



1 Introduction

1.1 Problem Definition and Objective of This Work

Covered bonds are interest-bearing securities issued by financial institutions and backed by assets combined in a cover pool. In the vast majority of cases, these assets are either residential or commercial mortgages (mortgage covered bonds) or loans to public sector entities (public covered bonds). With a history that goes back to the 18th century, covered bonds played a crucial role in the financial market for a long time, until changes in the inter-bank market resulted in a marked decline of their relevance in the middle of the 20th century. However, the issuance of the first German benchmark Pfandbrief¹ in 1995 triggered a remarkable comeback of the asset class.² Consequently, covered bonds evolved into one of the most important classes of interest-bearing securities with a total volume outstanding of nearly €2.5 trillion at the end of 2016.³

The large size of the asset class shows the importance of covered bonds for issuing banks (which use them as a refinancing tool), for public and private creditors (whose loans are combined in the cover pool), and for investors seeking low-risk investment options. The banks act as financial intermediaries when issuing covered bonds by combining several small-sized loans granted to creditors (who often have no possibility of obtaining the loan directly from the capital market) in a cover pool and refinancing these combined loans with large-sized covered bonds sold to large-scale investors. Thus, covered bonds are a

¹Pfandbrief is the name for the German covered-bond type.

²See Grossmann et al. (2014).

³See ECBC (2017a, Ch. 5).

cost-effective refinancing tool for mortgage or public-sector loans and they therefore play a crucial role for credit supply and financial stability. The high importance of covered bonds as a refinancing tool can also be seen in the European Central Bank's (ECB) launch of three covered bond purchase programs, during which the ECB purchased covered bonds in the primary and secondary markets.⁴

For investors, the greatest advantage of covered bonds is the dual recourse they have against the issuer and the cover assets. In case of issuer insolvency, investors have a preferential claim to the assets in the cover pool and a claim to the remaining insolvency estate equal to that of other creditors.⁵ For this reason, covered bonds were often considered as substitutes for government bonds, and therefore almost default-risk-free, in the past.⁶ However, due to distortions in the financial markets affecting the international banking world, declining housing prices in several countries and the awareness that even government bonds might contain substantial default risk, this notion is likely to have changed. Therefore, for issuing banks and investors it becomes increasingly important to know what factors influence the risk premiums of covered bonds.

In the literature, previous studies investigating factors influencing risk premiums of covered bonds often focus on the German Pfandbrief market.⁷ However, the German Pfandbrief market is the largest component of the international covered-bond market. Thus, corresponding results might not hold for covered bonds issued in other countries. Furthermore, there exist different covered-bond laws in different countries and the assets in the cover pool are often domestic. Therefore, it is likely that differences in the factors influencing risk premiums exist between covered bonds issued in different countries. Thus, one goal of this thesis is to investigate factors influencing risk premiums in the international covered-bond market, that is, risk premiums of covered bonds issued in several different countries and currencies. Concerning studies investigating risk pre-

⁴See Section 3.2.2 or the ECB's website (<https://www.ecb.europa.eu>) for more details.

⁵See Schwarcz (2011).

⁶The term default-risk-free is appropriate in this context because in the vast majority of the existing covered-bond laws, insolvency of the issuer does not automatically lead to an acceleration of the covered bond, see <http://www.ecbc.eu/framework/list>. Instead, the bond-holders' claims are satisfied from the assets in the cover pool as scheduled, leading to no default of the covered bond.

⁷See, e.g., Kempf et al. (2012); Koziol and Sauerbier (2007); Breger and Stovel (2004); Herbert and Birkmeyer (2002); Herges (2000); Rees (2001); Prokopczuk et al. (2013).

miums of covered bonds in the international market, often mortgage and public covered bonds are examined together.⁸ However, it is likely that there exist different influencing factors of risk premiums for these two covered-bond types. Thus, another goal of this thesis is to investigate the influencing factors of risk premiums separately for mortgage and public covered bonds. While risk premiums of mortgage covered bonds have been studied before,⁹ the literature lacks a comprehensive study examining factors influencing risk premiums of public covered bonds in the international market and this thesis aims to fill this gap. Since risk premiums of mortgage covered bonds have thus far only been investigated in a few countries, in addition to examining public covered bonds, another objective of this thesis is to investigate risk premiums of mortgage covered bonds in more detail. Moreover, after examining both covered-bond types separately, differences between the factors influencing risk premiums between the two types are investigated.

