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Determining factors of Norwegian Covered bond spreads

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Preliminary Thesis

Determining factors of Norwegian Covered bond spreads

Contents

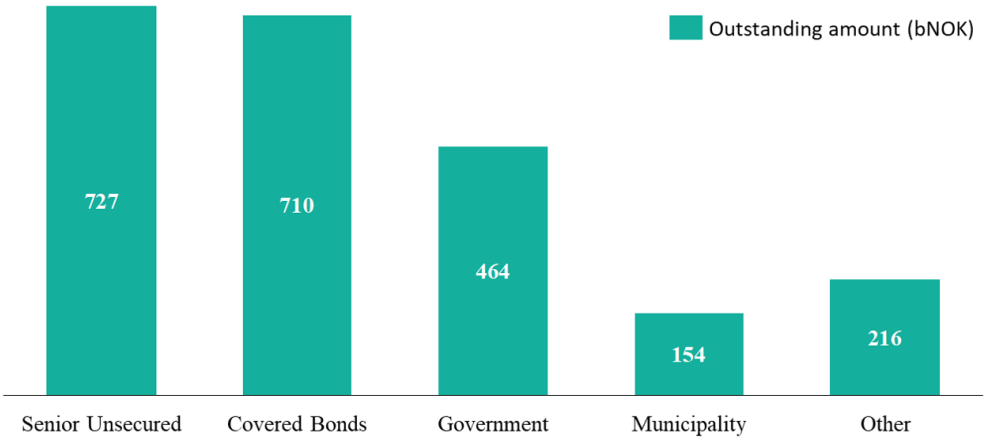
0 Introduction

In our thesis we want to study the risk premium in Norwegian covered bonds. In particular we are going to investigate how various bond-specific and macroeconomic factors explain the variation in the yield spreads in these bonds.

A covered bond is a highly safe fixed income security with priority claims on an underlying asset pool (cover pool) which share many similarities with traditional mortgage-backed securities (MBS). An important difference is that investors not only have recourse against the cover pool (as with MBS) but also have unsecured claims against the issuer providing an extra layer of security known as dual recourse.

Our motivation for the topic comes largely from the fact that covered bonds comprise a major part of Norwegian debt (see Figure 1) and is one of the most important sources of funding for Norwegian banks. Consequently, it is of high interest to learn what drives the yields of these securities as it ultimately has large consequences for the Norwegian economy. The Deputy Governor of Norges Bank states that the covered bond's impact on banks' funding indeed is reflected in the (low) household lending rates (Nicolaisen, 2017).

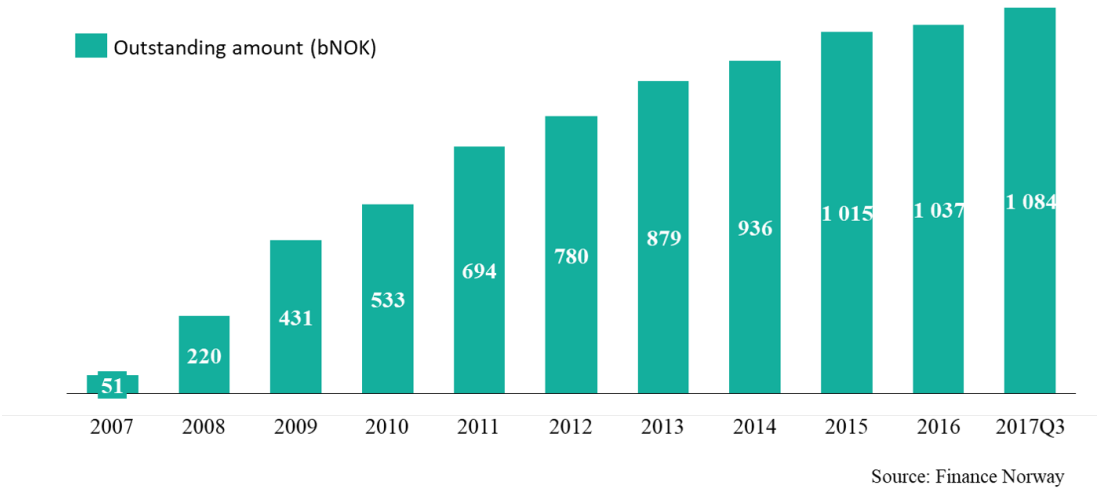
Figure 1: Outstanding amounts for Norwegian bonds as of 11.01.2018



