UNIVERSIDADE CATÓLICA PORTUGUESA

Are Asset Securitization Bonds different in W.E. vis-à-vis with the U.S.

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Having finished this research study and knowing that it was the last chapter of my Master's degree I feel really motivated to continue studying this topic and to increase my knowledge in the financial world.

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Abstract

The main objective of this empirical analysis is to provide some evidence in the differences in pricing between Asset Securitization bonds such as: Asset Backed Securities (ABS), Mortgage Backed Securities (MBS) and Collateralized Debt Obligations (CDOs) issued in the United States and in the Western European market. Using micro and macroeconomic variables as controls the study pretends to show the effect that the 2008 financial crisis as well as the deal region had in the credit spread of these securities between January 1st, 2000 and December 31st, 2016. The sample used, contains 66,354 observations, divided in 35,453 ABS, 19,941 MBS, and 10,960 CDOs.

After performing the econometric analysis, it was evident that the 2008 financial crisis increased the value of the spreads especially in the U.S. Moreover, the sovereign debt crisis that occurred in Europe, starting in 2009 with the first Covered Bonds Purchase Programme (CBPP) launched by the ECB led to a reduction of the credit spreads of these securities with a large reduction until 2013 and an increase from 2013 to 2016.

It was also concluded that: (i) a better rating reduces the credit spread for all types of AS bonds; (ii) rated AS bonds have lower spreads than not rated ones; (iii) higher bond maturities reduce the credit spread of the bond; (iv) higher government yields are related to a reduction in the pricing of AS bonds; (v) issuances in the UK turned out to have a higher credit spread. In addition, this research provides robustness checks with issuer parent details and key ratios that helped to confirm the conclusions achieved by the statistical analysis.

Keywords: Asset Securitization Bonds, Asset Backed Securities, Mortgage Debt Securities, Collateralized Debt Obligations, Credit Spread, Financial Crisis

Resumo

O principal objetivo deste estudo empírico é o de fornecer provas entre as diferenças de preço entre "Asset Securitization bonds" (AS bonds) tais como: "Asset Backed Securities" (ABS), "Mortgage Backed Securities" (MBS) e Collateralized Debt Obligations"(CDOs) emitidas nos Estados Unidos da América e na Europa Ocidental. Usando variáveis micro e macroeconómicas como variáveis independentes este estudo tem o principal objetivo de mostrar o efeito que a crise financeira de 2008 e a região onde estas obrigações foram emitidas tiveram no preço destas obrigações entre 1 de Janeiro de 2000 e 31 de Dezembro de 2016. A amostra utilizada tem 66,354 observações (tranches emitidas), dividas em 35,453 ABS, 19,941 MBS e 10,906 CDOs.

Depois de feita a análise ecnométrica, foi claro o impacto que a crise financeira de 2008 teve no aumento do preço destas obrigações, com especial relevância nos Estados Unidos. Mais ainda, verificou-se que a crise de dívida soberana que ocorreu na Europa, começando em 2009 com o primeiro programa de compra de obrigações por parte do Banco central Europeu, levou a uma redução do preço destes instrumentos financeiros, nomeadamente até 2013, ano a partir do qual os preços começaram a subir até 2016.

Também se conclui que: (i) um rating melhor traduz-se numa redução do preço para os três tipos de obrigações analisadas neste estudo; (ii) AS bonds com rating têm preços menores do que aquelas sem rating; (iii) obrigações com uma maturidade maior traduz-se numa redução do preço das mesmas; (iv) quanto maior a "yield" das obrigações do país onde as AS bonds são emitidas, menor é o preço das AS bonds; (v) emissões de AS bonds no Reino Unido revelam ter um preço maior. Adicionalmente, este estudo fornece uma análise robusta, inserindo algumas características relativas aos bancos que emitiram AS bonds durante o

período de análise, tendo como objetivo confirmar as conclusões atingidas durante a análise estatística.

Palavras-chave: Asset Securitization Bonds, Asset Backed Securities, Mortgage Backed Securities, Collateralized Debt Obligations, Preço das Obrigações, Crise Financeira

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Introduction

Asset Securitization products were very popular until the 2007-2008 financial crisis. Indeed, in the "golden age" of financial markets development, that started in the early 1970s, the securitization process added value to the economy, verifying a fast growth in volumes between 2002 and 2006 (Choudhry and Landuyt, 2009). Afterwards, the use of these structured finance products decreased exponentially because of the important role played by securitization in the 2007-2008 financial crisis, mainly through the issuance of CDOs and other types of synthetic securitization.

The financial crisis that started in the U.S. shortly arrived in Europe and the problem became even worse because of the banking credit, real estate and mortgages markets just collapsed. These markets were pillars of the economy and they directly influenced the bankruptcy of some big investment banks like Lehman Brothers on September 15th, 2008 and financial institutions that received a bailout, like Northern Rock and Bradford & Bingley (both British banks). After these events, investors completely lost the confidence in the financial markets and the governments had to intervene. It was in that moment that measures implemented after the crisis by governments and central banks in Europe and in the US were completely different. On the one hand, the European Central Bank (ECB) first measure was to decrease the reference interest rates, followed by an increase in the maturity of long term refinancing operations, an increase in the number of assets used as collateral in fixed income deals, and finally the launch of covered bonds purchasing programmes (in total three) in the aftermath of the financial turmoil. On the other hand, the Federal Reserve in the U.S. implemented programmes in order to restore liquidity in the financial institutions, with the purchase of long-term securities aiming to decrease the long-term interest rates.

The tools applied by the FED can be divided into three categories. Firstly, FED approved bilateral currency swap agreements with several foreign central banks to assist these entities in their provision of dollar liquidity. Secondly, FED provisioned liquidity directly to borrowers and investors in the most important financial markets. Thirdly, with the goal of decreasing long-term interest rates, FED started buying MBS in 2012 ($40 billion on average per month), followed by the purchase of longer-term Treasury securities ($45 billion on average per month) in 2013. In October 2014, FED announced the ending of these purchasing programmes.

Europe was affected by the financial crisis in the U.S, due to the large amount of business between the two regions, specially the banking system (the most affected area). However, this was not the only problem that Europe faced after 2008. Actually, just after the financial crisis, Europe faced another big problem, the sovereign debt crisis, which severely affected Greece, Portugal, Italy, and Spain. This happened because after bailing out the banks, the revenues of the governments became lower, the cost of funding increased, the commodities prices also incremented, and the government's deficit jumped as well. Adding up this sovereign debt crisis with the failure of the banking system in Iceland, determined one of the toughest challenges of the European Union.

In order to restore bank funding, the ECB launched three covered bonds purchase programmes (CBPP) announced in 2009, 20011, and 2014 and one asset backed securities purchase programme (ABSPP), announced in 2014. The objective of these programmes was to promote the ongoing decline on money market term rates to avoid the potential risk of low inflation. Actually, "CBPP has led to a very rapid tightening of covered bond spreads in the secondary market and a narrowing of bid-offer spreads" (Beirne, Dalitz, et al., 2011). In addition, it has contributed to:

i) a fall in money market term rates;

ii) better funding conditions for credit institutions and enterprises;

iii) incentive banks and other credit lenders to keep and try to increase their lending amounts to clients;

iv) improve market liquidity in important segments of the private debt securities market.

Surprisingly, the ECB launched an ABS purchase programme (ABSPP), even though knowing that these securities were on the roots of the financial crisis. However, it is important to understand that securitization is an important tool when the aim is to provide short-term liquidity. Therefore, is important to highlight that if each securitized tranche of ABS, MBS or CDOs issuances is correctly priced, securitization starts to be a way of restoring liquidity in the market.

Using a sample of 24,727 asset securitization bonds issued in the U.S. and Western Europe by financial institutions between 2000 and 2016, I cleaned it, and achieved a total of 84,580 tranches within those 24,727 AS bonds issued. Furthermore, the above-mentioned sample of tranches can be split in 42,705 ABS tranches, 26,535 MBS tranches and 15,340 CDOs.

Consequently, the main purpose of this research is to examine the impact of some microeconomic and macroeconomic variables on credit spreads of ABS, MBS, and CDOs.

Securitization is a recent topic. It was introduced in the U.S. in the late 1970s, peaked by volume in the 2007, and felt significantly with the 2007-2008 financial crisis (Choudhry and Landuyt, 2009). It is, namely in Europe, crisis relatively understudied field. Thus, the main intention of this study is to compare the pricing of AS bonds between the U.S. market and W.E. market (Euro zone and the UK) and also in what extent the financial crisis affected the pricing of these operations.

From 2000 to 2016, with special insights from 2008 to 2016, that represents the end of our sample of AS bonds, we intend to understand what impact the ECB policies and the financial crisis had (adding other variables such as credit rating and other controls) on the pricing of this operations.

Considering the previous literature on the pricing characteristics of corporate bonds, this research project intends to contribute to the literature by raising the following questions:

1. How do common pricing characteristics compare between AS bonds in the United States (U.S.) and Western Europe (W.E.)?
2. Is the credit spread on AS bonds in the U.S. higher than the credit spread on AS bonds in W.E.?
3. To what extent are AS bonds issued in the U.S. and W.E. priced by common factors?
4. Are the credit spread and pricing processes of AS bonds significantly affected by the 2007-2008 financial crisis and the subsequent European sovereign debt crisis?
5. What was the impact of the Central Banks' Quantitative Easing programmes on AS bond credit spreads?

The structure of this work is designed as follows. Next section (section 2) presents the literature review, where the extant theoretical and empirical works about securitization are reviewed. In section 3, the hypotheses to be carried out in this study are presented, as well as the description of the variables chosen to perform the empirical analyses. Section 4 provides a descriptive statistics of AS bonds, a description of the U.S. and W.E. markets as well as a detailed analysis of the credit spread. In section 5, the results of the empirical analyses are presented and discussed and some robustness checks are also presented and discussed. Afterwards, in section 6,the answers to the formulated hypotheses are

presented. Finally, in section 7, the main conclusions are presented, along with some gaps that can be used in future studies about securitization.

1 Literature Review

1.1 What is asset securitization?

Asset securitization is a form of structured finance "… where monetary assets with predictable cash flows are pooled and sold to a specially created third party that has borrowed money to finance the purchase." [Roever and Fabozzi (2003)]. The financial assets and the respective cash flows, after being pooled together, are converted into negotiable securities to be sold in the market; i.e., it is a technique used to transform illiquid assets into securities [Fabozzi et al. (2006) and Pinto (2014)] and it can be done in two ways.

On the one hand, we have the most used securitization process (funded securitization), in which a bank or a financial institution creates a Special Purpose Vehicle (SPV) or a Special Purpose Entity (SPE), where it allocates its financial assets as well as their respective cash flows, with the purpose of taking out these assets from its balance sheet by selling them to the SPV. The objective with this strategy is to increase liquidity, reduce funding costs and improve risk management.

On the other hand, the synthetic securitization process is also used, and in this case, the sale of assets to the SPV does not happen, since the underlying assets remain on the balance sheet of the originator, and only the risk of that assets is transferred to the SPV, by buying credit default swaps and other derivatives over these assets (Tasca and Zambelli, 2005). Henceforth, according to the fact that in this method of securitization the sale of assets does not take place, the seller does not receive any cash flows and the SPV is not the owner of the pool of assets but, indeed, the entity that supports the credit risk.

According to Pinto (2014), in this form of structured finance, the key element is that the obligation that the issuer has to repay investors is backed by the value of a pool of financial assets or credit support provided by a third party to the transaction.

1.2 Asset securitization structures and securities

In a typical securitization transaction, we have the transfer of assets from the originator to the SPV, "which then issues securities in the form of debt instruments, to be placed in the market through a private or public offering" (Joao M. Pinto, 2014). In order to better perceive the securitization transaction process, Figure 1.1 shows a simple diagram with the main asset and cash flow transfer between the parties involved.

