Measuring Pre-War Threat Perceptions using Financial Markets: The Nordic Countries before World War II[*]

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Abstract

This paper compares new financial market-based estimates of widely held *ex ante* war threat assessments in history with what conventional historical writing says about this. Specifically, we use a newly assembled sovereign debt yields from the Nordic markets before World War II to test for unknown structural breaks which reflect changes in perceived war threats among people. The analysis gives several examples of increases in perceived war threats in all four Nordic countries prior to the war. By and large, these findings put into question the conventional Nordic history writing which mostly describes the Nordic contemporaries as feeling quite safe from external military threats and hence assessing a low risk of war (which later occurred in most cases). We argue that using markets to reassess threat perceptions in history is a fruitful way to complement and improve existing historical writing.

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1 Introduction

This paper estimates and compares different ways of assessing how people in the past conceived impending war threats. The empirical analysis focuses on the dramatic episode in the history of the Nordic countries around the beginning of World War II. While these countries were small and neutral soon after the war outbreak they were either fighting a war (Finland), under enemy occupation (Denmark and Norway) or still being neutral (Sweden). Their *ex post* realized war threats evidently differed vastly, but did this difference also come through in the perceived *ex ante* threats, i.e., before the war broke out, of the residents in the respective countries? Using newly assembled financial evidence from these countries in this period and testing for unknown structural breaks in sovereign yield series using the recently developed method of Bai and Perron (1998, 2003), the study can present market-based estimates of the *ex ante* war threat perceptions of people. Thereafter the conventional Nordic historiography of the same popular war risk expectations is outlined. Since this rests on mainly interpretative critical readings of a small sample of sources, a comparison of the two sets of estimates offer not only interesting historiographical findings but also tangible evidence on the relative accuracy of the two contrasting versions of history.

The literature on how financial markets reflect surrounding political developments, especially wartime events, has grown in recent years. An underlying postulate is that financial markets aggregate the opinions of independently active individuals, all driven by their pecuniary incentives and hence inclined to reveal their true beliefs about the values of the assets traded. In Wolfers and Zitzewitz (2004a,b), securities with payoffs contingent on political outcomes traded on so-called prediction markets are shown to produce highly consistent assessments of the likelihood of a U.S. attack on Iraq during the period before the 2003 war. Rigobon and Sack (2005) use parallel econometric techniques to estimate ex ante war risk perceptions during the same period but on asset prices on the large U.S. financial markets. Also historical developments have been analyzed along similar patterns. For example, Elmendorf et al. (1993) showed that news affected U.K. consol prices in predictable ways and Willard et al. (1996) used novel statistical methods for detecting unknown structural breaks in currency prices to revise the history of the U.S. Civil War. A number of studies have also analyzed government bond prices during the two World Wars, finding in general a clear and consistent effect on prices by the occurrence of important wartime events.

Our paper complements the current literature by offering the following three main contributions. First, it uses data on sovereign yields collected from two different locations, do-

mestic and foreign markets, which hence offer unique insights into the formation of *ex ante* war threat perceptions depending on citizenship and location of trade. Second, the explicit comparisons between the market-based estimates and conventional Nordic history writing are also a novel feature in the literature. Third, the empirical case is previously little examined but yet highly interesting for our purposes. The stark differences in historical trajectories across the nations create variation in our sample which increases the accuracy of the estimates. Our reliance on Nordic financial market evidence, in particular the data from the Stockholm market, is also of particular relevance for the study since these securities markets, unlike most other European markets, were allowed to function freely for most of the analyzed period.

An important precondition for our study is the assertion that sovereign risk, i.e., the risk of government default of its debt, is a relatively clean measure of the threat of war to a country. In particular, this would be a motivated claim for many European countries around the outbreak of World War II. First, when a country is attacked or occupied the status of its government debt may become highly uncertain if the survival of the country in its current shape is at risk. Moreover, countries at war generally experience severe fiscal pressures that eventually could force the government to postpone or even cancel its debt repayment.[1] We expect that the connection between threat of war and risk of government default is observable in quoted market yields and although other bond yield determinants certainly exist, they were mostly constant or insignificant during our period of analysis.[2]

The study starts by presenting the econometric model used to identify structural breaks and thereafter in section 3 we discuss the data used and institutional features of the Nordic bond markets. In section 4 we present the results for each country and a discussion as to how they can be interpreted in the light of the existing historical writing. Section 6 concludes.

2 Econometric methodology

We test for unknown multiple structural breaks in the means of time series using the recently developed methodology of Bai and Perron (1998, 2003). This method tests for the existence, number, coefficients and confidence intervals of the breaks and also allows for a

[1] Governments may also deliberately boost inflation or devaluate in order to debase the value of its debt. In our study, however, we use bonds issued in the Swedish *kronors* and neither of these politically driven debasements were ever effectuated.

[2] Other standard determinants are 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 all market-specific determinants. These estimations produced essentially the same results and are available from the authors upon request.

wide range of distributions and non-spherical errors (serial correlation and heteroskedasticity) in the disturbances. The estimations depart form fitting multiple linear regressions of the following form:

$$y_{it} = \mu_j + \varepsilon_t, \qquad t = T_{j-1} + 1, ..., T_j, \tag{1}$$

where j is the segments (j = 1,…, m+1) separated by the m structural breaks, y_{it} the nominal sovereign yield of country i at time t, μ_j is the estimated intercept for each segment and ε_t a white noise error term.[3] The parameters of interest are the (unknown) number of breaks m, the dates at which they occur ($T_1, \cdots, T_m$) and the coefficient estimates associated with the separated regimes $\hat{\mu}_j$. Bai and Perron's method then applies a technique to minimize the global sum of squared residuals across all possible combination of breaks.[4] A binding constraint is that each segment must be at least πT periods long, where π is a trimming parameter set to be 0.10 (10%) in this study. which is sufficient for the calculation of variance-covariance matrices given our large total sample sizes.[5] Choosing π involves the trade-off between having shorter breaks that could overfit the sequence and mainly capture short-term noise ("blips") and having longer breaks with potentially many shorter breaks within and hence a twisted overall effect. For robustness purposes, we have also used both shorter (0.05) and longer (0.15) trimming parameters but have not found any important differences in the basic findings.[6]