Note: Not all bonds are included in the database (largely by DNB Boligkreditt), however the graph underlines the relative magnitude of covered bonds

Source: Stamdata

Figure 2: Outstanding amounts of Norwegian Covered bonds (2007-2017)



Source: Finance Norway

Since the market for Norwegian covered bonds is relatively new (the first bond was not issued until the second half of 2007) (See Figure 2), there has been limited academic focus on the topic. Most research and information come from the issuers (banks) and regulators (the Norwegian central bank and financial authorities). The major part of other theses we have encountered focus on regulations/legislation or take on a more macroeconomic view. Literature on covered bonds is to a larger extent available on European markets with the German Pfandbrief being the most mature, both in terms of market size and academic coverage. Our thesis will to a large degree be inspired by the methods and explanatory variables used here. To our knowledge, we are the first to examine the determinants of Norwegian covered bond spreads.

The preliminary thesis will be structured as follows. Section 1 concerns the research question that which is followed by a brief literature review in Section 2. Section 3 will give an overview of the Norwegian covered bonds market showcasing its importance in the economy whilst Section 4 gives a brief introduction to general bond pricing theory. The theoretic foundations will guide the empirical methods in Section 5 and which variables of interests in Section 6. We further provide a progression plan in Section 7 and attach a bibliography of our current used sources.

1 Research question

In our master thesis, we want to study the risk premium in Norwegian covered bonds. In particular, we examine how Norwegian cover bond spreads relate to bond-specific and macroeconomic factors. Our research question is:

Which risk factors determine Norwegian covered bond spreads?

Our current hypothesis in line with previous research is that most of the spread between covered bonds and NIBOR should be due to liquidity risk. However, the literature has shown that several other important factors are relevant in the pricing of covered bonds.

2 Literature review

In this section we will provide an overview over the literature that is relevant to our thesis. Although covered bonds are one of the most important sources of funding for European banks, it has not been very much academic focus on it and even fewer studies focus on pricing and spreads. Most research has been conducted on the German Pfandbrief market which is by far the most mature covered bond market in the world.

In the literature concerning covered bonds, yield spreads are often interpreted as pure liquidity premia (Prokopczuk, Siewert, & Vonhoff, 2013; Kempf, Korn, & Uhrig-Homburg, 2012; Koziol & Sauerbier, 2007). Kempf et al. (2012) argue that German covered bonds are essentially risk-free with the spread only caused by liquidity.

Some research point however to credit risk as an important factor. To assess credit risk in fixed income securities and hence credit spreads we have two approaches with well grounding in theory. In the structural framework (Black & Scholes, 1973; Merton, 1974) we model the evolution of a company's value and assume that it defaults on its obligations when the value of the assets falls beneath a certain point. In the reduced form approach (R. Jarrow & Turnbull, 1992;

R. A. Jarrow & Turnbull, 1995; Duffie & Singleton, 1999) credit risks is estimated assuming a probabilistic process for the probability of default and recovery rate. In a study of the two models' performance in the Nordic covered bond market (Sulku & Falkenbach, 2011) find that the reduced form model prices covered bonds with satisfactory results. They argue that the structural model is not suitable for their study as the necessary information is not easily or publicly available to the investors.

Within the structural approach, Huang and Huang (2012) concludes that credit risk accounts to a high degree for yield spreads in junk bonds but only for a small fraction in investment grade bonds. Prokopczuk et al. (2013) finds however that credit risk is present in German covered bonds, especially under financial turmoil, by assessing the credit quality of the cover pools. This is also in line with a broader study by Prokopczuk and Vonhoff (2012) who studies covered bond spreads in Germany, France, Spain and the UK. They calculate yield spreads on a range of covered bonds and include several bond-specific variables such as coupon (to account for tax-effects) and bid-ask spreads (to account for liquidity risk), both yielding statistical significance. Furthermore, they surprisingly find that real-estate returns as a proxy of the cover pool quality has no statistically significant impact on the spreads in normal circumstances but highly (negative) significant impact in times of financial turmoil. The risk-free rate was included in order to account for the lower expected spreads to higher risk-neutral drift (Longstaff & Schwartz, 1995; Campbell & Taksler, 2003). They find that equity returns (on each country's major equity index) reflecting the general business climate has a strong negative effect and that volatility has a positive effect on spreads.