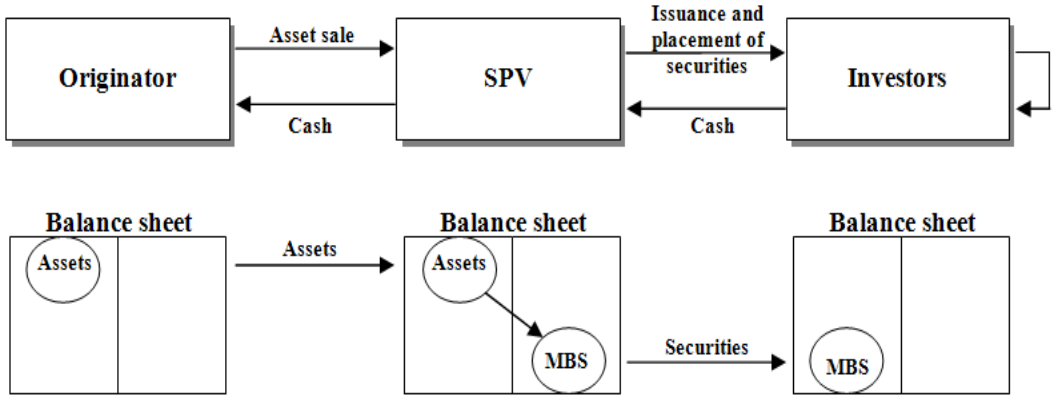

Figure 1.1.: Financial flows in a securitization transaction

Note: Adapted from Roever and Fabozzi (2003), Tasca and Zambelli (2005) and Pinto (2014)

In this figure we can see two essential deals: the asset sale (1) and the issuance of securities (2). To better detail the elementary securitization process, it is actually divided in four distinct steps: the originator sells the assets (loans, mortgages, etc) to the SPV (1); the SPV converts these assets into negotiable securities to be sold in the market (2); these securities have as collateral the assets bought by the SPV to the originator (3); the interests, principal and other cash

flows generated by the assets are used to repay the investors that bought the negotiable securities (4). In addition, the securitization process has to be analysed before the issuance of securities. Thus we have the following steps before the issuance: "assessing the collateral (1); modelling cash flows (2); quantifying risk factors via stress tests or other techniques (3); and structuring the transaction, taking into account some factors as the client's specifications, the type of assets, the rating agencies' opinion, the availability of data, and the investor's interest in the deal (4)" (Joao M. Pinto, 2014).

In Figure 1.2, is possible to understand the whole securitization process.

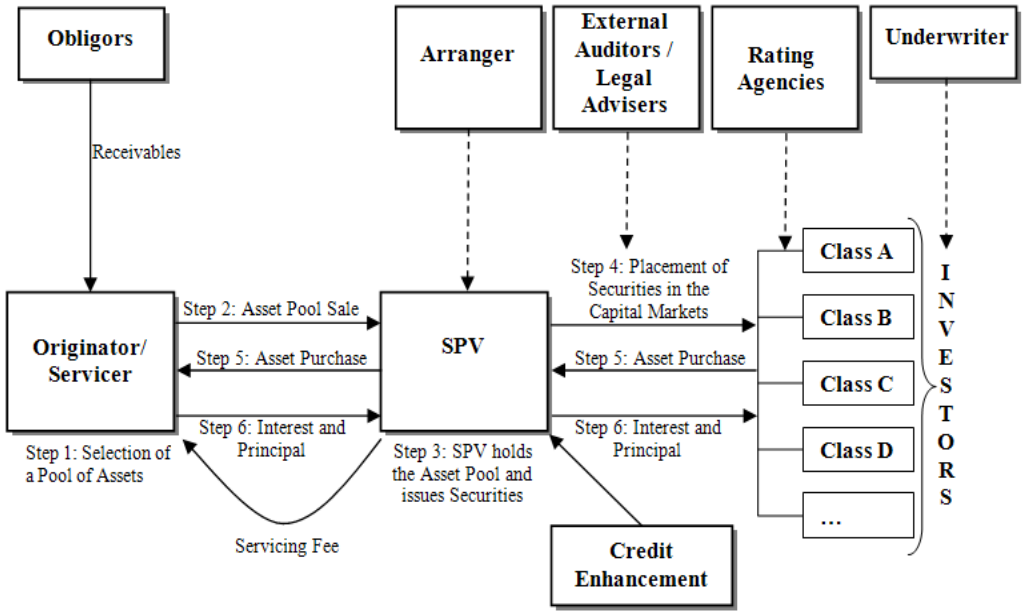

Figure 1.2.: Basic securitization process

Note: Adapted from Pinto (2014)

Detailing the image, in Step 1: the originator creates a pool of assets in order to start the securitization process; Step 2: the created pool of assets is sold to the SPV (this happens in all types of securitization types except synthetic securitization); Step 3: the SPV is now the owner of the pool of assets and the proceeds obtained from its issued securities guarantee the payment of those assets; Step 4: the securities are branched into tranches according to the rating

and they can start being traded; Step 5: the investors that buy these securities divided into tranches, normally institutional ones, pay to acquire the securities; Step 6: the SPV receives the money paid by issuing the securities and the cash flows are transferred to the issuer as of the initial purchase of the pool of assets (Joao M. Pinto, 2014).

In Step 4, when the securities are structured into different classes, according to its rating, the highest rating for Class A (the most senior class) is explained by the division of assets according to the risk of default of the originator and the employment of credit enhancement strategies. (Joao M. Pinto, 2014)

As an example of a strategy of credit enhancement we have the creation of a credit risk mitigation instruments by subordination of Classes B, C, D…, in which those lower classes provide credit support to class A. Indeed, the entire transaction is structured to meet specific investor's needs.

For instance, if the cash flows generated by the assets are not sufficient to remunerate investors, then the mot junior tranches, with low underlying credit ratings, are the first to assume the initial credit losses, protecting the most senior classes of the potential losses, through a subordination credit enhancement mechanism.

To improve credit rating, internal or external credit enhancement mechanisms are needed. Additionally, the amount of necessary enhancement is determined according to each transaction specifications by the credit rating agency. In this case, for rated transactions the amount of enhancement required to perform the transaction is related to the level of the expected losses. For example, triple A tranches will require an enhancement of four/five times the level of expected losses and triple B would just need an enhancement of two times the expected losses. These mechanisms aim to protect the investors against the risk of the collateral not being repaid.

For instance, external credit enhancement mechanisms are provided by third-party guarantees, providing first loss protection against losses up to a certain amount. Examples of external credit mechanisms are: guarantees, letters of credit and bond insurance. On the other hand, we have internal credit enhancement mechanisms such as: subordination; overcollateralization; cash reserves and accounts; excess spread; trigger events; and minimum debt or interest service coverage levels (Joao M. Pinto, 2014).

The goal of these mechanisms, is to help the issuer finding the one that suits it better in order to reduce the cost of funds, or to target specific investors. Thus, it is normal for issuers to change the type of credit enhancement mechanisms from one deal to another according to their willingness. The issuer always faces the trade-off between the cost of enhancement versus the reduction in yield required to sell the securities.

1.2.1 Structures

As mentioned, securitization can be implemented in two ways: (1) a real sale of assets, in which the underlying assets are sold by a financial institution to the SPV via a true sale and by doing this assets are removed from the balance sheet; (2) a synthetic securitization, where the underlying assets remain in the balance sheet of the originator, and only the risk of the underlying assets is transferred to the SPV, by buying credit default swaps and other credit derivatives over these assets (Tasca and Zambelli, 2005). Thus, in this second securitization structure, the originator does not receive any cash flows, because the asset sale does not take place and the SPV is not the owner of the assets, but is the entity carrying the credit risk of those assets.

1.2.2 Classes of securities

The asset securitization market is divided in three main classes (Blum and Diangelo, 2008; Fabozzi and Choudhry, 2004; Vink and Thibeault, 2008): asset-backed securities (ABS), backed by consumer-backed products; mortgage-backed securities (MBS), backed by mortgages; and collateralized debt obligations (CDO), backed by debt obligations.

CDOs are a type of securitization in which a SPV issues bonds or notes backed by debt obligations such investment-grade and high-yield corporate bonds, emerging market bonds, MBS, ABS, bank loans, special-situation loans and distressed debt, and other CDO.

Asset-backed securities are bonds or notes backed by financial assets such as: credit card receivables, auto loans, manufactured-housing contracts and home-equity loans.

Mortgage-backed securities are bonds or notes secured by home and other real estate loans.

In Figure 1.3., it is presented the securitization process divided by securitization instruments.

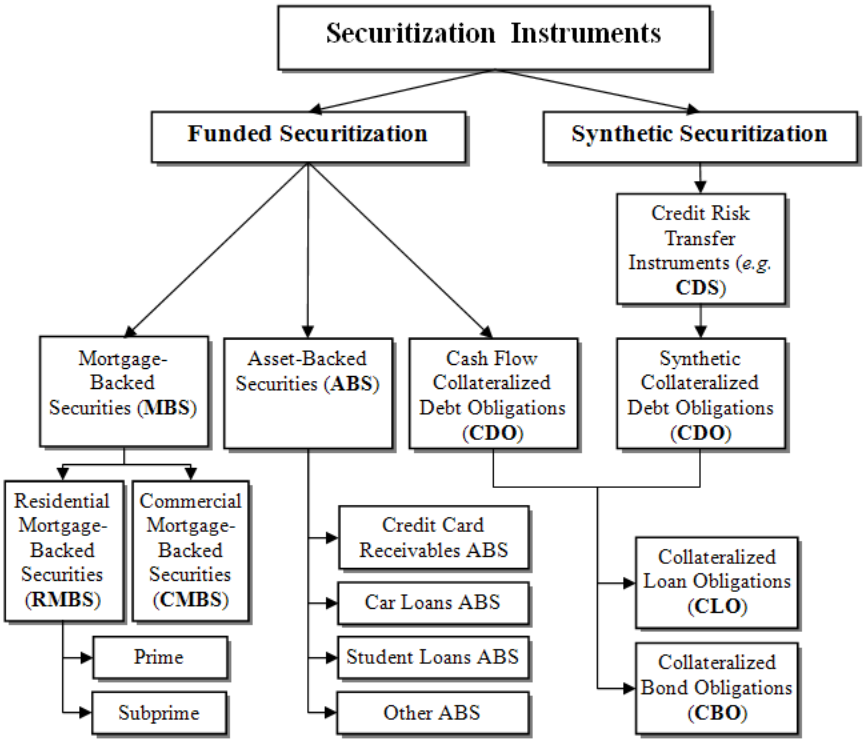

Figure 1.3.: Securitization instruments

Note: Adapted from Pinto (2014)

1.3 Advantages and disadvantages of using asset securitization

To understand the advantages and disadvantages of securitization we have to go back to the Modigliani and Miller (1958) capital structure irrelevance theorem. In this world, securitization would not exist because securitization transactions would not bring advantages over other alternatives, since the funding cost would be the same and investors would have to support higher costs related with the structuring process and credit enhancement mechanisms. If we take as an example a world where perfect and liquid financial markets exist, asymmetric information is not an issue, then the securitization process does not add value and consequently, the firm's financing structure is irrelevant. From the above explanation we can conclude that using securitization is a good strategy to create

value by reducing the net costs in an economy that has market imperfections as asymmetric information, agency conflicts and market incompleteness. Hence, the use of tranching and off-balance sheet financing makes sense (Joao M. Pinto, 2014).

Moreover, since securitization is done off balance-sheet (with the exception of synthetic securitization) through an SPV, we can have a scenario in which the securities of the SPV are rated investment grade, and the rating of the originator is speculative grade. Simultaneously, since the issuer no more bears the interest rate risk and credit risk associated to the pool of assets, it can reduce its cost of funding.