Our prime motivation for using the mean model (1) is that it both produces intuitive and easily interpreted estimates and that the Bai and Perron methodology is robust to a wide range of error distributions. Since many high-frequency financial variables, as well as the bond yields used here, exhibit high degrees of persistency one could have wished for a model that more explicitly account for these features. Simulations in Paye and Timmerman (2003), however, show that persistency has limited interference with the ability of Bai and Perron's method to consistently pick breaks. Nevertheless, to make sure our model choice does not interfere with the results we have run parallel break searches using a yield model with a lagged dependent variable, $y_{it} = \mu_j + \beta y_{it-1} + \varepsilon_t$. The results are basically the same as in the mean model except for the fact that the autoregressivity causes breaks to occur somewhat earlier (due to a convergence in the and also that the estimated intercepts are dampened by the AR term.[7] The similarity in dating across the models could

[3] We follow the convention of using T_0 = 1 and T_{m+1} = T (total length of sequence).
[4] For details on the tests and inferential setup of the method, we refer the reader to Bai and Perron's papers. All estimations used the GAUSS program with later corrections available from Perron's web page.
[5] Bai and Perron (2005) recommend a π of 0.15 for sample sizes of 120, and we have samples of 157–239.
[6] These estimations are available from the authors upon request.
[7] Available from the authors upon request.

well be due to the large magnitudes of most breaks due to the extreme political turbulence of the war, and Bai and Perron (2005) also emphasize this as a crucial factor to get robust estimates.

Another model issue of importance is that non-sovereign risk influences on the level and changes of nominal bond yields, especially macroeconomic fluctuations such as inflation or market interest rates. To check for this we compute yield spreads on the Stockholm dataset for the three non-Swedish countries, meaning their yields over the Swedish yield and a canceling out of most common macroeconomic influences. The results are basically identical with the outputs when nominal yields are used, which again indicates a satisfying robustness of our method and findings.

3 Data and institutional setting

The data used in this study are secondary market yields on Nordic sovereign debt during 1938–1940. The yields are based on bid prices collected from the markets in all four Nordic markets. In the case of the Stockholm market, yields exist for all Nordic government bonds since this was the one place in the region where both domestic and foreign assets were listed and traded. From the other countries we could only get domestic bond yields, and due to the variation in availability and reporting standards there is lacking uniformity of these data. For example, the Helsinki Stock Exchange stopped all trading in bonds from October 11, 1939, why the yield series necessarily go no further than that. In Oslo, we could not find price information before August 1939 and in both Oslo and Copenhagen all bonds stopped being traded for months after the German invasion on April 9, 1940. Table 1 lists information on the bond loans examined and their sources.

The institutional setting of the Nordic secondary bond markets have not been excessively researched before, why there are potential loopholes in microstructure rules or regulations that influence recorded bond prices but that are unaccounted for in this study. As for the Danish and Swedish markets, however, Waldenström (2005) offers a broad overview of the most important regulations and rules. Moreover, since we only use peacetime data from the non-Swedish Nordic countries there should be at least a fairly normal trading environment underlying the data used by us.

Missing values appear in most of the series and we use linear interpolation to fill the gaps. In most cases this does not incur any problems, but for the Norwegian yields in Stockholm after April 1940 the gaps are longer and caution therefore has to be taken. Having missing values indicates that underlying trading volumes were insufficient, which would be a severe problem to a study like this resting on the information contents in quoted prices. Un-

fortunately there is an overall lack of data on these issues, but based on a newly assembled small sample of volumes from Stockholm for the four bonds during March, June, September and December in 1938 and 1940 and estimates in Waldenström (2005) of the OTC trading activity, trading can be assumed as sufficient for most periods and countries. Using bid prices also assures that prices do not merely reflect unrealistic, self-interested valuations of a few bondholders.

Knowing the identities of the traders is also of high interest to our analysis to further assure the efficiency of quoted prices.[8] Again, there are no records on order flows on the large Nordic bond markets, but bondholding was common among interwar Nordic residents and in the case of the Stockholm market we know that both large financial institutions as well as thousands of households were holding Swedish and foreign government bonds.

4 Estimation results

This section presents the results of the structural breaks estimations for each country. Recall that the breaks reflect changes in *ex ante* perceptions of impending war threats among contemporaries. For each country, we start with depicting what conventional Nordic historical writing claims were the contemporary threat perceptions and then we contrast them with the market-based estimates. We have collected the historical accounts from some of the most well-known and reputed Nordic historians, e.g., Norborg (1970) and Weibull (1991) for overall descriptions; Nissen (1988) on Denmark; Jakobson (1961) and Zetterberg (1991) on Finland; Jensen (1965) and Skodvin (1979) on Norway and on Sweden Norborg (1981) and Åberg (1992). We have only read the work of Nordic historians since they correspond to the predominantly Nordic investors active on the markets analyzed.

4.1 Denmark

According to the historians, Danes felt quite safe from foreign military threats during the 1930s and early 1940. The Danish-German non-aggression pact of May 31, 1939 was seen as further ensuring peace and stability (Nissen, 1988, pp. 353f) and although some strains of pessimism came through in a widely discussed new year's speech of the Danish Prime Minister, the truce in Moscow on March 12, 1940 between Finland and the Soviet Union was clearly regarded as lowering the likelihood of an Allied march into Denmark to assist the Finns (Nissen, 1988, pp. 354f.). Accordingly, the German invasion on April 9 came as

[8] If all traders acted rationally, however, their identity actually does not matter since they all capitalize on the same publicly available information.

"a total surprise" to the Danish government and, according to historians, probably also to the rest of the population.