As mentioned above, covered bonds cannot be considered entirely risk-free anymore. This can also be seen when looking at the average ratings of covered bonds. Covered bonds generally have a higher rating than senior unsecured bonds due to the dual recourse investors have against the issuer and the cover pool. Although this statement still holds, following the financial crisis after the collapse of Lehman Brothers, the average covered-bond rating decreased significantly for all three major credit rating agencies (CRAs) ‘Fitch Ratings’ (Fitch), ‘Moody’s Investors Service’ (Moody’s), and ‘Standard & Poor’s Ratings Services’/‘Standard & Poor’s Global Ratings’¹⁰ (S&P), i.e., several covered bonds have been downgraded. In the literature, studies investigating other asset classes often verify decreasing prices and thus, increasing risk premiums following rating downgrades, but no price effects around upgrades. Concerning covered bonds, however, no study has investigated the effects of positive or negative rating events thus far and due to the dual recourse it might well be that price effects around rating events are different. Furthermore, since covered-bond ratings generally depend on the issuer rating, there might also be differences in the effects of rating changes between the issuer or the

⁸See, e.g., Volk and Hillenbrand (2006); Packer et al. (2007); Bujalance and Ferreira (2010).

⁹See, e.g., Prokopczuk and Vonhoff (2012).

¹⁰Standard & Poor’s Ratings Services changed its name to Standard & Poor’s Global Ratings on 27 April 2016.

bond rating. Therefore, another objective of this thesis is to investigate whether prices of covered bonds react to changes of the issuer or the bond rating.

Summarizing the statements above, the main focus of this thesis is on the risk assessment of covered bonds in the international secondary market. More precisely, the objective is to investigate the following three important research questions in more detail:

- What are the main factors influencing risk premiums of covered bonds?
- What differences exist between public and mortgage covered bonds with regard to the factors influencing the covered bonds' risk premiums?
- Do the prices of covered bonds react to rating changes and, if so, do differences exist in the covered bonds' price reactions if either the issuer rating changes or if the bond rating changes?

All three research questions are examined with empirical analyses. To answer the first two questions, regression estimation techniques for panel data are used. First, only public covered bonds are investigated because the literature dealing with risk premiums of covered bonds in the international market mainly focuses on mortgage covered bonds or investigates both covered-bond types together, as mentioned above. Subsequently, building on the results obtained for public covered bonds, mortgage covered bonds as well as both covered-bond types together are investigated to study differences in the factors influencing the two covered-bond types. The third research question is investigated using an event study methodology specifically controlling for the peculiarities of the bond market that do not exist in the stock market, such as different ratings and maturities.

Our results on the knowledge of factors influencing risk premiums of covered bonds are particularly relevant for issuing banks and for covered-bond investors. Particularly during crisis periods with concomitant high risk premiums, issuers have an incentive to send signals to investors and thereby possibly lower their refinancing costs. For this purpose, knowing the factors that influence risk premiums is essential. Covered-bond investors, on the other hand, can consider the results in their investment decisions. By considering

the typical factors influencing covered bond risk premiums in the international secondary market, investors might be able to detect possibly anomalously priced covered bonds and to exploit such anomalies. Second, they can use the results in their risk management processes related to the covered bonds they are invested in. In the context of their risk management processes, the knowledge of the price reaction of covered bonds following rating changes is also highly relevant and beneficial for covered-bond investors. For example, they can consider the results in their scenario analyses regarding potential losses in market value resulting from negative rating events. This is particularly important for the ECB, which holds a significant amount of covered bonds as a consequence of the recent covered bond purchase programs.

1.2 Course of Investigation

To analyze the research questions stated in the previous section, the thesis is structured as follows. In Chapter 2, some fundamentals of covered bonds are presented. First, Section 2.1 mentions the essential features a bond has to fulfill to qualify as a covered bond, describes the international covered-bond market, and reveals several differences between covered bonds and asset backed securities (ABS) and mortgage backed securities (MBS), respectively. Subsequently, Section 2.2 describes why ratings are particularly important for covered bonds, and gives a short overview about the rating methodologies of the three major CRAs. Finally, Section 2.3 explains the basics of the regulatory treatment of covered bonds.

Chapter 3 deals with the first of the three research questions stated above. More specifically, the factors influencing risk premiums of public covered bonds are investigated. First, Section 3.1 gives a short motivation why it is important to examine public covered bonds separately from mortgage covered bonds and it provides a literature overview concerning factors influencing risk premiums of covered bonds. Section 3.2 describes the importance of public covered bonds for the funding of local and regional governments. Furthermore, several more specific research questions, which will be examined during the empirical

analyses, are derived. Subsequently, Section 3.3 describes the dataset used in the empirical analyses. The results of the analyses are presented in Section 3.4 before a short conclusion with a summary of the results is provided in Section 3.5.