1.3.1 Advantages

After the conclusion that in a world with market imperfections securitization adds value, it is important to understand why. According to the existing literature, the core reasons for the emergence of securitization transactions are: (i) increasing liquidity and funding (Greenbaum and Thakor, 1987; Hess and Smith, 1988; Jobst, 2005; Krebsz, 2011; Pavel and Phillis., 1987; Roever and Fabozzi, 2003; Sarkisyan, Casu, *et al.*, 2009); (ii) reducing the cost of funding (Calomiris and Mason, 2004; Davidson, 2003; Fabozzi and Kothari, 2007; Fabozzi, Davis, *et al.*, 2006; Goldberg and Rogers, 1988; Jobst, 2005); (iii) allowing originators to diversify funding sources (Davidson, 2003; Fabozzi and Kothari, 2007; Jones, 2000; Krebsz, 2011; Roever and Fabozzi, 2003); (iv) improving originator's risk – credit, interest rate, and prepayment risks - management (Cumming, 1987; Davidson, 2003; Fabozzi and Kothari, 2007; Goldberg and Rogers, 1988; Hess and Smith, 1988; Jobst, 2005; Rosenthal and Ocampo, 1988); (v) increasing the segmentation between the origination and investment functions (Davidson, 2003); (vi) allowing originators to benefit from regulatory and/or tax arbitrage (Cumming, 1987; Davidson, 2003; Jones, 2000; Krebsz, 2011); and (vii) allowing originators to improve key financial ratios (Fabozzi and

Kothari, 2007; Goldberg and Rogers, 1988; Krebsz, 2011; Roever and Fabozzi, 2003).

However, these motivations can change regarding if we are analyzing the perspective of a bank or a non-bank corporation. As stated by Fabozzi (Fabozzi, Davis, et al., 2006), the principal reasons a non-bank corporation may prefer to issue ABS are: (i) to reduce funding costs; (ii) to diversify funding sources; (iii) and to accelerate earnings for financial reporting purposes. Moreover, Lupica (L. R. Lupica, 1998) also presents the following motivations: (i) improving liquidity; (ii) lowering the effective interest rate; (iii) improving risk management; and (iv) achieving accounting-related advantages.

On the other hand, for a bank corporation, the motivations to use securitization transactions are the following: (i) new sources of funding (Cardone-Riportella, Samaniego-Medina, et al., 2010; Fabozzi, Davis, et al., 2006; Goldberg and Rogers, 1988; Jones, 2000; Loutskina and Strahan, 2009); (ii) risk management and the transfer of credit risk to fund risky financial assets and minimize financial distress costs (Cardone-Riportella, Samaniego-Medina, et al., 2010; Chiesa, 2008; Fabozzi, Davis, et al., 2006; Goldberg and Rogers, 1988; Jobst, 2005); (iii) new profit opportunities, by recognizing accounting gains when the market value of loans exceed their book value (Affinito and Tagliaferri, 2010; DeMarzo, 2005; Flannery, 1989); and (iv) the adjustment of capital ratios (Ambrose, LaCour-Little, et al., 2005; Berger and Udell, 1991; Berger, Herring, et al., 1995; Calomiris and Mason, 2004; Carlstrom and Samolyk, 1995; Fabozzi, Davis, et al., 2006; Jagtiani, Saunders, et al., 1995; Jones, 2000).

Turning now to the benefits of securitization from an investor's perspective, Fabozzi (Fabozzi, Davis, et al., 2006) argues that securitization allows investors to diversify sector interest, access different risk reward profiles, and access sectors that are otherwise not open to them. Hence, the key benefit to investors is the ability of securitization to tailor risk-return profiles. This idea is

corroborated by Jobst (Jobst, 2005), who points out that "investors of securitized debt can quickly adjust their investment holdings at low transaction costs in response to a change of personal risk sensitivity market sentiment or consumption preferences".

1.3.2 Disadvantages

As any other financial product, securitization also has some disadvantages. Asset securitization transactions are very complex and deal with a very high level of due diligence, negotiation, and legal procedures (Joao M. Pinto, 2014). Henceforth, it is costlier to implement than a normal corporate bond issuance. Cardone Riportella (Cardone-Riportella, Samaniego-Medina, et al., 2010) mention that the disadvantages of securitization include the fixed costs of creating the SPV and the potential reduction in tax benefits, that the originators would have if they kept the assets on the balance sheet and financing them with debt, whereas while setting up a SPV they will lose some tax shields. Similarly, Jobst (Jobst, 2005) states that the structural complexity is the major problem in this type of structured finance. Indeed, the matters that should worry the originators are: "high accumulation of interest rate risks; the potential for errors in the rating and pricing of complex security designs; and the shortcomings of analytical models for assessing risks".

Another commonly mentioned disadvantage is the fact that the link between the borrower and the bank is disconnected, because the bank creates a SPV/SPE to move the assets from its balance sheet to this entity. When this happens, the bank has an incentive to be less risk conscious. Moreover, aligning this risk careless with the fact that the bank depends on its investors to fund its loans, mostly the commercial paper investors, this could lead to the reduction of the number of investors and consequently the funding amount. Additionally, another shortcoming brought by securitization was the increase of leverage ratios, in some cases 1:40 or even 1:50, which at the minimum failure of some

payments the entities that sold these products would have losses, for example the failure on a payment on a mortgage (Choudhry and Landuyt, 2009). This aligned with the overestimated liquidity of the assets given as collateral to the securitized products (as an example a house as a collateral to a MBS) could result in a collapse of the market.

In general, the literature points out the following problems related to securitization: (i) complexity (Caselli and Gatti, 2005; Davidson, 2003a; Fabozzi, Davis, et al., 2006; Fender, Mitchell, et al., 2005; Jobst, 2005); (ii) off-balance sheet treatment (Fabozzi, Davis, et al., 2006; Rutledge and Raynes, 2010); (iii) asymmetric information (Demyanyk and Van Hemert, 2011; Gorton, Gorton, et al., 2008; Jobst, 2009; Keys, Mukherjee, et al., 2010; Krebsz, 2011; L. Lupica, 2009; Purnanandam, 2011); (iv) agency problems (Demyanyk and Van Hemert, 2011; Fabozzi and Kothari, 2007; Jobst, 2005, 2009; Purnanandam, 2011); and (v) higher transaction costs (Cardone-Riportella, Samaniego-Medina, et al., 2010; Davidson, 2003).

1.4 Asset Securitization and the 2007/2008 financial crisis

Securitization process started in the early 1970s, in the United States, with the sale of pooled mortgage loans guaranteed by government agencies (Moody's, 2003). The government National Mortgage Association (Ginnie Mae) was established in 1968 after Fannie Mae was privatized. The main objective of this government institution is to enlarge funding for mortgages that are insured by other federal agencies. Indeed, through the use of securitization techniques, when these mortgages are converted into negotiable securities and placed in the market to be sold, Ginnie Mae provides credit guarantee on those securities, creating a less risky product for investors, and increasing the demand for these products. With the guarantee from the government, investors felt more comfortable to invest on issued securities, and this was the main reason why we

noticed the fast growing of the securitization technique until the beginning of 2007, in the U.S.

Actually, after the 9/11 we noticed further growth in the application of this technique, not just as cash securitization transactions, but also synthetic securitization transactions. It had a rapid growth from 2002- 2006, but in 2007 this market languished. In roughly terms what happened was that banks gave credit, namely mortgages, to clients with no jobs and no sources of income; i.e., with a higher credit risk. Subsequently, financial institutions pooled that loans and mortgages together and sold them to a SPV in order to get fast liquidity and funding. The financial institutions did it because to receive the entire money of a mortgage would take 30 years or more, whereas by selling the mortgage to an SPV, banks anticipate those cash flows to grant more credit. Afterwards, in the SPV the loans are converted into negotiable securities. For instance, bonds are divided into tranches according to the riskiness of the loans and mortgages, being the more junior tranches the ones to assume the first loss in case of default and the senior ones the last to lose. Being aware that these bonds were collateralized with mortgages given to clients with a high probability of not repaying the credits, we arrived to the origination of the financial crisis. Indeed, some of the mortgage borrowers started to not paying the principal and the interest and banks started to get the houses as a counterpart. With a high number of clients not paying the mortgages and banks accumulating real estate buildings without the ability to sell them the investors that bought the MBS, ABS and CDOSs started to face losses, and after that the whole economy started to collapse. Correlated with the subprime crisis, where mortgages not conforming to the government's requirements in terms of credit quality and size, were not sold with the government sponsored entities and were actually sold in secondary markets, originating subprime mortgages, and reflecting a high value of mortgages relatively to house prices, dictate the collapse of the market when the price of the

houses started to reduce (Coval, Jurek, et al., 2009). Moreover, with direct influence in the defaults of some entities like Lehman Brothers, the image of securitized products was severely tarnished during the crisis (Choudhry and Landuyt, 2009).

The same authors (Choudhry and Landuyt, 2009), pointed out some factors that contributed to the fall in confidence in the market since 2007, due to securitization.

Firstly "the flexibility and wide application of the securitization technique", gave banks the possibility to move assets off the balance sheet, which allowed banks to sell low-quality assets like sub-prime mortgages to investors who had little knowledge about the credit risk they were getting. This is known in the finance literature as asymmetric information. In this case, the bank that has the loans knows much more about the risks associated to that loans than the investors that would buy bonds collateralized by those assets, which gives a strong advantage to the bank.

Secondly, in securitization the link between the borrower and the bank is separated. Hence, there is a less incentive for the bank to be risk conscious. In a normal bank regime, banks should have a minimum loan to deposits ratio, but this do not apply if they get rid of some loans by selling them to a SPV. This turns out to be an agency problem, because the originator loses the interest on the pool of assets in the moment they are sold to the SPV. Since the assets do not belong to the issuer anymore, the originator starts to be careless when it evaluates the creditworthiness of its customers, because even if the client has a bad rating the losses on those assets do not impact the balance sheet of the issuer(Iacobucci and Winter, 2005; Jensen and Meckling, 1976).

The amount of leverage in the SPVs at the time was very high. The normal leverage was 1:15, but some SPVs had leverage ratios of 1:40 and even 1:50. This led to a fail of hundreds of SPVs.

Furthermore, some of these products became very complex and difficult to analyse by outsiders. As an example, the correlation risk within the credit portfolio became very difficult to measure, which made more difficult the pricing of the securitized securities.

Also, the credit rating agencies, used complex methodologies to give credit ratings, that were not understood by all investors. Additionally, they gave very optimistic ratings to certain deals.

Finally, the liquidity of the majority of the securitized assets was overestimated. For instance, the liquidity of an AAA-rated securitized paper was believed by investors to be the same as the liquidity of a plain vanilla AAA-rated paper and consequently, it could be easily funded by highly liquid commercial paper.

With all the problems of the securitization technique referred above, being the financial institutions exposed to the subprime mortgage marked we arrived to a financial crisis, due to the role played by the structure finance market. In addition, Criado and Rixtel (Criado and Rixtel, 2008) pointed out that banks abused in the use of structured finance products and putting them out of the balance sheet. Additionally, they also had a large exposure to CDOs.

Since the image of the securitized products was completely damaged after the financial crisis, some authors (Choudhry and Landuyt, 2009), pointed out some recommendations in order to restore the market confidence in this kind of financial products, such as: establishing a securitization forum of interest parties, in which the main market entities, as an example banks, investors and regulators review the state of the market and make recommendations for change to which all new transactions would adhere and also monitor the current legislation; re-couple the de-coupling (not direct intermediation between lender and borrower during the transaction, because of the use of a SPV/SPE), that is the major pitfall of securitization, with the objective to make the lender more risk consciousness;

restore the credibility of the rating agencies, by trying to give more transparency as well as neutrality, and the performance of these agencies should not be based in the number of issued ratings, but instead on the quality of the ratings given; review of credit rating methodology, in order to be more understandable by investors.

1.5 Western European markets versus the US market

According to Tasca and Zambelli (Tasca and Zambelli, 2005) the concept of asset securitization was introduced in the US financial system in the 1970s. From then until the introduction of the Euro in 1999 this market had a small growth, especially in Europe. Although, after that introduction the importance of the European securitization market increased, leading to a rapid growth until the beginning of the financial crisis in 2007.