The results in Table 1 report a quite distinct picture. They show the estimated structural breaks in the Danish government bond yields at the daily and weekly level in Copenhagen and in the weekly Stockholm series. Overall, the results show that markets reflected significant increases in war threat assessments already by the time of the German attack on Poland in September 1939. The Stockholm yields even show a jump in yields in late March 1939, right after the Nazi aggressive takeover in Czechoslovakia. The next jumps in yields come in December 1939 in the weekly series, in time corresponding with the Soviet attack on Finland bringing Scandinavia in an entirely new strategic light, and in mid-February 1940, which was right after the widely noticed incident in Norwegian territorial waters when British troops boarded the German ship *Altmark* and several German soldiers died. Interestingly, the Stockholm series do not capture this date but instead fits the large upward jump right after the German invasion.

Altogether, both the timing of the breaks found in both the Copenhagen and Stockholm yields as well as the notable magnitudes of the breaks puts into question the feelings of safety and assurance that historians claim were held by most Danes. On the contrary, they seem to have reacted strongly to surrounding events and effectively interpreted them in terms of default risk of the quoted Danish sovereign debt.

4.2 Finland

Historians describe Finland's main foreign policy objective in the 1930's as holding back imminent Soviet pressures for military and territorial concessions, which indicates that there was an awareness of external threats. There was a mutual distrust between the two countries (Zetterberg, 1991, p. 56) and the Soviet demands grew in intensity in a series of secret meetings at the top political levels from April 1938. The Finnish public, however, felt safe and optimistic about the future, much thanks to the peace-promises in the Munich Agreement in September 1938 (Jakobson, 1961, pp. 48ff, p. 99) although the Russo-German non-aggression pact of August 23, 1939, and the Soviet expansionistic treatment of the Baltic countries made them more "anxious". Despite increasingly harsh and open Soviet pressures in October and early November the Finnish government and Parliament resisted and some historians argue that this relied on firm believes that Soviet would never attack and also a hope for Swedish military assistance in case of war.[9] It is not clear if the Finns were surprised by the Soviet attack came on November 30 or not. On the one hand

[9] See Zetterberg (1991, pp. 77, 81) and on the speculation about the beliefs of Finnish politicians, Norborg (1970, pp. 205f).

Finland was fully mobilized since early October but on the other troops had been home from the front in mid-November. Historians today know, however, that "most diplomatic observers" in Finland, and Moscow, did not believe in a Soviet attack even only a few days before it came (Jakobson, 1961, p. 142).

The sovereign debt yields in Helsinki and Stockholm displayed in Table 3 are not fully mutually congruent, and they both corroborate and question the historical accounts. The daily yields in Helsinki only produced one large (57 basis points) break, on September 7, 1939, which matches the pact between Germany and the Soviet Union as well as the outbreak of the war. This seems to roughly corroborate the history writing reported above. However, a clear sign of increased Finnish worries of much larger magnitudes, was the cancellation of all bond trading at the Helsinki Stock Exchange as early as October 10. This radical measure better matches the development of Finnish yields in Stockholm, where a break on August 22 of 733 basis points was recorded! Hence, clear perceptions of increased war threats were found both as the closure of trading in Helsinki and the huge sovereign risk increase in Stockholm, which largely rejects the worries described by historians.

Since Stockholm kept on listing the Finnish bonds throughout the war, we can asses the impact of the realization of the war believes on bond yields, which was a huge break of 2,111 basis points dated on December, 12, 1939, i.e., roughly one and a half week after the Soviet invasion. As a further indication of the robustness of bond yields as portraying war threat perceptions, the Moscow truce in March was associated with a new structural break of –1,171 basis points. Since the yields did not resume their pre-war level the Swedish market participants obviously did not fully believe in a continued peace for Finland, which also would turn out to be a correct prediction.

4.3 Norway

Nordic historians agree that if there were widespread feelings of security and safety among Nordic citizens, they were definitely most articulated among the Norwegians. Thanks to their remote geographical location they felt completely safe from a military attack of a foreign power. Historians report that when intelligence reports on April 2, 1940 (one week before the German invasion) indicated German troop movements towards the North Sea, the Norwegian Minister of Defense the same day suggested a comprehensive military disarmament plan to start within two weeks (Jensen, 1965, p. 113). Not even the *Altmark* incident in February 1942 are described as having increased the war threat perceptions

among the Norwegians.[10] Instead, the Moscow Peace in March was celebrated as diminishing the likelihood of having Scandinavia as a battle ground (Jensen, 1965, p. 112).

The financial markets once again tell a compound history (see Table 4), for the most questioning the above accounts but also yielding some important instances of support. The daily yields at the Oslo exchange report a series of significant yield increases between August 1939 and February 1940, timing the main political events that one would have expected to increase the assessed war threats (the war outbreak, the Soviet attack on Finland and the *Altmark* incident) and with a joint magnitude of 129 basis points. However, almost half of this increase was erased in the negative break on March 13, the day after the Moscow truce. Hence, while the Norwegians clearly assessed increased war threats to their country unlike what historians have claimed, the reaction to the Finnish peace indicates that there were no true beliefs even among market participants in an attack on Norway. The Stockholm series reveal a less positive development of the assessed war threats, including several large jumps in the yields at basically the same dates as in Oslo but summing up to a total yield increase of 930 basis points! The difference across borders is remarkable, indicating either a less romanticized picture of Norway's political position or that additional sovereign risk consideration were at work such as a differential propensity of the Norwegian government to default on its domestic and foreign debt.[11]

4.4 Sweden

Sweden is the historical outlier in the group of Nordic countries, remaining neutral throughout the war and never engaging itself in warfare. It is well-known, however, that this neutrality stood on dubious grounds as Sweden allowed far-reaching concessions to Germany in terms of troop movements and iron exports during the first half of the war. Nevertheless, historians assert that the Swedes were never worried about getting involved in the war, not even after their Nordic neighbors were attack and invaded by the superpowers of the East and South. As a matter of fact, Sweden demobilized on a broad frontier after April 1940 which according to Norborg (1981, pp. 249ff) and Åberg (1992, p. 522) was motivated by a firm belief that Germany would never attack Sweden.[12]

