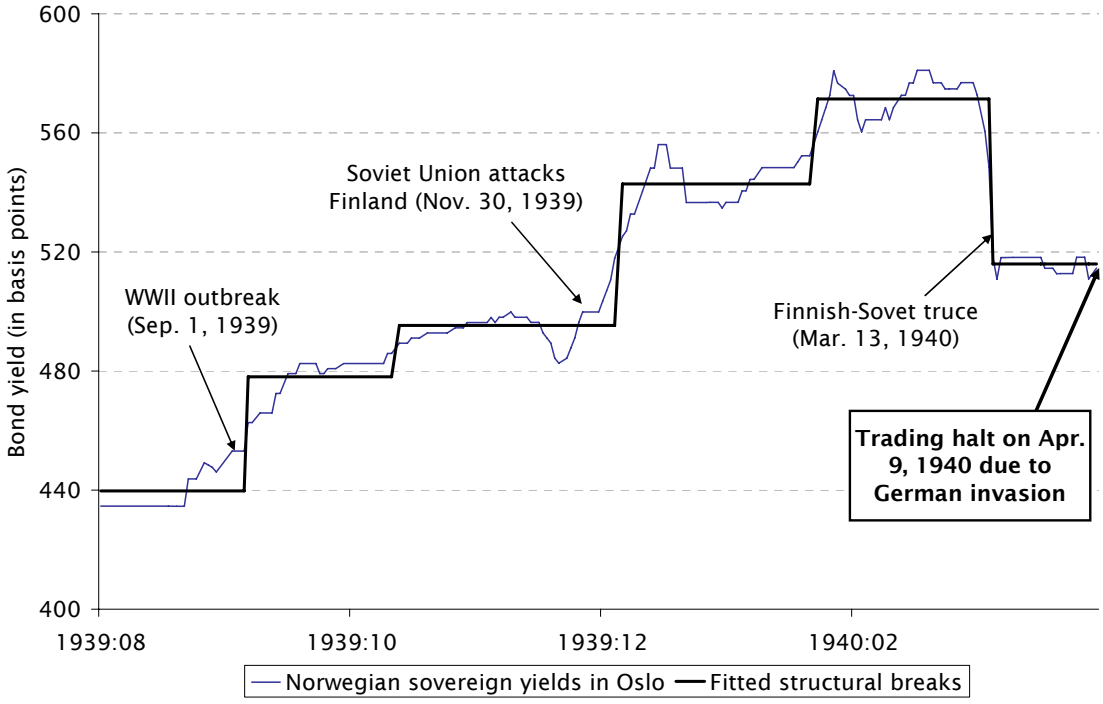
Note: The figure is based on results in Table 2.

Figure 5: Finnish sovereign yields and structural breaks. Stockholm market (weekly data).



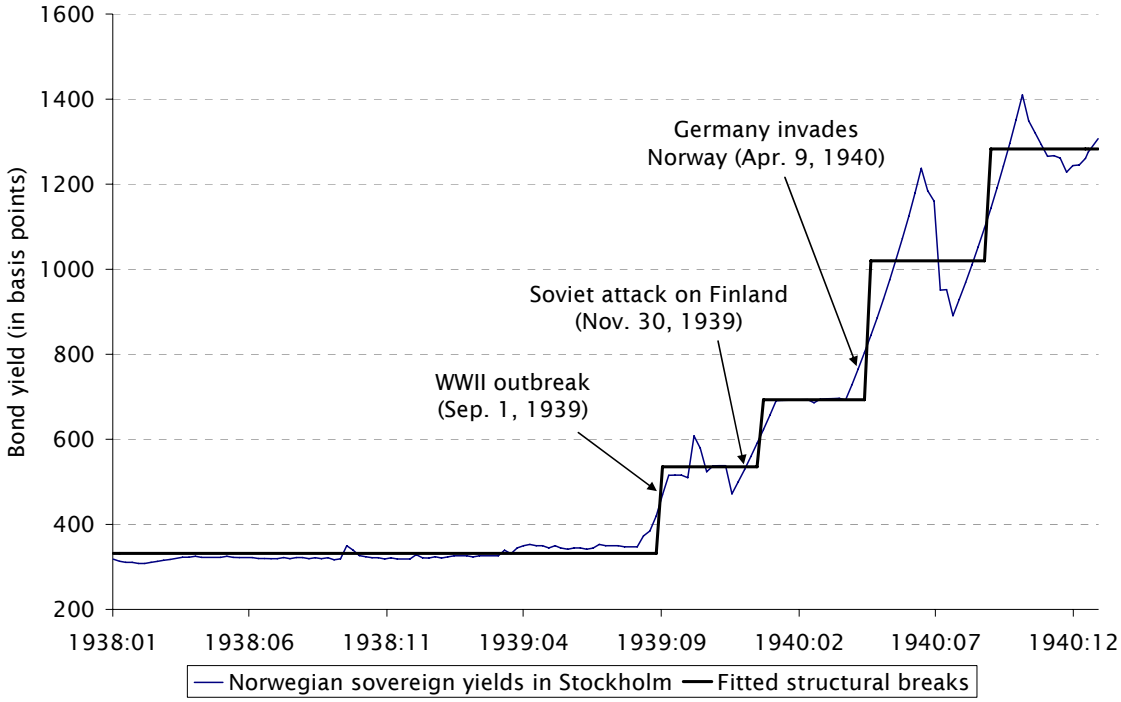
Note: The figure is based on results in Table 2.