The main difference between the European and the much larger and developed US market, is that in the US the main promoter of securitization transactions was the government, that had the goal to encourage home ownership and create a secondary market for mortgages. By contrast, in Europe, the government did not intervene in order to promote securitization. Indeed, in Europe, the first MBS were issued by large commercial banks with the objectives of regulatory arbitrage, diversification of funding sources, and as a response to the appeal of international investors (Joao M. Pinto, 2014).

In addition, the fact that the European market is divided into a large number of countries with different legislations, in contrast to the US market, led to a more complicated legal setup as well as more upfront costs to be supported by the originators. As stated by Adams (Adams, 2005), the wide divergence in market sizes within Europe is a reflection of the very different economic, financial, political, historical, legal, and social frameworks.

Finally, Adams (Adams, 2005) mentions some more differences between the European and the US market:

1. Lack of uniformity in the structures and the definitions used in the European ABS markets, since there are no definitions for concepts such as: prime, conforming, non-conforming, or jumbo loans. Missing of agencies in the European market like Fannie Mae[1] and Freddie Mac[1] operating in the US.
2. Absence of credit score in the European countries. In contrast to the US market, there is no credit score acceptance in Europe like FICO score[2] in the US. There are some credit reference agencies in Europe that developed their scores, however these scores are not used by finance companies.
3. European investors have lower propensity to borrow than consumers in the US.
4. In terms of default, European consumers are, in general, less likely to default in their debts than the US consumers. This is explained by the fact that in Europe bankruptcy is regarded more seriously, and the financial impact of bankruptcy tends to be more severe. Moreover, the legal systems in Europe support more the lender.
5. The prepayment risk that has a more important role in the US rather than in Europe.

[1] Fannie Mae and Freddie Mac are government sponsored enterprises that buy mortgages from lenders, poll them together and sell them as mortgage-backed securities to investors

[2] Fico Scores are a global standard for measuring credit risk in the banking, mortgage, credit card, auto and retail industries.

1.6 The pricing determinants of AS bonds

The literature on the pricing of AS bonds is scant when compared with the abundant literature regarding corporate bonds spread determinants. In this section we present the empirical literature on the pricing of corporate bonds as they are important to understand what factors can affect the spread of AS bonds with the goal to create a background to understand the pricing of AS transactions. Additionally, the AS market is composed by ABS, MBS, and CDOs. Since we have differences in the assets related to these securities, the relevant pricing factors for these securities should differ, too (Vink and Thibeault, 2008).

Gabbi and Sironi (Gabbi and Sironi, 2005) show that credit ratings are the most important factor determining the spreads between the yield to maturity of corporate bonds and that of equivalent Treasury securities. Furthermore, the issuance spreads of corporate bonds issued in Europe over the corresponding maturity Treasury bonds reflect investors' perception of the risk and of the bond primary and secondary market efficiency and liquidity conditions. Henceforth, they are a function of five main factors: (i) the bond issuer default risk; (ii) the bond's expected recovery rate in case of default; (iii) the expected liquidity of the secondary market of the bond issue; (iv) the expected tax treatment to which investors will be subject; and (v) the bond's primary market efficiency conditions. They concluded that among those five factors (determinants of the pricing), ratings of corporate bonds are the most important factor to determine the credit spreads, along with the bond's expected tax treatment. However, the primary market efficiency and the secondary market liquidity turned out to be poor explanatory variables. In this study the authors carried out an analysis of the spreads in the primary market, since the liquidity in the secondary market is poor.

Moreover, (Elton, Gruber, et al., 2001) state that the "spreads in rates between corporate and government bonds differ across rating classes and should be positive for each rating class". They pointed out three factors that may increase the spread on corporate bonds: (i) expected default loss, meaning that the investors require a premium to compensate this expected loss in comparison to the non-defaulting government securities; (ii) tax premium, yields that the capital gains on corporate bonds are taxed whereas interest payments on government bonds are not; (iii) risk premium, stating that the return on corporate bonds is riskier than the return on government bonds, because a considerable part of the risk on corporate bonds is systematic. Although, some authors do not corroborate factors two and three[3], by assuming that the spread is all default premium. To cast doubt on this opposite literature, Elton (Elton, Gruber, et al., 2001) found that taxes and risk premiums represent a large part of corporate bonds pricing determinants. Beyond the credit rating as being the most important pricing determinant the literature also points out liquidity (Bao, Pan, et al., 2011; Chen, Lesmond, et al., 2007; Longstaff, Pan, et al., 2011), systematic risk (Collin-Dufresne, Goldstein, et al., 2001; Elton, Gruber, et al., 2001), incomplete accounting information (Flannery, Nikolova, et al., 2012), leverage (Flannery, Nikolova, et al., 2012) and taxes (Elton, Gruber, et al., 2001) as another important pricing factors. Moreover, macroeconomic variables such as the reference interest rates, the yield curves, the volatility in the market also can affect the credit spread of an AS bond(Campbell and Taksler, 2003; Krishnan, Ritchken, et al., 2005). Finally, the characteristics of the issuance, such as: maturity, tranche size, transaction size and the year of the issuance also contribute to influence the credit spread. Putting all these findings together the previous literature found that ABS,

[3] Some authors assume a zero risk premium, and state that the only price determinant of the spread of a corporate bond is the expected default

MBS and CDOs are influenced by the same pricing determinants, though in a different way(Vink and Thibeault, 2008).

Turning now to the pricing of securitized products, the academic literature contains few AS bond pricing studies. Maris and Segal (Maris and Segal, 2002) found that default probability, tranche size, transaction size, and year of issuance influence credit spreads for commercial mortgage-backed securities (CMBS). In addition, for CMBS, (An, Deng, et al., 2010) it was concluded that interest rate volatility, the yield curve slope, and the property type composition of the underlying asset pool have a significant impact on credit spreads. Rothberg (Rothberg, Nothaft, et al., 1989) corroborates that interest rate volatility affects the pricing of AS bonds and adds that liquidity, credit risk and the term structure of interest rates also affects significantly the pricing of the mentioned securities. Furthermore, Ammer and Clinton (Ammer and Clinton, 2004) argue that credit rating is the most important pricing factor for AS bonds. This research is confirmed by other literature studies (Buscaino, Caselli, et al., 2012; Hu and Cantor, 2007; Vink and Thibeault, 2008).

As can be perceived by comparing the pricing of corporate bonds with the pricing of securitized bonds, the main price determinant for both is the credit rating.

2 Hypotheses and Sample Selection

2.1 Hypotheses

The primary goal of this work is to compare the differences between the pricing of AS bonds in the Western European (W.E.) versus the United States (U.S.) market. Henceforth, regarding the five research questions presented in the introduction, we can formulate 3 hypotheses:

1. Credit spreads and pricing characteristics differ significantly between AS bonds issued in the U.S. versus W.E.
2. AS bonds credit spread is higher in the U.S. than in W.E.
3. The 2007-2008 financial crisis and the subsequent European sovereign debt crisis affected significantly AS bonds credit spread and pricing determinants.

On the first hypotheses, we will use a univariate analysis to begin the study of the differences in the credit spread as well as the pricing factors of AS bonds in both markets, the U.S. and W.E. Therefore, we will take conclusions about the main pricing factors of AS bonds in both markets.

The second hypothesis, comes up from the previous finding in the literature and also analysing the data (further on explained in the Credit Spread Analysis section), that corroborate the idea that the credit spread for AS bonds issued in the U.S. have increased during and after the crisis period in comparison to the before crisis period. In fact, we already expect an increase of the credit spreads on these securities in the U.S. and in W.E. after 2007, however the main goal of the second research question is to observe and explain the different credit spreads for the same securities issued in the U.S. and in W.E. Additionally, there is an intent to see which market was more affected by the financial crisis in terms of

credit spreads, and why we had different credit spreads between the two analysed markets. The answer to this hypothesis starts once more with the univariate analysis, in which we compare the average credit spread of our sample between AS bonds types (ABS, MBS, and CDOs) and deal region (U.S. and W.E.).

Finally, in the third hypotheses, we want to examine the impact of the financial crisis in the credit spreads of each security type and also the impact that this crisis had in each analysed market. It is expected that the credit spread of these securities increase in the aftermath of the financial crisis, with more intensity in the U.S. In order to study this impact, we intend to build a univariate analysis table in which we calculate the mean of the credit spread and the variables that determine it, before (from January 2000 to September of 2008) and during the crisis periods (from September 2008 to December 2016). Afterwards, we intend to run OLS regressions for pre-crisis and crisis periods.

2.2 Sample Selection

2.2.1 Databases

The sample of ABS, MBS, and CDOs used was extracted from DCM analytics database, within the period of January 1st, 2000 to December 31st, 2016. Beyond the date criterion, the sample was also filtered by nationality of risk (similar to deal nationality), by selecting bonds issued by originators located in the U.S., U.K. and Euro Area countries. The issuers of AS bonds that we chose to the sample are only banks.

Macroeconomic data like the risk-free rate for both Europe and the US, market volatility, Libor US, Libor UK, Euribor, and government yields (Germany, UK, and the US) were obtained from Bloomberg. Finally, accounting and market variables from the originators, such as total assets, ROA, ROE, loans, customer deposits, capital ratios and equity value, were extracted from Bankscope.

2.2.2 Description of variables

Credit Spread (Dependent Variable)

Credit spread was used as the dependent variable and represents the pricing of the financial product. The credit spread consists in the difference between the yield to maturity (YTM) of the tranche and the corresponding Government yield (with the same maturity of the deal) on the issuance date; i.e., the option adjusted spread (Elton, Gruber, et al., 2001).

The sample of credit spread was divided into two big categories, fixed rate and floating rate notes. From the initial sample, the following issue types were removed: fixed rate converting to floating, fixed rate extendible and floating rate note extendible.

We only use deals with a deal currency code of in EUR, GBP, and USD and government yields of the US, the UK, and Germany. By doing this we avoided the forex effect. As an example, for a deal made in Europe in USD we used the US respective government yield (according to issuance date and maturity dates) to subtract from the YTM of the tranche.

Adjusted Spread

To improve the comparison of credit spreads between fixed rate and floating rate issuances, we use the adjusted spread. It is necessary to account, in credit spread computation, for the fact that the fixed rate bond carries the interest rate risk, whereas a floater--quoted as a spread relative to a benchmark (e.g., Libor) --does not. Hence, to ensure comparability of spreads at issuance we converted floating rate bonds to fixed rates using fixed-for-floating rate swaps. This conversion was implemented individually for each bond, using the appropriate quote for the swap matching the maturity of the bond and taken at the issuance

date. We also consider the specific interest rate market (EUR Libor, USD Libor and GBP Libor) and even different reference rates within the same market (USD Libor 1M, USD Libor 3M, USD Libor 6M, and USD Libor 12M).

Country Risk

This variable is a proxy of country rating estimated by Standard & Poor's. The scale goes from 1 to 22. The value of 1 means that the rating of the country where the deal took place was AAA at the time of issuance. The scale continues until the number 22, matching the rating DD. Hence, a positive coefficient in this variable is expected, since countries with lower score (higher rating) have lower risk. From the previous literature we can point out Zaghini study (Zaghini, 2014), in which he states that a positive effect on spread is expected since banks headquartered in countries with lower risk tend to give a special protection in default.

Credit Rating

Credit rating measures the credit risk given by Standard & Poor's to the deal's tranche at the time of issuance. As in country risk the range of values goes from 1 to 22, in which an AAA rating gets a value of 1 and a DD rating gets a value of 22. As it can be perceived, the higher the value is, the lower the rating is given. In the previous studies (Gabbi and Sironi, 2005; Zaghini, 2014) the relationship between credit rating and credit spread was analysed and was it was found that: credit rating is the most important determinant of credit spread; and the higher the credit risk, meaning a higher score in the rating scale, turns out to increase the value of the credit spread, creating a positive relationship between these two variables.