Table 4 reports the structural breaks estimations, which weakly corroborate the historical account. There are significant breaks occurring after the outbreak of the war in September

[10] On the general Norwegian optimism to stay out of war, see, e.g., Weibull (1991); Skodvin (1979, pp. 49f), and on its non-reactions to the *Altmark* incident, see Norborg (1970, pp. 210f).
[11] Precisely this differential treatment of the public debt was traced on Danish domestic and foreign sovereign debt yields in this period by Waldenström (2005).
[12] Historians have often pointed out June 1941 (the "Midsummer crisis") and February 1942 (the "February crisis") as the peaks in external war threats against Sweden, but earlier versions of this paper failed to find any structural breaks for either of those periods.

1939, the Soviet attack on Finland and right before the German invasion of Denmark and Norway. Hence, these obviously ominous events to the entire region also affected Sweden in significant ways. However, the magnitudes of these breaks were not particularly large, altogether 120 basis point increase, which merely reflects a limited increase in the likelihood of war. After the summer of 1940, Swedish yields dropped significantly and remained not much above the pre-war levels throughout the period.

5 Concluding remarks

This paper analyzes and contrasts ways of assessing how people in the past conceived changes in war threats to their own countries. An empirical analysis of the dramatic episode in the history of the Nordic countries around the beginning of World War II is presented. All these countries were initially small and neutral but this changed soon after the war outbreak. One of them (Finland) was engaged in direct warfare, two (Denmark and Norway) were occupied by enemy powers and only one (Sweden) remained neutral. The *ex post* realized war threats evidently differed vastly but was this difference also perceived *ex ante* by the citizens in the different countries, i.e., before the war reached them? Using new contemporary financial market evidence from all these countries data and estimating structural breaks in sovereign yield series, the study presents new market-based estimates of the *ex ante* war threat perceptions of people. By thereafter outlining what conventional Nordic historiography has said about the same popular war risk expectations, we are able to compare the two versions of history. It is important to note that the economic approach pursued is not intended to substitute for time-honored historical methods but rather serve as constructive complements to improve on the full historical picture.

Our main results from the structural breaks estimations both corroborate and question the conventional versions of history. In particular, the claims that people in Sweden, Denmark and Norway did not feel worried of being drawn into war until late 1939 (Sweden) or even early April, 1940 (Denmark and Norway) find little support in the market-based views. In all these countries, the significant break points were found much earlier and in several cases the magnitudes of the yield increases were substantial. On the other hand, the Norwegian yields traded in Oslo decreased significantly after the Moscow truce between Finland and the Soviet Union and all the Stockholm series estimated additional yield increases when Germany occupied the two countries, suggesting that neither markets fully believed in a war coming.

In the case of Finland, the differences between the two versions of history are smaller, especially when considers the estimates based on the Helsinki yield series. However, considering that the Helsinki market closed down its activities already in October 1939 and

the heavily discounted Finnish debt trading in Stockholm was not repurchased through the still available cross-border capital markets, perhaps one should not rely too extensively on the Helsinki findings. If so, there is in fact almost no supportive evidence at all for the conventional views of Finns feeling basically safe in the period prior to the Soviet attack.

As a general disclaimer, however, it should be noted that both the data and the econometric method used carry problems and rest on several choices and considerations. For example, a crucial assumption is that increases in bond yields reflect widely held increases in war risk perceptions. Furthermore, the selection and reading of the available historical writing is also not without problems. In particular, the amount of written history on World War II is enormous and to adequately reconcile a balanced view of it in terms of popular beliefs at a certain point in time is not a trivial exercise. Nevertheless, we feel confident in the versions portrayed as they rest on the work of recognized historians.

What then could explain these observed discrepancies between the historical writing and the market-based assessments? Perhaps the nature of source materials is one possibility. Historians mainly use written samples of documents, diaries related to a small number of centrally located decision makers, e.g., ministers in governments. When set to assess the minds of large populations the historical methodology becomes less suitable and one of the few feasible ways would be to go through newspaper material. Hence, even if historian's work doubtlessly is crucial to the understanding of the views of the prime actors, and thereby also perhaps the causes of important political events, they may be less able to assess the views of thousands of people. In contrast, the financial market data are the final outcome of the interaction of independent individuals all acting on their own, profit-minded behalf and, given a sufficient size of the market, with no chances to bias or interfere with the recorded asset prices. In the context of bond markets and wars, their forward-looking valuations of future payoffs become trustworthy signals of their true beliefs of impending war threats.

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Table 1: Bonds analyzed in the study.

Bond	Frequency	Trading period	Price source
Stockholm market:			
Danish government, 1936–1956, 4%	Weekly	1/4/1938–12/31/1940	*Affärsvärlden*
Finnish government, 1934–1944, 5%	Weekly	1/4/1938–12/31/1940	*Affärsvärlden*
Norwegian government, 1934–1959, 4%	Weekly	1/4/1938–12/31/1940	*Affärsvärlden*
Swedish government, consol, 3%	Weekly	1/4/1938–12/31/1940	*Affärsvärlden*
Copenhagen market:			
Danish government, 1934–1959, 4%	Weekly	10/1/1938–4/5/1940	*Finanstidende*
Danish government, 1934–1959, 4%	Daily	7/3/1939–4/8/1940	*Berglinske Tidende*
Oslo market:			
Norwegian government, 1937–1968, 4.5%	Daily	8/2/1939–4/8/1940	*Morgenbladet, Aftenposten*
Helsinki market:			
Finnish government, 1935–1960, 5%	Daily	1/3/1939–10/10/1939	*Hufvudstadsbladet*

Note: Despite the discrepancy in time to maturity, the Swedish 1934 consol was selected from a large range of loans traded in Stockholm for its high degree of representativity of Swedish long-term market interest rate according to the Swedish National Debt Office.