After examining public covered bonds, Chapter 4 focuses on the investigation of factors influencing risk premiums of mortgage covered bonds. Again, the chapter starts with a short motivation in Section 4.1. Section 4.2 describes the dataset before the results of the empirical analyses are presented in Section 4.3. To answer the second of the three research questions stated above, in addition to the investigation of the factors that influence risk premiums of only mortgage covered bonds, the differences that exist compared to the factors influencing risk premiums of public covered bonds are also examined using a combined dataset comprising the risk premiums of both covered-bond types. Section 4.4 summarizes the results.

The objective of Chapter 5 is to answer the third and last of the three research questions stated above. Therefore, this chapter examines the effects of rating changes on covered-bond prices. Analogous to the previous chapters, first, Section 5.1 provides the motivation. Section 5.2 discusses the research question in more detail before Section 5.3 provides a description of the empirical methodology. Subsequently, Section 5.4 describes the dataset used in the empirical analyses and Section 5.5 reports the results of the analyses. Finally, Section 5.6 contains a short summary of the results.

2 Fundamentals of Covered Bonds

As mentioned in the introduction, the main objectives of this work are to analyze secondary-market risk premiums of covered bonds and to quantify the effects of rating events on secondary-market covered-bond prices. Against this background, in this chapter, we want to present some fundamentals of covered bonds, first. In Section 2.1, we define the term covered bond and describe essential features of this asset class. Furthermore, we highlight differences compared to asset backed securities and mortgage backed securities. Subsequently, in Section 2.2, we elaborate on covered-bond ratings. We explain why ratings are especially important in this asset class and we shortly present the different approaches of the three major CRAs Fitch, Moody's, and S&P. Finally, we describe the regulatory treatment of covered bonds for banks and insurance companies in Section 2.3.

2.1 Covered Bonds

2.1.1 Definition and Description

The European Covered Bond Council (ECBC)¹¹ defines covered bonds as bonds with the following four essential features, which have to be stipulated by national law (either a special covered-bond legislation or the general law). First, either the issuer is a credit institution subject to public supervision and regulation, or, if the bond is issued by a

¹¹The ECBC was founded in 2004, has over 100 members in 26 covered-bond jurisdictions, and describes itself a platform that brings together covered-bond market participants, see <http://www.ecbc.eu>. Accessed: 22 March 2018.

Special Purpose Vehicle (SPV), the bondholders have full recourse to the credit institution using the SPV to issue covered bonds. Second, in case of issuer insolvency, investors have a preferential claim against the so-called cover pool comprising certain financial assets. Third, the credit institution must ensure that the cover pool comprises sufficient financial assets to fulfill investors' claims at all times. Fourth, there exists public or independent supervision of the credit institution's obligations concerning the cover pool.¹²

In short, covered bonds are interest-bearing securities issued by financial institutions¹³ and backed by assets combined in a cover pool. Besides mortgages or loans to public-sector entities, there can be other types of collateral, for example, ships or planes,¹⁴ but these covered-bond types have only a marginal market share.¹⁵ There is no separate cover pool for each covered bond. One cover pool generally backs several covered bonds from the same financial institution with different issue and maturity dates, as well as different issue sizes; together, all of these covered bonds are called a covered-bond program. Coupon and principal payments to covered-bond investors do not have to be satisfied by cash flows generated from the cover pool. However, as mentioned above, if the issuer becomes insolvent, covered-bond investors have a preferential claim against the assets in the cover pool and, in addition, an equal claim to the remaining insolvency estate as investors in unsecured debt. Thus, investors have a dual recourse against both the cover assets and the issuer.¹⁶

Because the essential features stated above have to be stipulated by national law, the specific design of a covered bond varies from country to country. As of 2016, there exists a special covered-bond legislation in 23 European countries and seven countries outside the European Economic Area (EEA).¹⁷ The national laws prescribe several components of covered bonds, for example, the type of cover assets and the minimum amount of

¹²See ECBC (2017b).

¹³Regardless of whether the covered bond is actually issued by the financial institution itself or by an SPV, we will refer to the financial institution as the issuer or the issuing bank in the following.

¹⁴See Grossmann et al. (2014).

¹⁵See ECBC (2016, Ch. 5).

¹⁶See Schwarcz (2011).