Rated

As another measure of the Rating of a tranche this variable intends to distinguish between rated and not rated tranches. In, fact according to the previous literature of rating, described in the last variable analysis is possible to see that if rating is downgraded the credit spread increases. Henceforth, since a not rated bond is considered for the market to be more expected to default in comparison to a rated one, because it does not have a credit rating, the expectation is that when we compare a rated bond with a not rated one the credit spread for the not rated one be higher than for the rated one.

Maturity

This variable represents the time until maturity of the bonds in years. Ceteris Paribus, bonds with longer maturities tend to be riskier than the ones with shorter maturities, because it gets more difficult to forecast with accuracy the future cash flows. Consequently, the demanded spread for longer maturities tend to be higher. From the previous empirical studies regarding asset securitization bonds (Vink and Thibeault, 2008), we have evidence that a significant negative relationship between spread and CDOs yields with a maturity lower than 5 years, and the same relationship occurs in MBSs with a maturity longer than 15 years. For ABS these authors did not find any significant relationship between maturity and credit spread. Henceforth, it is difficult to forecast the variable sign.

Government Yield

For the Government Yield variable, the difference between the issuer country 10yrs Government Yield (long-term) and the 3mth Government Yield (short-term) was applied. We expected that an increase on this yield's difference, related

to an increase on the credit risk, and a not linear yield curve, result in an increase of the credit spreads (Barrios and European Commission. Directorate-General for Economic and Financial Affairs., 2009).

Subordinated Debt

This variable takes the value one if the tranche represents a debt owed to an unsecured creditor, which means that in a scenario of default, this creditor can only be paid after the claims of secured creditors have been paid. Therefore, as this means more risk for this kind of issuance, we expect an increase in the credit spread for subordinated debt tranches.

GDP per capita

The above variable is a macroeconomic one, that in a general level measures the average income of the citizens of a country. Thus, as this average income increases, we expect the country to be a more developed one. More developed countries have less risk associated, consequently we expect lower credit spreads for AS bonds issuances in countries where the GDP per capita is higher. In other words, we expect a negative correlation between credit spread and GDP per capita.

Creditor Rights

To use this variable, we extracted the Laporta's Creditor Rights scale (La Porta, Lopez‐de‐Silanes, et al., 1998). From previous studies (João M Pinto, 2018), in which was found that countries with better creditor rights have more probability to issue structured finance debt such as Project Finance loans, rather than straight debt funding. Therefore, we expect that countries with a higher level of creditor rights have more AS bond issuances with lower credit spreads.

Risk Free Rate

This variable intends to be a proxy for the general levels of interest rates. We used two different types of interest rates. For the European market, we use the three-month German Treasury bill (Risk free WE) and for the US market we used the three-month US bill (Risk free US). Both risk free rates were used with the values at the time of the issuance of the bonds. Some authors (Eichengreen and Mody, 1998;Kamin and von Kleist, 1999) state that the general level of interest rates is an important determinant of the bond's pricing. The à-priori expectation is that the risk free rate will have a significant negative impact on credit spreads, because higher yields are associated with a better and growing economy and so, lower probabilities of default (Collin-Dufresn, Goldstein, and Martin, 2001; Longstaff, Pan, Pedersen, and Singleton, 2011).

Volatility

Volatility means the change in the value of an asset and reflects a measure of uncertainty and risk. In order to measure this variable, the closing values for the US Volatility Index (VIX) were used as a proxy. US VIX is a negatively correlated index with the S&P 500, and we expect a positively correlation between US VIX and the credit spread. As it is stated by the literature until now, higher volatility, means higher risk, and that leads to a higher risk premium demand (Collin-Dufresn et al., 2001; Davidson, 2003; Fabozzi and Kothari, 2007; Pinto, 2013).

Number of banks

The number of banks involved in the deal can influence the deal's risk. For instance, if we have a deal involving a broad number of banks it might lower the spread, because investors tend to give less risk to a deal when it has certification from more agents. Previous analyses (Vink and Thibeault, 2008) found that credit spread and number of lead managers are significantly, negatively related for

MBS, while for ABS and CDOs they have an insignificant relationship. Therefore, the expectation is to have a negative influence of the variable number of banks on the spread (Nadauld and Weisbach, 2012; Sorge and Gadanecz, 2008a).

Loan to Value (Tranche to Transaction)

The Loan to Value is a measure that represents the ratio between the tranche size and the transaction size. It is gotten by dividing the tranche size over the transaction size. For AS bonds higher this ratio, lower the credit spread. As mentioned before, an example of a credit enhancement strategy consists in the creation of a credit risk mitigation instrument in which the lowest rating classes, the most junior ones (B, C, and D), provide credit support to the highest rating class, the most senior one (A), in order to reduce the risks transferred to investors. Thus, tranching is a pillar of the securitization process.

Tranche Size

The tranche size represents the tranche amount in USD. Maris and Segal (Maris and Segal, 2002) proved that tranche size influences negatively the CMBS (Commercial Mortgage-Backed Securities) credit spread. Additionally, the previous literature (Buscaino, Caselli, Corielli, and Gatti, 2012; Cuchra, 2004; Sorge and Gadanecz, 2008; Vink and Thibeault, 2008) also corroborates the statement, in which, tranche size has a negative impact on the credit spread.

Transaction Size

This variable represents the amount in US dollars of the whole transaction. We expect à-priori that larger transactions are negatively correlated with credit spread, since higher amounts issued, require more procedures and certification, being riskier.

Number of tranches

This variable gives the number of tranches per transaction. Having the transactions divided in tranches allow us to study the impact of tranching on the credit spread. As stated by Vink and Thibeault (Vink and Thibeault, 2008), "Tranching could allow the issuer to take advantage of market factors such as greater investor sophistication and heterogeneous screening skills related to asymmetric information". Additionally, Firla-Cuchra and Jenkinson (Cuchra and Jenkinson, 2005), found a significant and negative relationship between the number of tranches and the credit spread at launch. Therefore, a negative coefficient for this variable is predicted.

Fixed rate

The dummy variable fixed rate is one if the bond is a fixed rate bond, and zero otherwise. With fixed rate issuances the bond coupons are not affected by the market interest rates, except if they are callable bonds and the issuer decides to call them back in case of lower interest rates. The expectation of the issuer by issuing at fixed rate is to protect itself against an increase in interest rates. Henceforth, the issuer has to add a premium to borrow funds at fixed rate, vis-à-vis with floating rate issuances, so the spread for fixed rate issuances should be higher. Empirically, Sorge and Gadanecz (Sorge and Gadanecz, 2008) found a significant discount in the pricing of floating rate bonds, which can be correlated with the insurance premium that yields for fixed rate offers against future interest rate fluctuations.

Currency risk

This is another dummy variable that takes the value one if the deal's tranche currency is different from the currency of the issuer and zero otherwise. Like it is expected à-priori, and corroborated by Vink and Thibeault (Vink and

Thibeault, 2008) securitized bond issues exposed to currency risk have higher spreads than issues without it.

Callable

Callable represents a dummy variable that is equal to one if the bond has a call option embedded and zero otherwise. The callability of a bond gives the issuer the right to redeem the bond at some point before it reaches the maturity date. The call price normally exceeds the issue price. As that being said, the credit spread should reflect this option, and so, the callability of a bond should be positively correlated with the credit spread (Fabozzi and Kothari, 2007).

3 Univariate Analysis

3.1 Market Evolution

Our sample of AS bonds, more specifically MBS, ABS and CDOs was extracted from DCM analytics with the following criteria:

- AS bonds issued in the European Union, in the UK and in the US;
- Issued between January 1st, 2000 and December 31st, 2016;
- Not issued by state-owned entities

After applying these criteria, we excluded perpetual maturity bonds, as well AS bonds issued by nonfinancial firms. Finally, we excluded outliers: 0.5% of the lowest and highest spreads and tranche sizes were excluded.

After applying these screens, we are able to analyse 24,727 deals, corresponding to 84,580 tranches, worth $ 17,514 billion. We next describe further our sample.

Since the purpose of this dissertation is to compare the pricing of AS bonds in the U.S. vis-à-vis W.E., the majority of the graphs show the differences between these two regions. However, as stated by the literature, the U.S. market is broader and larger than any other country or region in the world. By contrast the W.E. market is divided in Eurozone and the UK, and we can even go further and split the Eurozone in several countries. Thus, we also created some charts in order to show the differences within the W.E. market.

Graphs displayed in figures 3.1.1 and 3.1.2, present the number of deals by region (U.S. vs W.E.) and security type (MBS, ABS, and CDO) throughout the period of analysis (2000 to 2016), as well as the amount issued by region and security in the same period, respectively.

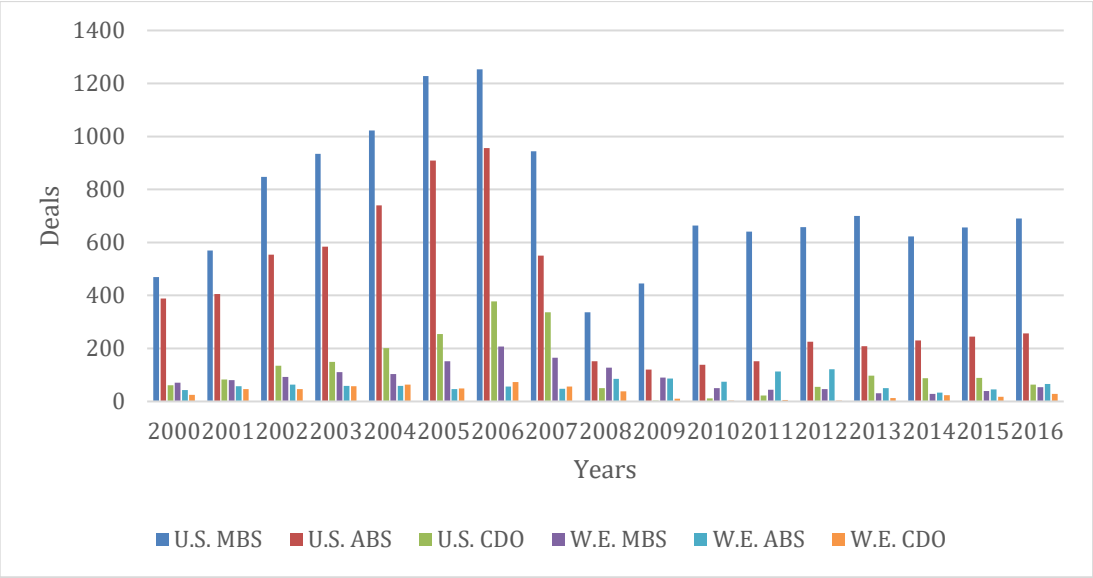

Figure 3.1.1.: Number of deals per security and region

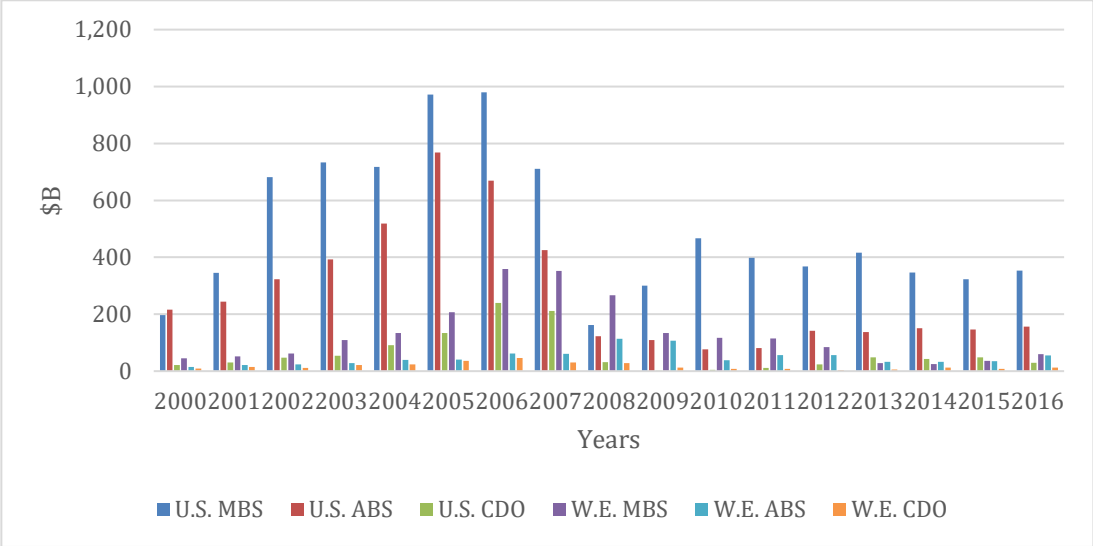

Figure 3.1.2.: Amount issued in $B by security and region

As expected, the U.S. market dominates in terms of number and amount. Our sample is in line with the previous literature findings. Also, we can see that between 2002 and 2007 the securitization market achieved its peak. Once more, this is in line with the literature about the topic that evidences the period after the introduction of the euro (2000) until 2007 as the "golden age" of securitization.