Hellmich, Kraft, and Siddiqui (2015) conduct a study on the financial crisis' impact on the relation between government and covered bond spreads in Germany, France, Italy and Spain. They find that this relation in Germany were only temporarily driven apart during 2007-2009 which they attribute to "flight to safety". In France, Italy and Spain, the relation between government and covered bond spreads have not yet returned to normal.

3 The Norwegian Covered Bonds Market

In this section we go through the Norwegian covered bonds market in more detail. After the adoption of the Norwegian covered bonds legislation in June 2007 with the first issue following in the second half of 2007, the Norwegian covered bond market has become an integral part of the Norwegian financial system. As of March 2017, covered bonds accounted for more than 30% of the Norwegian bond market and it has become one of the main financing sources for Norwegian financials (Heitmann & Stokstad, 2017). According to Norwegian regulation, covered bonds can be issued by special purpose vehicles only (Finance Norway, 2016).

Most issuers are subsidiaries owned by individual parent banks, while some are owned by a group of banks. The Norwegian covered bond market is made up of 25 issuers with a total outstanding amount of more than NOK 1,100 billion (Heitmann & Stokstad, 2017). Of current outstanding volume, 50% is issued in NOK, while 44% is issued in EUR and 6% in SEK (Heitmann & Stokstad, 2017; Stamdata, 2018). 80% of current outstanding bonds are floating rate notes (FRN). The issues in NOK are primarily listed on Oslo Stock Exchange (Finance Norway, 2016).

The secondary market for Norwegian covered bonds market is considered to be liquid (even more liquid than the market for Norwegian government bonds). To further improve liquidity, measures were taken by OSE in 2014 to increase the market transparency by introducing the Norwegian Covered Benchmark list. The listed bonds are subject to continuous indicative pricing by Nordic Bond Pricing.

3.1 Cover Pools

Transparency and investor protection are important requirements in the covered bond market. All entities with outstanding covered bonds are required to release information on the quality of the cover pool on a quarterly basis. This information is reported according to the Harmonised Transparency Template (HTT) initiated by the European Covered Bond Council (ECBC) in 2012.

3.1.1 Loan-to-Value ratio (LTV)

Practically all covered bonds issued in Norway are covered by a pool of residential mortgages. According to EU regulations, the loan-to-value (LTV) ratio for residential mortgages can not exceed 75%. For commercial mortgages the LTV ratio can not exceed 60%. The median LTV of Norwegian cover pools is around 50% (Heitmann & Stokstad, 2017).

3.1.2 Overcollateralization (OC)

Regulations imposed by the Norwegian Ministry of Finance set requirements for the size of the cover pool. As of March 29 2017, the value of the cover pool must exceed 102 percent of the outstanding bonds covered by the pool. This limit might be subject to individual adjustment based on the derivatives positions of each issuer. The OC values of Norwegian cover pools as of December 2017 ranged from 6% to 8,600% with a median of 17% (Heitmann & Stokstad, 2017).

3.2 Cost of funding through foreign currency markets

Substantial amounts of Norwegian mortgage companies' financing of NOK assets come from issuing covered bonds in foreign currency markets (Molland, 2014). Most of this type of issuance in the Norwegian market is done in EUR. Funding NOK assets in a foreign currency exposes the banking group to foreign exchange risk. The foreign currency needs to be converted to NOK for lending in the Norwegian market, but at the same time the banking group needs to ensure that it is able to pay its obligations in foreign currency. This risk needs to be hedged which can be done using foreign exchange derivatives. A cross currency basis swap with the same maturity as the issued bond is a particularly popular instrument in this regard. The NOKEUR cross currency basis swap is a known measure of the relative cost of receiving funding in EUR versus NOK and should affect spreads positively.

4 Bond pricing theory

In this section we give a brief overview of relevant bond pricing theory.