¹⁷See Grossmann and Stöcker (2016, p. 131).

overcollateralization.¹⁸ With a share of approximately 15% of the outstanding covered-bond volume at the end of 2016,¹⁹ the German Pfandbrief remains the largest component of the asset class but with a declining tendency; at the end of 2008, the German Pfandbrief represented more than a third of the entire asset class.²⁰ Concerning issuance volumes, in recent years, covered bonds from Denmark, France, Italy, Spain, and Sweden have occasionally already exceeded that of Germany.²¹ An overview of the outstanding covered-bond volume is presented in Figure 2.1.²²

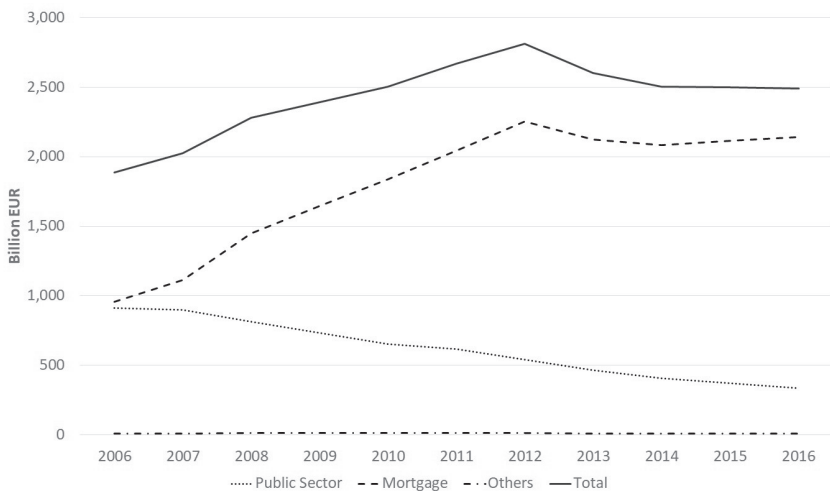


Figure 2.1: **Outstanding Covered-Bond Volume.**²³

This figure shows the outstanding covered-bond volume between 2006 and 2016 for the entire covered-bond market and divided into mortgage covered bonds, public covered bonds, and other covered bonds.

¹⁸Overcollateralization describes the percentage the value of the cover pool must be higher than the total value of all covered bonds backed by this cover pool.

¹⁹See ECBC (2017a, p. 589).

²⁰See ECBC (2009, p. 359).

²¹See ECBC (2013, 2014, 2015, 2016, 2017a, Ch. 5).

²²In Spain, besides normal covered bonds, there also exist so-called multi-issuer Cédulas. Cédulas is the short version of ‘Cédulas Hipotecarias’ or ‘Cédulas Territoriales’, respectively, the Spanish types of covered bonds. Multi-issuer Cédulas are securities, in which several issuers combine their covered-bond issuances. The new security is then backed by cash-flows from the combined covered bonds, and thus, the structure resembles that of a CDO.

²³Source: ECBC (2016, Ch. 5), ECBC (2017a, Ch. 5).

The outstanding covered-bond volume increased steadily from 2006 to a peak in 2012 and, after a slight drop, it remained fairly stable afterwards, with a total outstanding volume of nearly €2.5 trillion at the end of 2016, as already mentioned in the introduction. However, the development of the outstanding volume is significantly different for public covered bonds and mortgage covered bonds. In 2006, the outstanding volume of both covered-bond types was nearly equal, with €915bn (public) and €958bn (mortgage), respectively. After that, however, analogous to the entire market, the outstanding volume of mortgage covered bonds increased until 2012 and remained relatively stable in subsequent years, whereas the outstanding volume of public covered bonds decreased steadily. At the end of 2016, the corresponding outstanding volumes are €336bn (public) and €2,143bn (mortgage). The considerable decline of the outstanding volume of public covered bonds can almost completely be attributed to a decline of the outstanding volume of public German Pfandbriefe. Following the German re-unification in 1990, the high demand for capital by the German public sector led to a steep increase in the outstanding volume of public Pfandbriefe and, consequently, to a very high share of German Pfandbriefe in the international public-covered-bond market. However, a reduced demand by the German public sector and, in particular, the abolition of state guarantees for German Landesbanken in 2005 led to the significant decline in the outstanding volume over the last decade. However, the outstanding volume of public covered bonds actually increased in several other countries during this period, showing that public covered bonds remain an important part of the international capital market.²⁴

2.1.2 Differences Compared to ABS/MBS

As mentioned above, covered bonds are used by the issuing bank as a refinancing tool. Another possibility for banks to refinance their loans is to securitize them and to use an SPV to issue ABS or, in the case of mortgage loans, MBS. At first glance, covered bonds and ABS/MBS appear to be quite similar since both combine several financial assets in a pool used as collateral. However, there are significant differences between these two

²⁴See Berninger (2016, p. 120).