In terms of securities issued we can conclude that in the U.S., MBS leads not just in number of deals but also in amount issued followed by ABS and CDOs.

However, in W.E. despite that the 2000-2009 period MBS represents the most issued AS bond type by number, from 2010 to 2016 ABS reveals to be the most issued AS bond. CDOs, as for the U.S. market, is the least issued security in our sampling period. Looking now at the amount issued in the W.E. market, it is possible to state that MBS dominates for all the years except in 2013 and 2014, in which ABS is the most issued security for this market. Again, CDOs is the security type with the lowest issuance amount in Europe.

The next two charts, available in figures 3.1.3 and 3.1.4 present the same information as the previous two ones but now, they highlight the differences between the Eurozone and the U.K. markets. Both markets belong to the W.E. region.

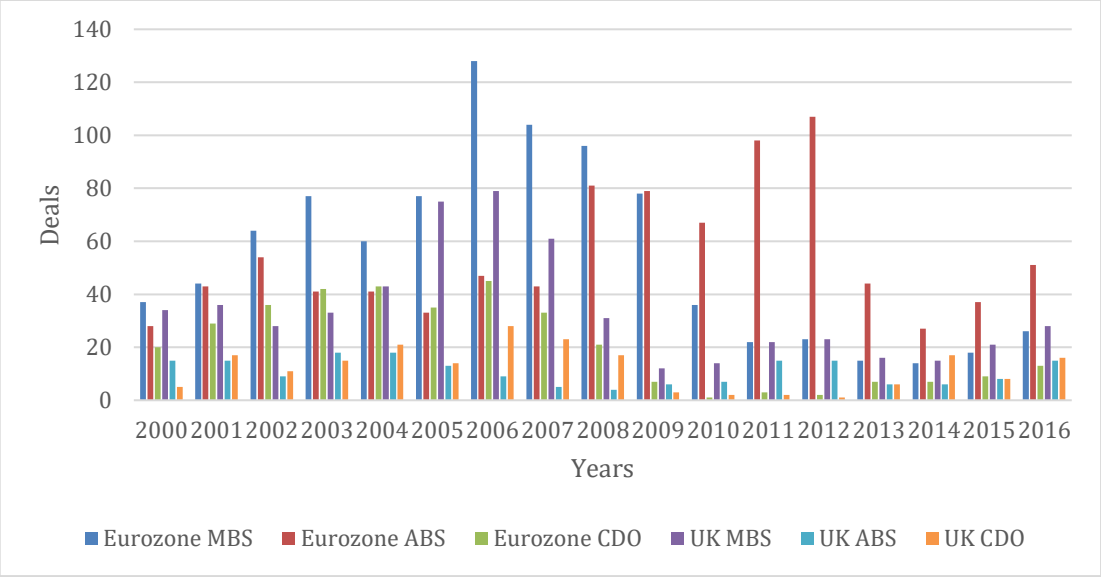

Figure 3.1.3.: Number of deals per security in W.E.

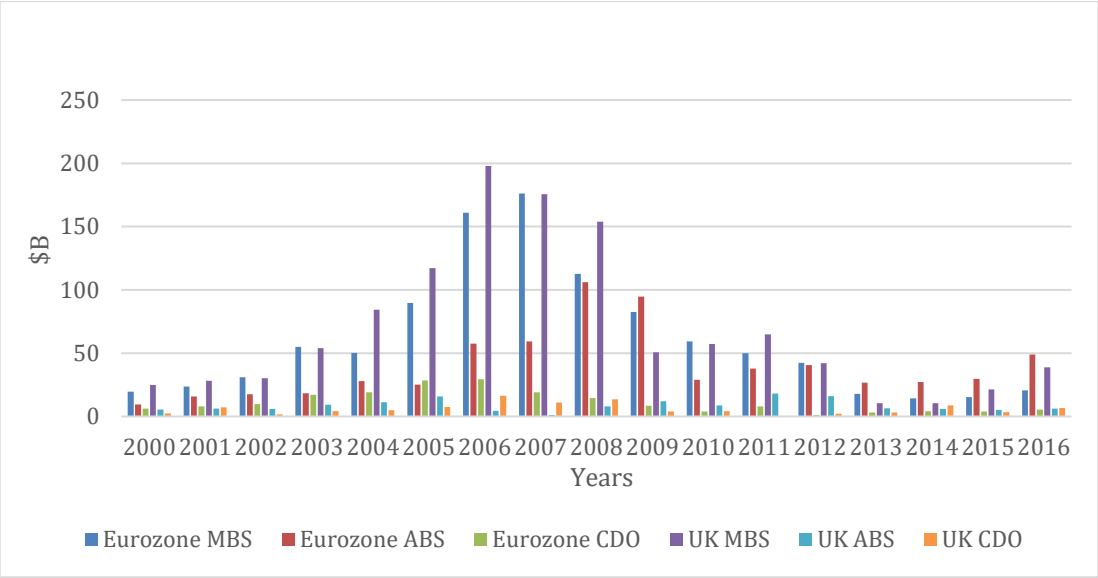

Figure 3.1.4.: Amount issued per security in W.E. in $B

The above two graphs in contrast to the U.S. market, evidence that in the Eurozone and in the UK the securitization market grew in the years of 2007 and 2008, just having a downturn in 2009 and afterwards.

The main evidences that we can point out regarding graphs from figures 3.1.3 and 3.1.4 are:

- in both the UK and Eurozone, MBS is the most issued security in number of deals as well as in issuance amount throughout all the period of analysis;
- after 2008, the most issued securities by Eurozone banks are ABS. This is related to the launch of the ABSPP programme by the ECB in 2014 after the CBPP programmes, that stimulate the issuance of ABS.

Table 3.1 shows the number of deals and amount issued in millions of dollars per country in the W.E. market between 2000 and 2016

Country	Deals	Amount issued $M
UK	961	1,410,110
Germany	542	313,444
France	233	112,377
Italy	399	329,484
Greece	37	56,674
Portugal	86	78,876
Spain	465	565,014
Austria	17	5,617
Belgium	25	11,959
Cyprus	1	1,015
Finland	8	5,131
Ireland	90	77,823
Latvia	1	64
Lithuania	1	46
Luxembourg	17	5,238
Netherlands	271	320,436

Table 3.1.: Number of deals and amount issued in $M per country in W.E.

Analysing the table, it is possible to conclude that the UK market dominates in terms of volume issued within the analysed period of this sample, with $1,410,110 issued of ABS, MBS and CDOs. Spain is the first country in the Eurozone and the second in Europe (after the UK) with more AS securities issuances in a total amount of $565,014. Finally, to finish the top three countries in Europe with more dollar's issuances we have Italy with an issuance amount of AS bonds of $329,484 between 2000 and 2016.

Finally, graphs presented in figures 3.1.5 and 3.1.6 show AS bond issuances per investment-grade rating class. In fact, our sample is mainly composed by tranches with AAA rating, because in a typical AS transaction, AAA tranche has a tranche to transaction ratio between 80% and 90%.

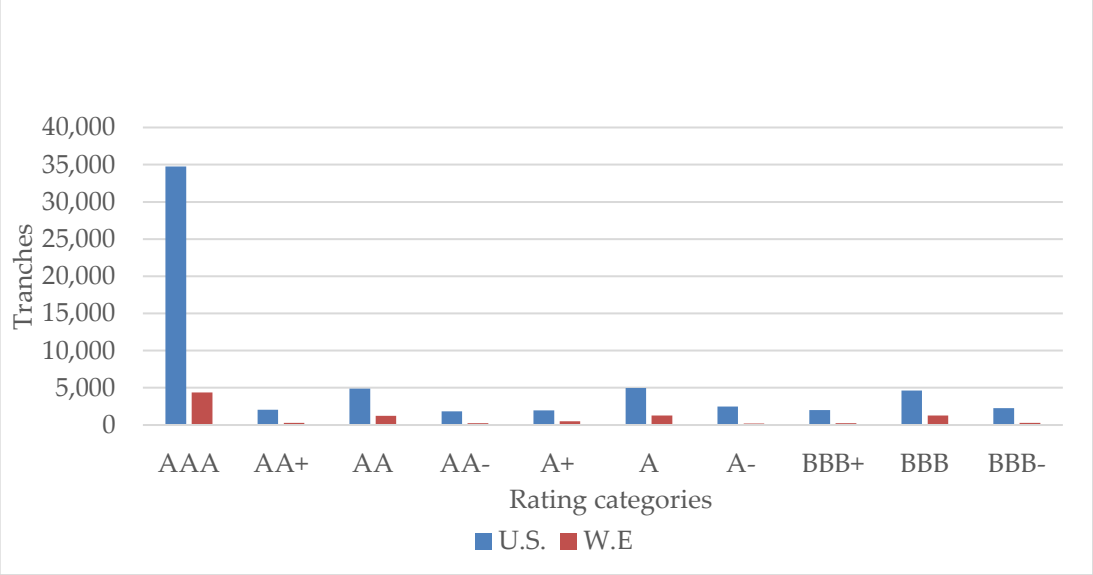

Figure 3.1.5.: Number of tranches issued by investment grade rating categories per region

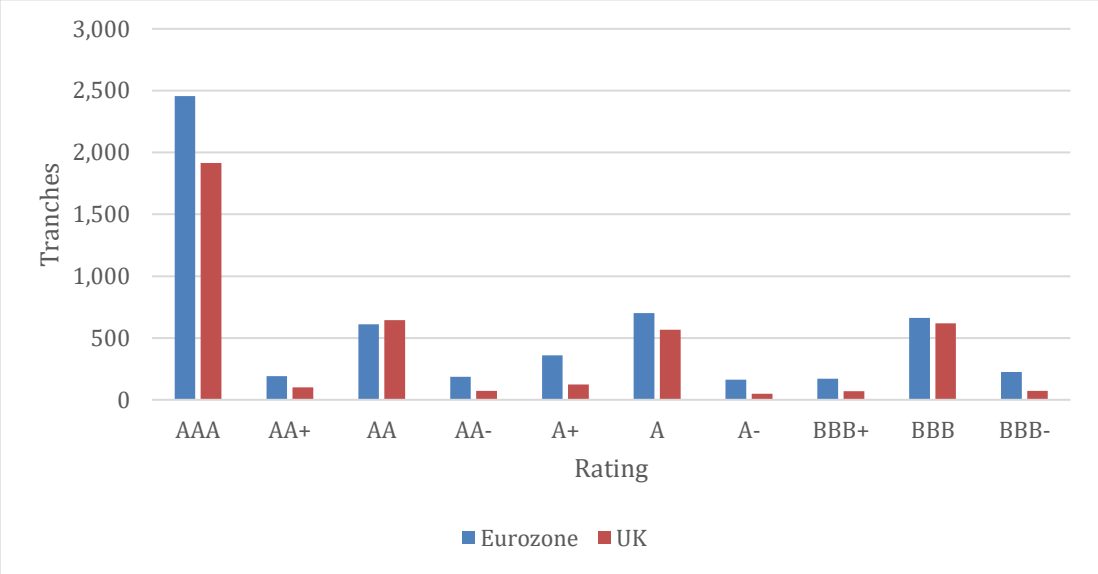

Figure 3.1.6.: Number of tranches issued by investment grade rating categories in W.E.