Table 2: Structural breaks in Danish sovereign yields, 1939–1940.

Trading location:	Copenhagen	Copenhagen	Stockholm
Data frequency:	Daily (T=189)	Weekly (T=78)	Weekly (T=157)
Sample period:	Prewar (7/3/1939–4/8/1940)	Prewar (10/1/1938-4/5/1940)	Prewar and War (1/4/1938–12/31/1940)
Break 1	Aug. 21, 1939 [–1 , +0] +44 bp	Nov. 12, 1938 [–8 , +2] –7 bp	Dec. 13, 1938 [–7 , +8] +13 bp
Break 2	Sep. 25, 1939 [–4 , +3] +79 bp	Aug. 4, 1939 [–4 , +1] +28	Mar. 28, 1939 [–5 , +1] +40 bp
Break 3	Feb. 14, 1940 [–2 , +6] +54 bp	Sep. 29, 1939 [–2 , +1] +93 bp	Aug. 22, 1939 [–7, +2] +136 bp
Break 4		Dec. 1, 1940 [–3 , +45] +28 bp	Dec. 5, 1939 [–3, +3] +215 bp
Break 5		Feb. 16, 1940 [–3 , +1] +50 bp	Apr. 16, 1940 [–1, +0] +362 bp

Notes: The table shows structural breaks estimated on sovereign debt yields (see Table 1 for bond descriptions), with 95% confidence intervals in brackets containing the number of periods (days or weeks) surrounding the estimated break point. Note that some breaks may be locally imprecise with wide confidence intervals, which although these breaks are jointly significant would be the effect of certain method constraints (e.g., minimum segment length) could cause. Trimming is 10%. All estimations allow for heterogeneity and autocorrelation in the residuals (see Bai and Perron, 2003). "bp" denotes basis points.

Table 3: Structural breaks in Finnish sovereign yields, 1939–1940.

Trading location:	Helsinki	Stockholm
Data frequency:	Daily (T=238)	Weekly (T=157)
Sample period:	Prewar	Prewar and War
	(1/3/1939–10/10/1939)	(1/4/1938–12/31/1940)
Break 1	Feb. 2, 1939	Aug. 22, 1939
	[–6 , +1]	[–1 , +0]
	–5 bp	+733 bp
Break 2	Apr. 5, 1939	Dec. 12, 1939
	[–2 , +4]	[–3 , +1]
	+5 bp	+2,111 bp
Break 3	Aug. 8, 1939	Mar. 19, 1940
	[–1 , +0]	[–1 , +1]
	+7 bp	–1,171 bp
Break 4	Sep. 7, 1939	
	[–2 , +2]	
	+57 bp	

Notes: See Table 2.

Table 4: Structural breaks in Norwegian sovereign yields, 1939–1940.

Trading location:	Oslo	Stockholm
Data frequency:	Daily (T=212)	Weekly (T=157)
Sample period:	Prewar	Prewar and War
	(8/2/1939–4/8/1940)	(1/4/1938–12/31/1940)
Break 1	Sep. 15, 1939	Mar. 28, 1939
	[–2 , +1]	[–8 , +3]
	+37 bp	+31 bp
Break 2	Oct. 16, 1939	Sep. 5, 1939
	[–2 , +2]	[–3 , +1]
	+14 bp	+178 bp
Break 3	Dec. 9, 1939	Dec. 26, 1939
	[–2 , +1]	[–1 , +0]
	+47 bp	+176 bp
Break 4	Jan. 29, 1940	Apr. 30, 1940
	[–2 , +3]	[–15 , +40]
	+29 bp	+333 bp
Break 5	Mar. 13, 1940	Sep. 10, 1940
	[–2 , +1]	[–4 , +33]
	–55 bp	+243 bp

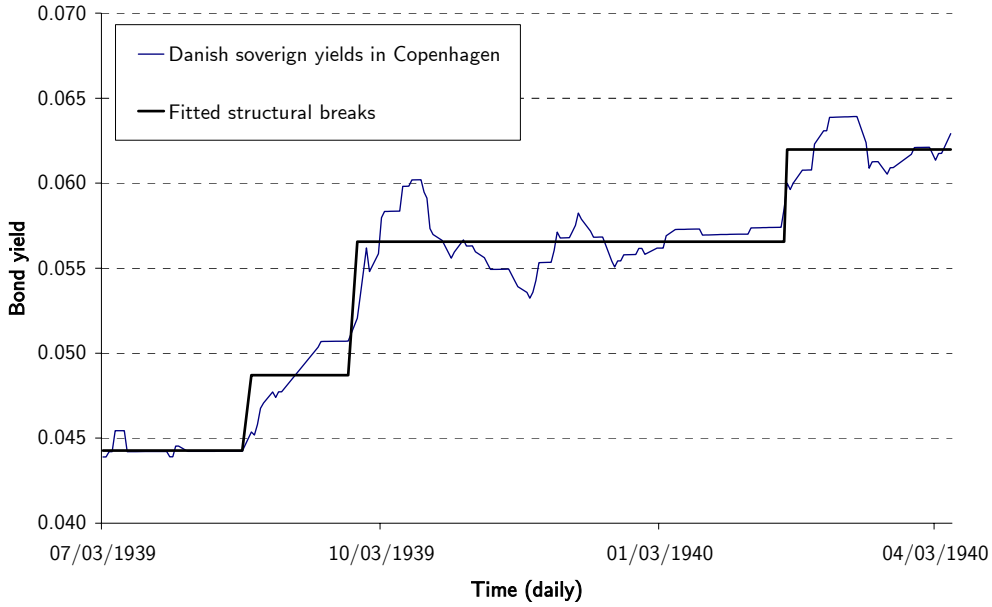
Notes: See Table 2.

Table 5: Structural breaks in Swedish sovereign yields, 1939–1940.