Figure 6: Norwegian sovereign yields and structural breaks. Oslo market (daily data).



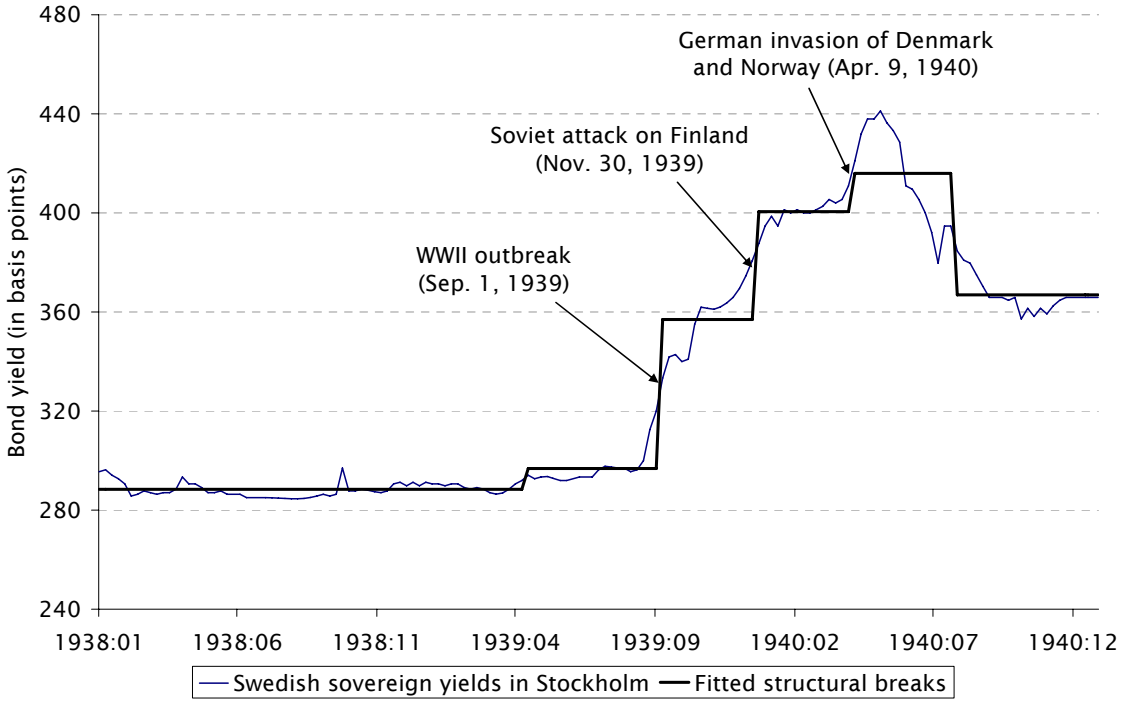
Note: The figure is based on results in Table 2.

Figure 7: Norwegian sovereign yields and structural breaks. Stockholm market (weekly data).



Note: The figure is based on results in Table 2.

Figure 8: Swedish sovereign yields and structural breaks. Stockholm market (weekly data).



Note: The figure is based on results in Table 2.

Figure 9: Danish sovereign spreads. Copenhagen market (monthly data).