3.2 Credit Spread Analysis

As we want to examine how credit spreads and pricing characteristics compare between AS bonds issued in the U.S. versus W.E. as well as the common pricing determinants, we selected a sub-sample of bonds with available information on credit spreads.

The credit spread is computed as the difference between the AS bond Yield to Maturity (YTM) and the government yield with the same maturity at the time of the issuance, the so-called option adjusted spread

As previously mentioned, to ensure comparability of spreads at issuance we converted floating rate bonds to fixed rates using fixed-for-floating rate swaps. This conversion was implemented individually for each bond, using the appropriate quote for the swap matching the maturity of the bond and taken at the issuance date. We also consider the specific interest rate market (EUR Libor, USD Libor and GBP Libor) and even different reference rates within the same market (USD Libor 1M, USD Libor 3M, USD Libor 6M, and USD Libor 12M).

Finally, tranches with no information about the rating were deleted. These procedures yielded a final sample of 66,354 tranches with the following information:

Rated	Not Rated	U.S.	W.E	Floating rate	Fixed rate
64,984	1,370	**55,127**	11,227	**46,119**	20,235
98%	2%	**83%**	17%	**70%**	30%

Table 3.2.: Tranches' details in Credit Spread Sample

From the analysis of the above table is possible to conclude that our credit spread sample is mainly composed by rated U.S. floating rate tranches.

Figure 3.2.1 presents the average credit spreads per year, per region and per security type.

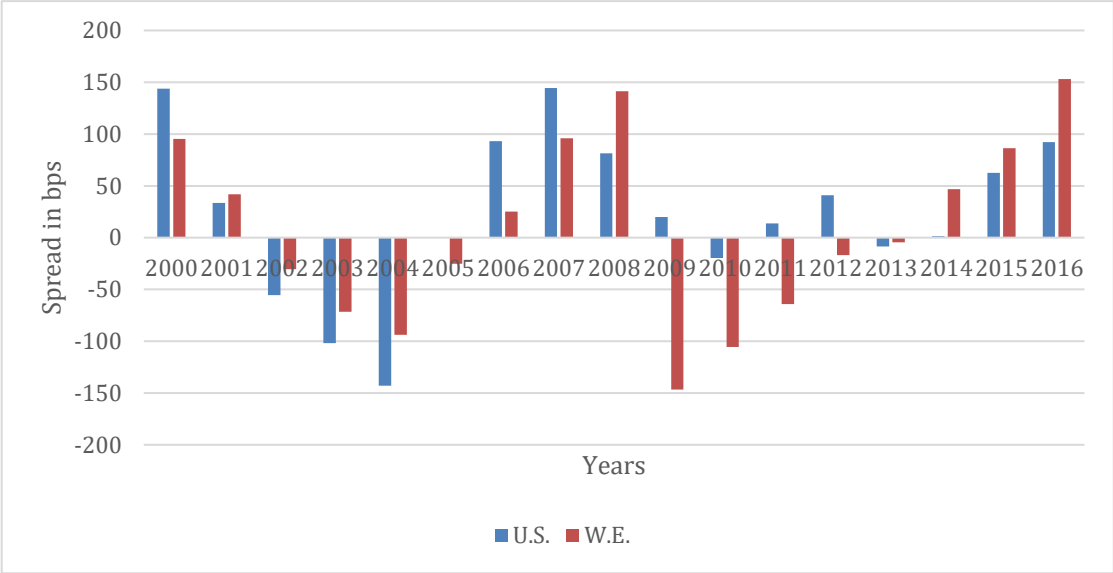

Figure 3.2.1.: Average credit spread in bps by region (U.S. and W.E.)

If we analyse the global market as a whole, the period in which the credit spread for AS bonds was lower coincides with part of the period where we had the most issued amount and number of deals, that is from 2002 to 2005. Additionally, if we don't consider 2016, as expected in 2007 and 2008 (financial crisis years) the credit spreads achieved its peak, resulting in a premium demanded by investors to buy these risky securities. One reason that can explain the increase in the credit spreads for AS bonds specially in Continental Europe is the end of the CBPP and ABSPP programmes taken by ECB. With the decrease in the demand for these securities, the pricing tends to increase.

Furthermore, comparing the spreads of AS Bonds issued in the U.S. and W.E. we can realise that from 2000 to 2012 the pricing of these operations was lower in W.E. with exception to the years of 2001 and 2008 (financial crisis), and was

higher in this region after 2012 vis-à-vis with the U.S. As a matter of fact, investors perceived more risk in the U.S. at the time.

The previous chart presented an initial comparison between the two markets under analysis during this study, although it lacks in showing the spread by security type. Since this study analyses three types of securities it is also important to figure out the differences in pricing between the securities throughout our period of analysis. Thus, figure 3.2.2 allows us to observe that.

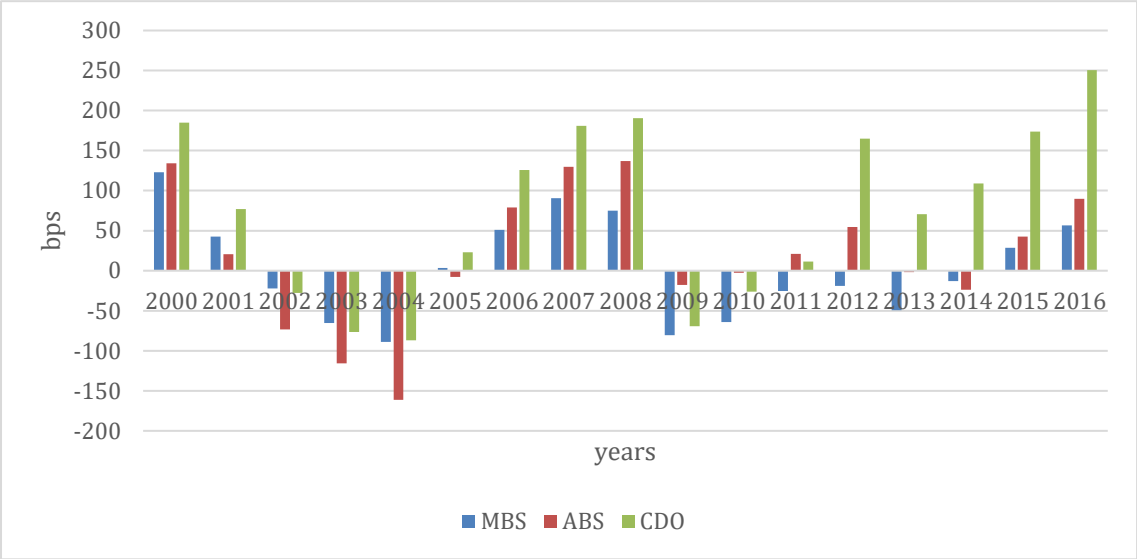

Figure 3.2.2.: Average credit spread by security from 2000 to 2016

The first thing that catches the attention is that this graph has a very similar pattern to the previous one. Indeed, we are analysing the same variable (credit spread) but this time in relation to security type.

In fact, as it was expected from the extant literature, CDOs are the security class with higher spreads, especially during crisis period (2007-2016).

Comparing now ABS with MBS it is possible to perceive that between 2001 and 2005 ABS had a lower spread than MBS, but in 2000 and after 2005 MBS spreads were lower than ABS ones.

The main goal of this research is to compare the U.S. market with the W.E. one, but as we all know the U.S. is a country and W.E. is a region with several countries. As it was done in market evolution section, the split of W.E., in this chapter is also important to divide the W.E. market in Eurozone and the U.K. As it was mentioned and showed before there is a considerable difference between these two markets, that can also be analysed in terms of credit spread.

Hence, the following chart, figure 3.2.3, shows evidence on the evolution from 2000 to 2016 of credit spreads between the U.K. and the Eurozone.

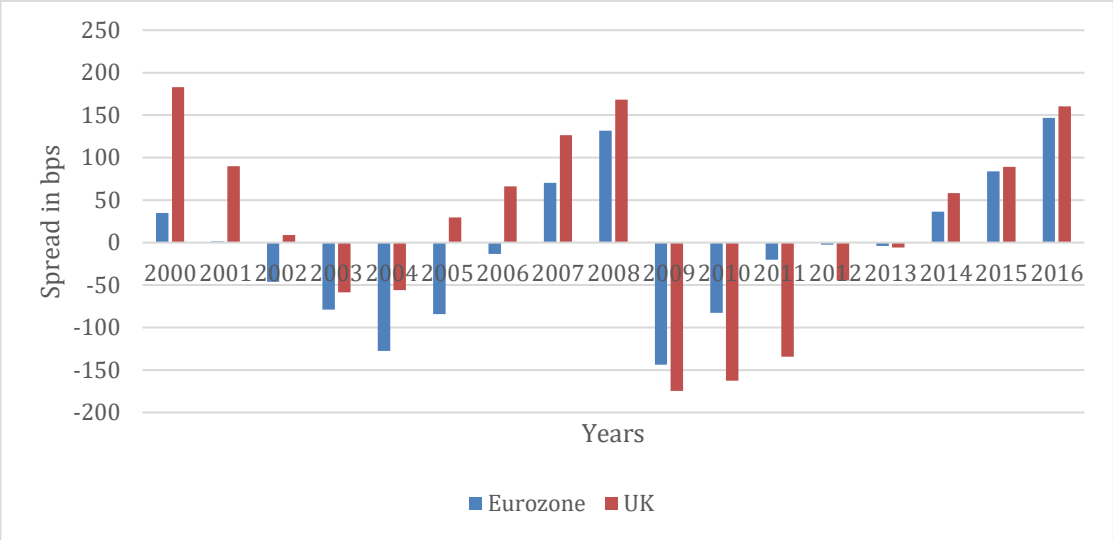

Figure 3.2.3.: Average credit spread in bps by region (U.K. and Eurozone.)

In a first look, we can say that in the U.K. the spread for AS bonds is higher than in the Eurozone countries with the exception of the period from 2009 to 2013. Indeed, the Eurozone faced a very difficult period after the 2008 financial crisis, having a sovereign debt crisis. That led to the launch of three debt purchasing programmes by the ECB.

Another important effect that we intend to study is the impact of the 2007-2008 financial crisis in the credit spread. Henceforth, the graph presented in figure 3.2.4 points out the differences in pricing before and after Lehman Brother's bankruptcy date for the U.S. and W.E.

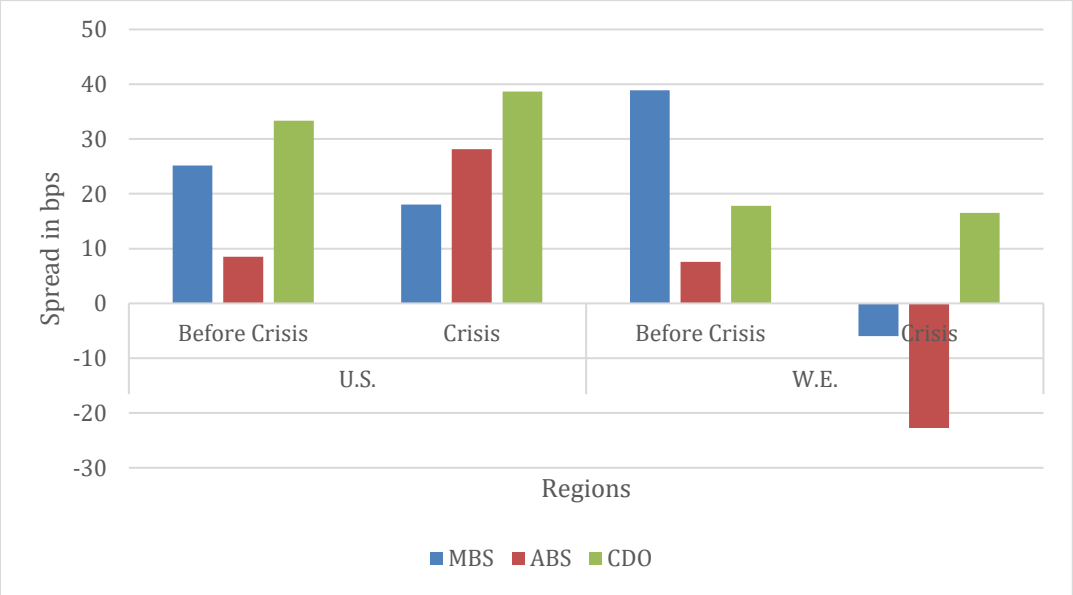

Figure 3.2.4.: Average credit before and during crisis in the U.S. and W.E.