Trading location:	Stockholm
Data frequency:	Weekly (T=157)
Sample period:	Prewar and War (1/4/1938–12/31/1940)
Break 1	Apr. 18, 1939 [–15 , +7] + 7 bp
Break 2	Sep. 5, 1939 [–3 , +1] +57 bp
Break 3	Dec. 19, 1939 [–2 , +6] +46 bp
Break 4	April. 2, 1940 [–14 , +5] +17 bp
Break 5	Jul. 30, 1940 [–2 , +2] –49 bp

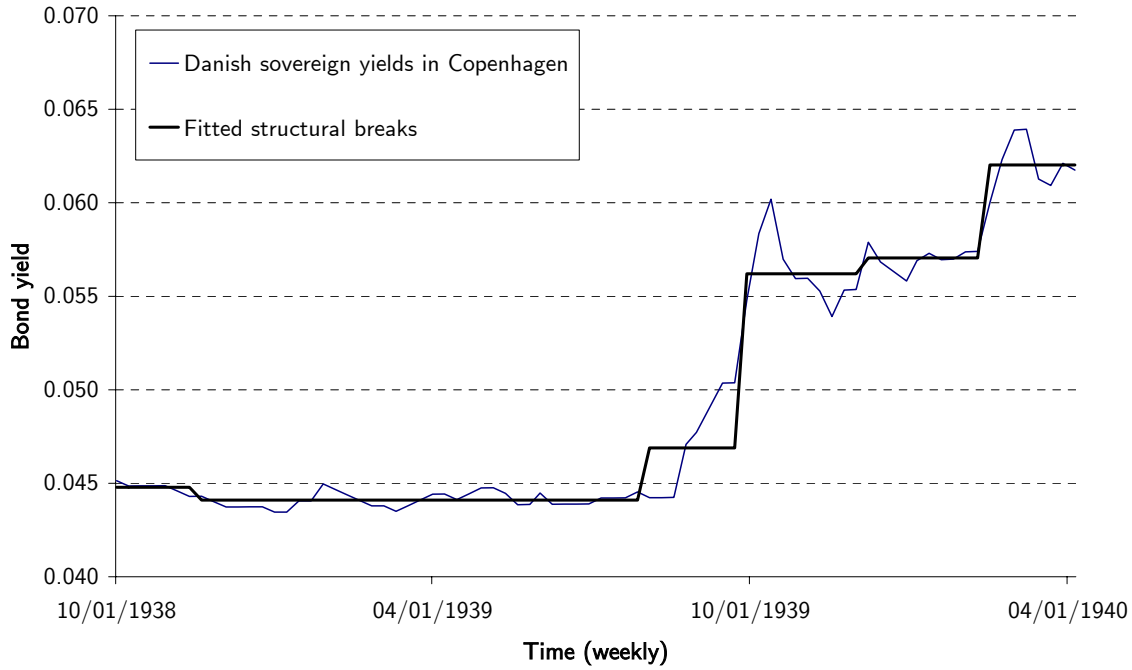
Notes: See Table 2.

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



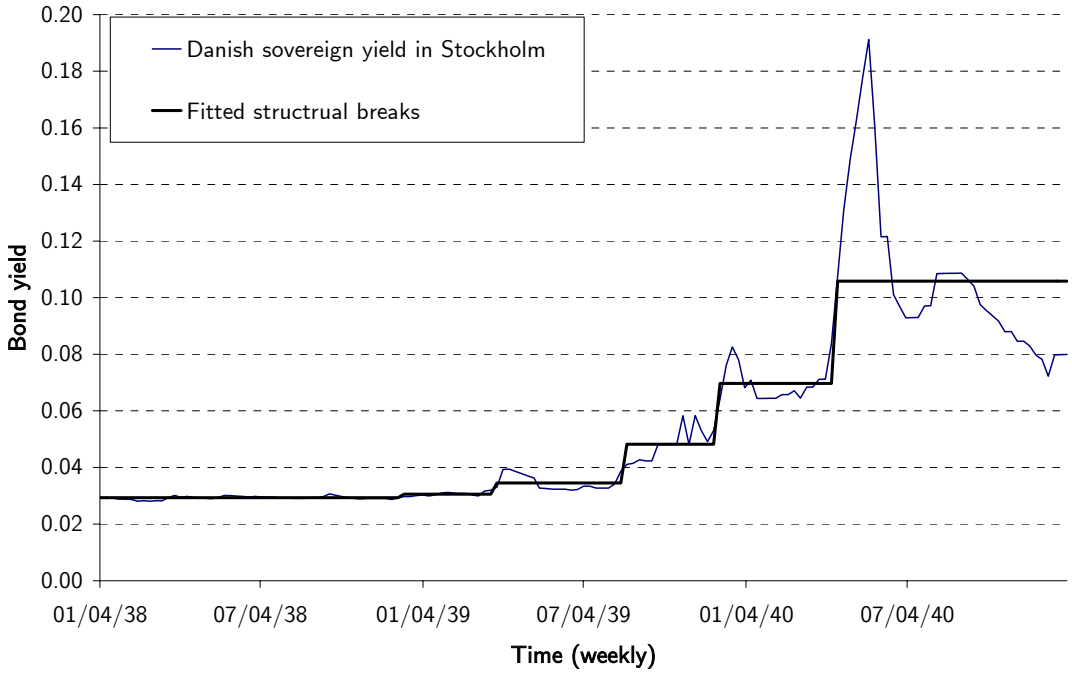
Notes and sources: Based on the results in Table 2.