4.1 Yield and the Pricing of Bonds

All fixed income securities can be priced by discounting their future cash flows to present values using appropriate discount factors (Veronesi, 2010). For an observed price P there must be a yield y that sets the present value of cash flows equal to the bond price. This yield (more specifically yield to maturity) is the expected annualized return if the bond is held to maturity. At time t, the price P of a standard fixed-coupon bond maturing at time T with yield to maturity y (using continuous compounding), paying a fixed coupon c each period in addition to the principal M at maturity is given by:

$$P(t,T) = \sum_{t=1}^{T} c \times e^{-y \times t} + M \times e^{-y \times T} \tag{1}$$

4.2 Risk Measures

Duration is a common risk measure for bonds. It can be mathematically expressed as a first-order approximation of the price sensitivity with respect to changes in the interest rate.

$$D = -\frac{1}{P}\frac{dP}{dr} \tag{2}$$

A favorable trait of bonds is their convex relationship between yield and the price. The convexity of a bond is a second-order approximation of the bond price sensitivity with respect to interest rate changes.

$$C = \frac{1}{P}\frac{d^2P}{dr^2} \tag{3}$$

4.2.1 Embedded Options in Bonds

Some bonds are callable. This means that the issuer has an option to call back the bond and pay the par value to the bondholder at any time (American) or at specified dates (European). This option has a cost to the bondholder as it

would only be exercised when it is optimal for the issuer (and hence suboptimal for the bondholder) and will reduce the price as the bondholder in effect is long a non-callable bond and short a call option on the same bond.

4.3 Yield Curve

Interest rates can vary greatly over time and across maturities. The interest rates for different maturities at a point in time can be represented graphically in a yield curve. It is usually upward sloping, but might also be flat, downward sloping (inverted) or have a combination of slopes. Plotting a yield curve from observed bond yields in the market directly will often give an uneven curve as one will almost never have bonds with regular maturity intervals. The Nelson-Siegel method (Nelson & Siegel, 1987) can be used to estimate a smoothed yield curve given input from yields observed in the market. It is important to specify which yield curve that is being referenced as there are several yield curves. The most commonly used are those for government bonds or interbank lending (IBOR) in different markets.

4.4 Spread

A yield curve is often used as a benchmark for other bonds. The difference in a bond's yield and that of the corresponding maturity on the reference yield curve is often referred to as the (yield) spread. The spread incorporates characteristics (e.g. coupon size and frequency, maturity and embedded options) and different risk factors (e.g. liquidity and credit risk) that is inherent in bonds and for which investors require compensation over the benchmark yield.

4.4.1 Discount Margin and Zero-Volatility spread

The discount margin is the average expected return in addition to the reference rate for a floating rate note (FRN). It is a constant margin that would make the bond trade at par when added to the reference rate. The zero-volatility spread (z-spread) is the constant spread that when added to the benchmark yield curve sets the present value of cash flows equal to the market price of the bond.

5 Empirical methods

In this section we will describe our empirical approach to answering the research question.

5.1 Ordinary least squares (OLS) regression

As in most of the studies we have encountered, our primary workhorse will be the OLS framework. The method aims to find a function

$$\hat{Y} = \hat{\alpha} + \hat{\beta}_1 X_1 + \cdots + \hat{\beta}_k X_k \tag{4}$$

which fits the data best. The left-hand side variable, $\hat{Y}$ is called the dependent variable or variable of interest and is in our case the yield spread. X_j is an explanatory variable, e.g. bid-ask spread, in which the corresponding $\hat{\beta}_j$ captures the estimated effect on the dependent variable (spreads). We will estimate OLS models to help explain the factors determining the yield spread of Norwegian covered bonds.

We also seek to perform some additional analysis which might include other model estimation techniques.

5.2 Vector Autoregressions (VAR)

In an autoregressive distributed lag (ADL) model a dependent variable is regressed on lags of itself and other variables. A VAR model is in essence a system of ADL models, i.e. there is more than one dependent variable. This might be appropriate to reveal patterns in the data which might be overlooked when restricting one variable to be dependent and the remaining to be independent which is the case in a classical AR model. A drawback of such a model is that the results might be hard to interpret in a theoretical framework. Estimating VAR models might be a solution to potential endogeneity issues. Analyzing variance decomposition over

the cross-section of spreads could also potentially be interesting. This is a way to gain some interpretation to the results of a VAR model.