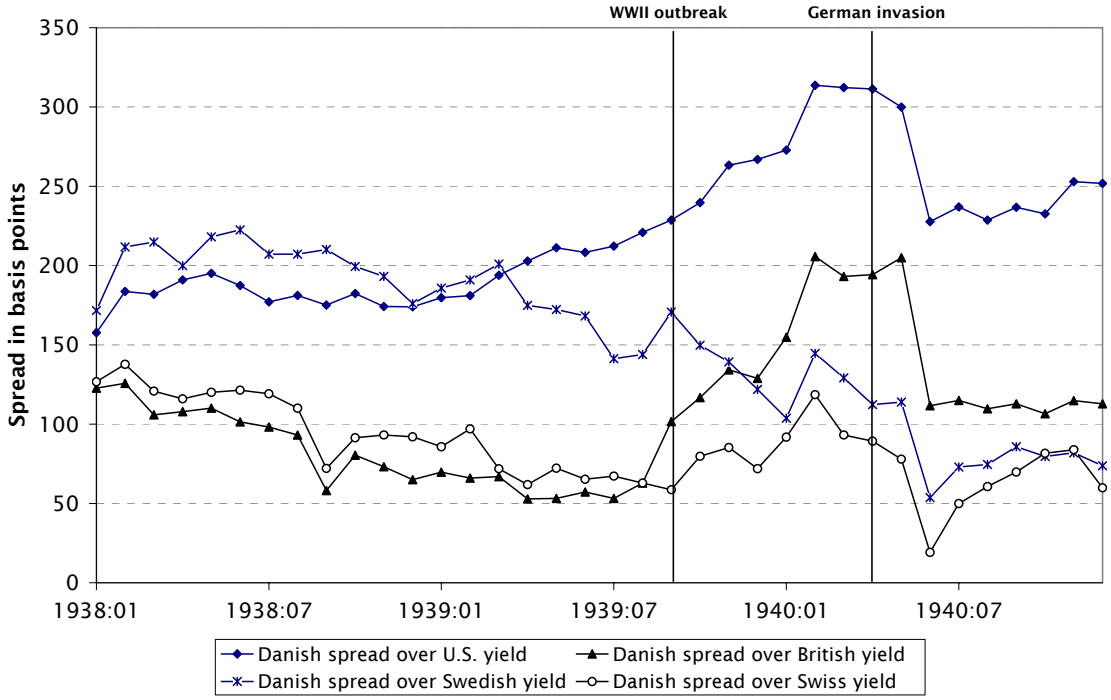
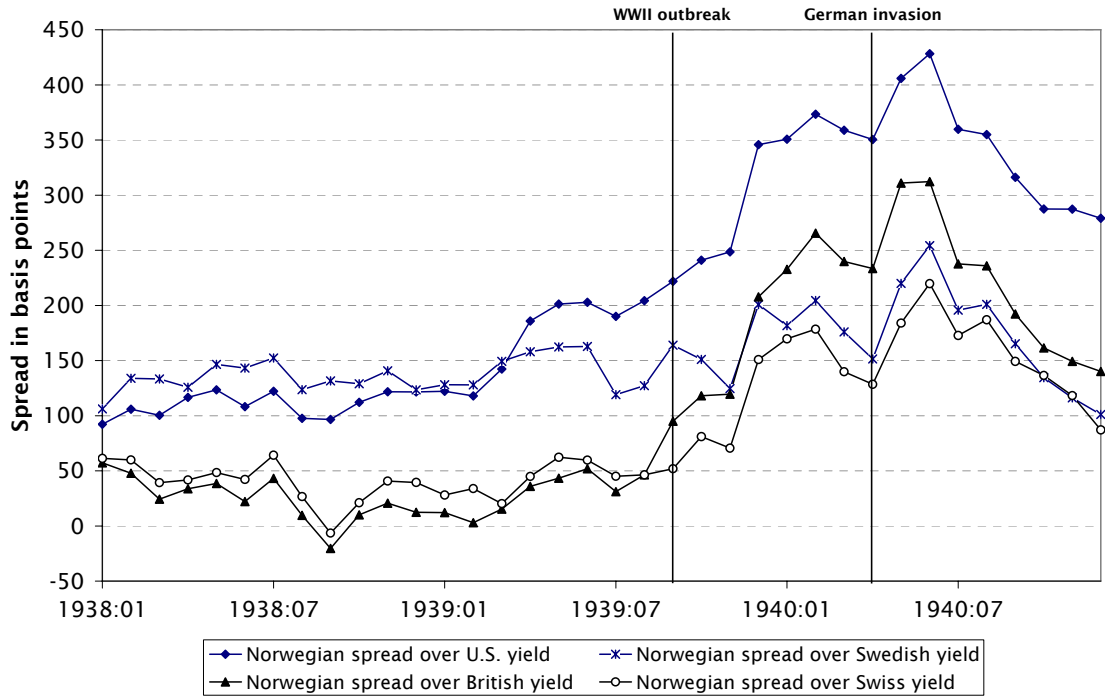



Figure 10: Norwegian sovereign spreads. Oslo market (monthly data).