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



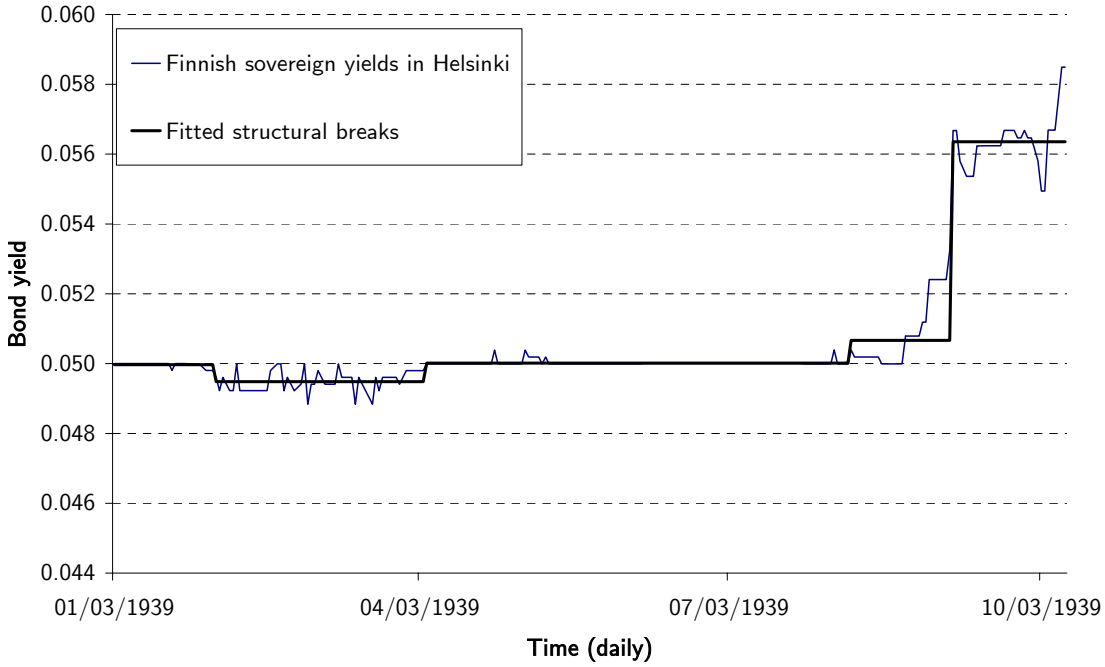
Notes and sources: Based on the results in Table 2.

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



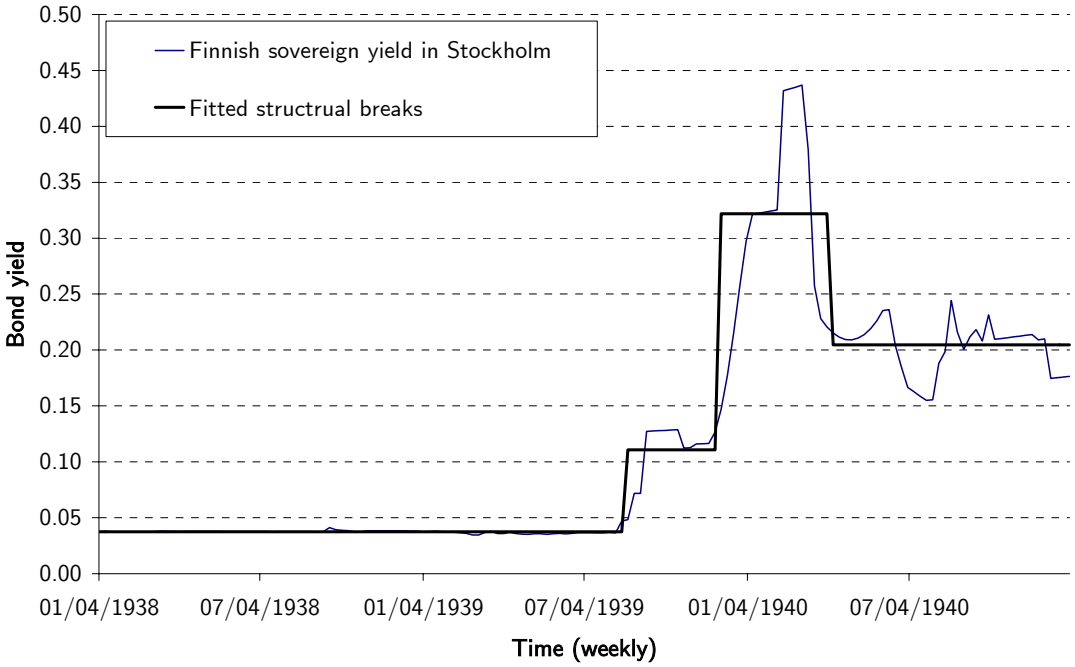
Notes and sources: Based on the results in Table 2.

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



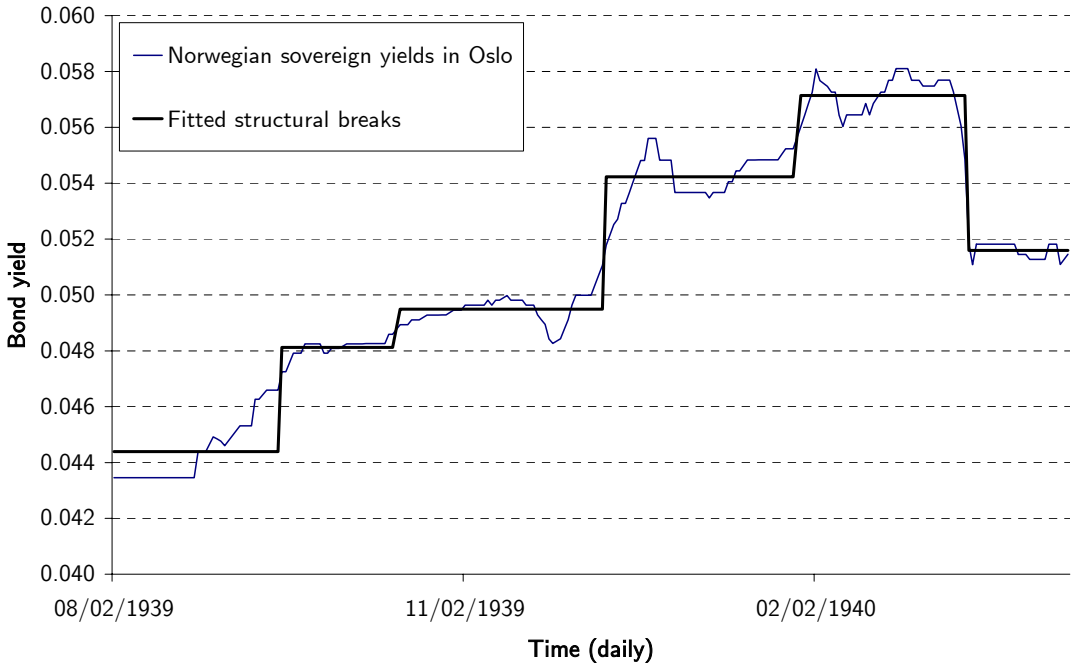
Notes and sources: Based on the results in Table 3.