5.3 Error correction models (ECM)

Engle and Granger (1987) found that many financial and economic time series are co-integrated. Estimating models including co-integrated time series will often lead to wrong conclusions. We will investigate this issue in the time series we use and if such indications are found perform the necessary measures. Error correction models can be used to analyze the relationship between government and corporate yields. They incorporate long-run relationships between the variables into the short-run dynamics of the empirical model (Morris, Neal, Rolph, et al., 1998). Such models are based on the idea that while a set of variables are individually non-stationary, a linear combination of the variables might be stationary.

6 Data

In this section we will describe the data we need to answer our research question regarding the risk premium in covered bonds.

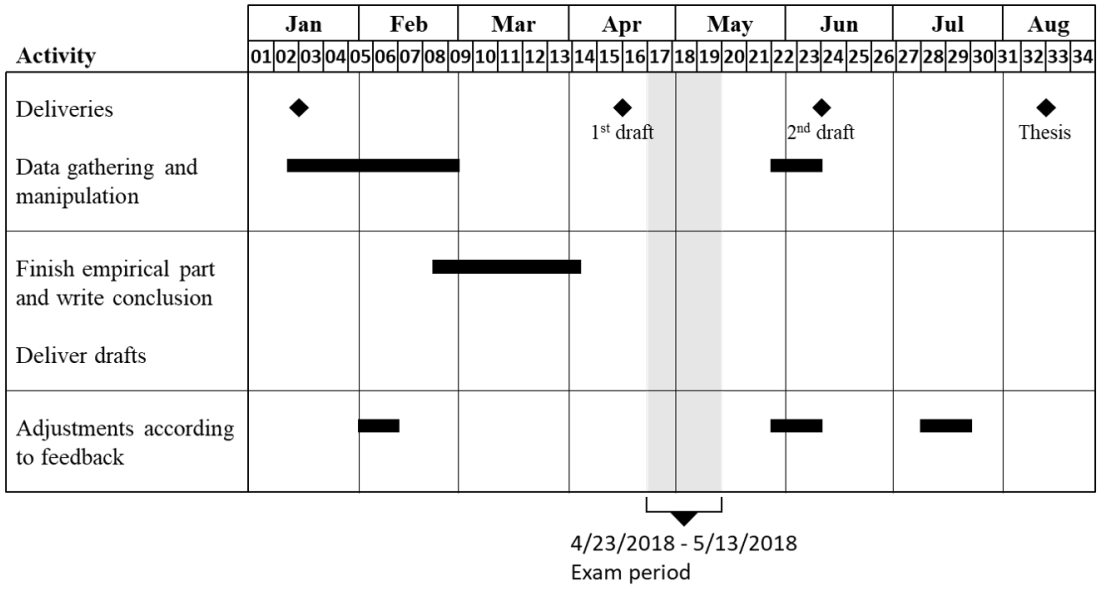
Guided by the literature we have been through this far, covered bond spreads seem to be explained mostly by (1) liquidity risk, (2) credit risk and (3) macroeconomic factors. Along with covered bond spreads (which we aim to calculate based on pricing data from Bloomberg), we have identified the following data needs:

- *Risk-free rate (NIBOR).* Expected to have a negative impact on spreads since a higher risk-neutral drift reduces the probability of issuer default and hence lower spreads.
- *Equity returns (OSE Index).* The return on a country's major stock index is associated with the general health of the economy and the business climate which should negatively affect spreads.
- *Implied volatility (OSE Index).* Implied volatility is a forward looking indicator of economic uncertainty and risk which should be positively linked with spreads.
- *Bond-specific features.* Coupon rate is relevant to include to capture tax-effects whilst bid-ask spreads and issue size are expected to demonstrate positive and negative impacts on spreads.
- *Cover pool characteristics (HTT Filings).* All covered bonds issuers are obliged to publish information on their cover pools quarterly. A strong cover pool (e.g. as measured by low LTV and high overcollateralization) should translate to a better protection of investors and lower spreads.
- *Real estate returns.* As cover pool information is only disclosed quarterly, we may need to proxy the quality of the cover pool by monthly price data on real estate (which constitutes the majority of the cover pools).

- *Cross currency basis swap (EUR/NOK).* The cross currency basis swap measures the relative funding costs in domestic currency which should increase the spreads.

7 Progression plan

Figure 3: Progression plan



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