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



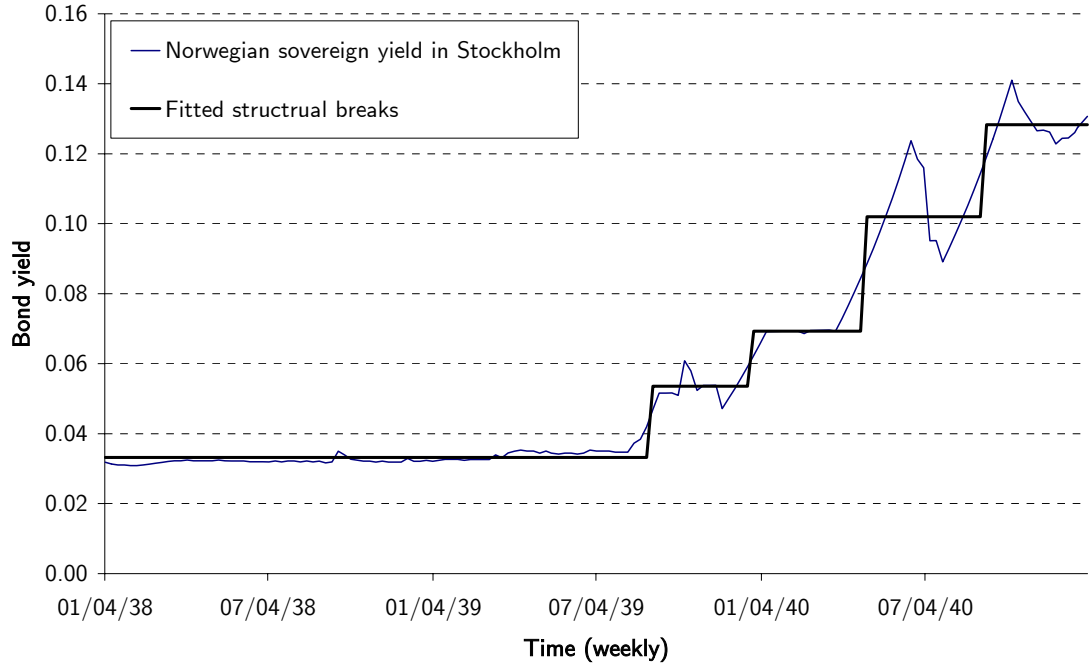
Notes and sources: Based on the results in Table 3.

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



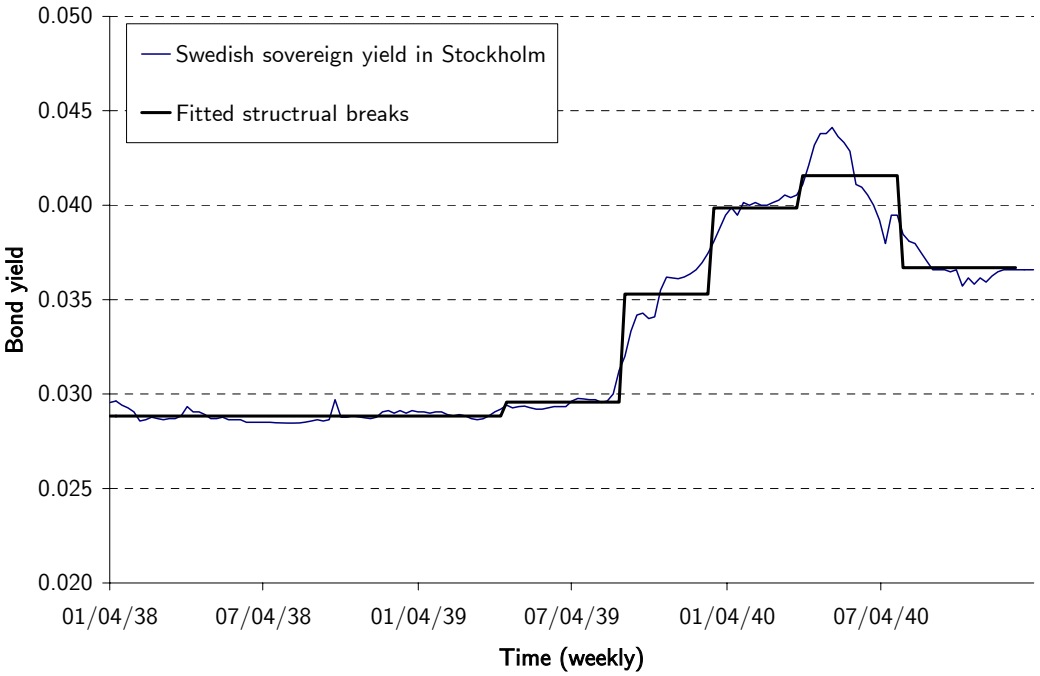
Notes and sources: Based on the results in Table 4.

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



Notes and sources: Based on the results in Table 4.

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



Notes and sources: Based on the results in Table 5.