On the one hand, in the U.S. the credit spread for CDOs and ABS increases during crisis, whereas for MBS it actually decreases.

On the other hand, if we look to the European continent we can see a reduction of the credit spreads across all security types, comparing the two analysed periods.

Finally, as we have seen before in the market evolution section, the sample used to conduct the empirical analysis is mainly composed by AAA rating tranches. Therefore, in this smaller sample (used to compute credit spread) we have 64,984 rated tranches, being 96% of those tranches within investment grade class and 52% have triple A rating. Thus, the next chart presents the credit spread across the different rating classes within investment grade rating class.

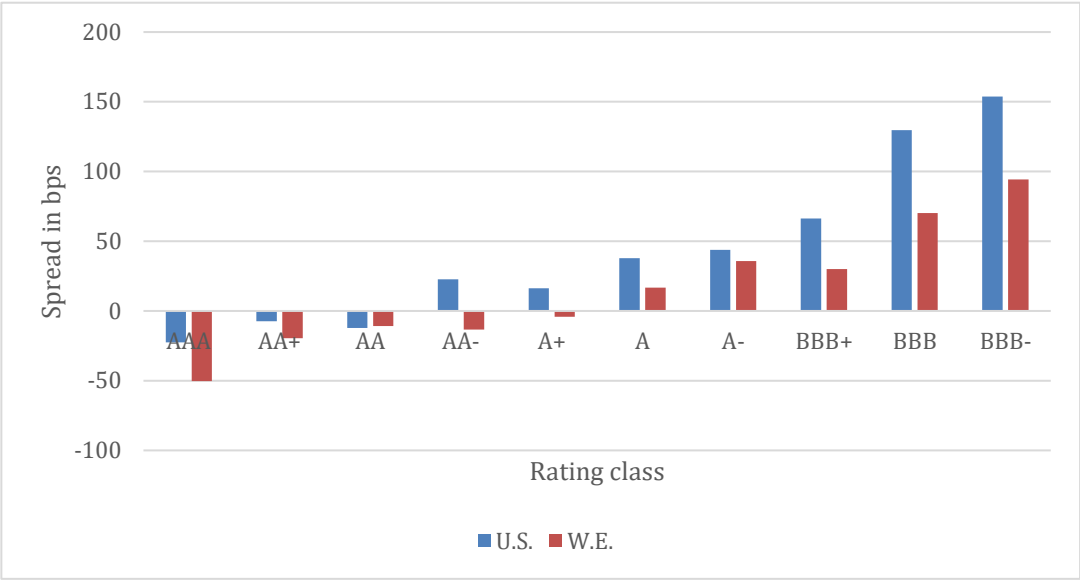

Figure 3.2.5.: Average credit spread om the investment grade rating class between the U.S. and W.E.

Analysing the graph is evident the gradually increase of the credit spread as the rating deteriorates. As expected, according to the previous literature, higher the credit risk, leads to an increase in the credit spread.

3.3 Descriptive Statistics

The following tables provide descriptive statistics for the core explanatory variables of our models as well as for our dependent variable, the credit spread. Bivariate comparisons for all the variables analysed were conducted, using the Wilcoxon rank-sum test for continuous variables and the Fisher's exact test for discrete variables

Table 3.3 1.: Descriptive Statistics for tranches in the U.S. and W.E.

Variable of interest	U.S. (*N=55,127*)		W.E. (*N=11,227*)		
Continuous variables: t test	**Mean**	**Median**	**Mean**	**Median**	
Credit spread (bps)	19.55	35.15	15.49	0.52	**
Credit rating [1-22 weak]	3.52	1.00	4.60	3.00	***
Maturity (years)	24.39	30.00	27.65	30.00	***
Number of banks	2.20	1.00	2.67	2.00	***
Transaction size ($ million)	823.18	679.70	1,870.34	851.34	***
Tranche to transaction (%)	29.70	8.00	24.55	8.01	***
Tranche size ($ million)	202.04	51.00	270.93	62.75	***
Number of tranches	8.99	8.00	6.33	6.00	***
Country risk [1-22 weak]	1.00	1.00	1.59	1.00	***
Dummy variables: Fisher's exact test (p-values)	**% of total**	**Number (D=1)**	**% of total**	**Number (D=1)**	
Fixed rate issue	35.41	19,520	6.37	715	***
Currency risk	0.94	518	21.23	2,383	***
Callable	65.97	36,367	54.79	6,151	***
U.K. borrowers	-	-	41.09	4,613	***

Notes: This table presents the mean and the median for our core variables. Also, the tests for similar distributions in bond characteristics across samples are the Wilcoxon Rank-Sum test for continuous variables and the Fisher's exact test for discrete variables. * indicates significant difference at 10% between the U.S. and W.E. samples; ** indicates significant difference at 5% between the U.S. and W.E. samples; and *** indicates significant difference at 1% between the U.S. and W.E. samples.

Table 3.3.1 shows that the average credit spreads for all types of securities are economically and statistically (at 5% significance level) lower for issuances made in W.E. (15.49 bps in W.E. versus 19.55 bps in the U.S.). As a matter of fact, this is in line with the second hypothesis in which is intended to corroborate the fact that the credit spreads are higher in the U.S. rather than in W.E. Additionally, these credit spreads difference highlights what was presented in the Credit

Spread Analysis section. We can conclude that while the credit spread is lower on average for issuances made in W.E. the credit rating is statistically worse for issuances made in this region (4.6 in W.E. versus 3.52 in the U.S.). Though, investors perceive the issuances in the U.S. less risky if we look at the rating, but penalize the issuances made in the U.S. in terms of pricing.

An average AS bond issuance matures in 27.65 years in W.E. and in 24.39 years in the U.S. According to the literature findings, the maturity of the securities issued frequently matches the maturity of the assets used as collateral, which normally have long maturities.(Vink and Thibeault, 2008)

If we look now at the average number of banks involved in the operation, the average values for the U.S. are very similar for the ones in W.E., 2.2 and 2.67, respectively. As previously mentioned, the market sees as safer an issuance with more banks participating on it. Although, taking into account that our sample is mainly composed by investment grade tranches and the majority of them being AAA rating we can conclude that the market does not need to see a high number of banks involved in the operation, in order to increase the level of certification of the transaction.

An average transaction in the US involves a $823.18 million issuance, lower than the $1,870.34 million, the average value for a transaction in W.E.

Related with transaction size are tranche to transaction and tranche size. The first one is on average, higher in the U.S. (29.70%) than in W.E. (24.55%). The average tranche size is $ 270.93 million in W.E. and $ 202.04 million in the U.S. Additionally, the number of tranches is, on average, 8.99 in the U.S. and 6.33 in W.E. Putting together these three analysis it is possible to conclude that tranching reduces the pricing of the operation and banks benefit from tranching in a large degree.

To end the continuous variables analysis, we also included the country risk. In fact, this value yields always 1 for the U.S. since it was repeatedly the same value

across years for this country. In W.E., the average country risk is 1.59 in our sample.

Analysing the discrete variables, we can start by verify that in the U.S. 35.41% of the issued tranches are fixed rate, whereas in W.E. only 6.37% have a fixed coupon. Clearly the biggest portion of issuances were floating rate ones, which leaves investors with interest rate risk exposure.

Currency risk shows that just a very inexpressive part of AS bonds issuances in the U.S. were affected by currency risk (issuances in another currency besides USD), 0.94%. Nonetheless, in W.E. we can see that 21.23% of the issuances were made in another currency than Euro in the Eurozone countries or GBP in the U.K.

The callability of an AS bond was also taken into consideration, and in fact, our results show that in the U.S. 65.97% of the bonds had the possibility to be called back, while in W.E. 54.79% had that option embedded. In reality, this option allows the issuer to call back the bonds in the case of a decreasing in the interest rates, in which normally the issuer redeems the initial bonds and issues new ones with lower interest rates, beneficiating from a reduction in the cost of funding. As it is understandable by the numbers, not just in the U.S. but also in W.E., the majority of the issuances had the callability option available.

Finally, the last dummy variable under analysis is U.K. Borrowers that catches the percentage of issuances made in the U.K., within W.E. region. U.K. issuances represents 41.09% of the total amount of deals made in W.E.

Table 3.3.2 shows differences between our core variables in relation to security type (MBS, ABS, or CDOs) and region (U.S. or W.E.).

Table 3.3.2.: Descriptive Statistics for ABS, MBS, and CDOs in the U.S. and W.E.

	U.S.						W.E.						
Variable of interest	MBS		ABS		CDO		MBS			ABS		CDO		
	(N=13,440)		(N=32,927)		(N= 8,760)		(N=6,501)			(N=2,526)		(N=2,200)		
Continuous variables: t test	Mean	Median	Mean	Median	Mean	Median	Mean	Median		Mean	Median	Mean	Median	
Credit spread (bps)	13.40	37.95	2.90	22.74	91.58	84.91	-0.29	-6.90	***	10.09	-2.10	** 68.35	26.16	***
Credit rating [1-22 weak]	1.60	1.00	3.87	2.00	5.15	4.00	4.50	3.00	***	4.38	3.00	*** 5.16	3.00	
Maturity (years)	25.87	30.00	24.61	30.00	21.31	14.00	34.60	36.00	***	16.98	12.00	*** 19.37	14.00	***
Number of banks	1.84	1.00	2.61	2.00	1.21	1.00	3.12	2.00	***	2.44	2.00	*** 1.63	1.00	***
Transaction size ($ million)	725.93	599.68	929.51	798.97	572.75	461.53	2,629.49	1,226.65	***	987.95	726.61	*** 640.21	455.39	***
Tranche to transaction (%)	73.39	100.00	15.36	4.87	16.57	6.17	20.44	6.37	***	38.92	19.11	*** 20.23	7.36	***
Tranche size ($ million)	492.85	316.72	114.09	34.30	86.45	30.00	313.12	73.18	***	299.02	90.26	*** 114.02	33.12	***
Number of tranches	4.57	1.00	11.23	12.00	7.35	7.00	7.23	6.00	***	3.87	3.00	*** 6.53	7.00	***
Country risk [1-22 weak]	1.00	1.00	1.00	1.00	1.00	1.00	1.39	1.00	***	2.00	1.00	*** 1.71	1.00	***
Dummy variables: Fisher's exact test (p-values)	% of total	Number (D=1)	% of total	Number (D=1)	% of total	Number (D=1)	% of total	Number (D=1)		% of total	Number (D=1)	% of total	Number (D=1)	
Fixed rate issue	73.80	9,919	27.09	8,920	7.79	682	2.46	160	***	13.14	332	*** 10.14	223	***
Currency risk	0.29	39	0.23	76	4.62	405	20.89	1,358	***	8.95	226	*** 36.36	800	***
Callable	53.43	7,181	83.71	27,563	18.49	1,620	58.71	3,817	***	50.99	1,288	*** 47.55	1,046	***
U.K. borrowers	.	.	.	.	.	.	51.33	3,337	***	17.62	445	*** 37.77	831	***

Note: This table presents the mean and the median for our core variables. Also, the tests for similar distributions in bond characteristics across samples are the Wilcoxon Rank-Sum test for continuous variables and the Fisher's exact test for discrete variables. * indicates significant difference at 10% between the U.S. and W.E. samples; ** indicates significant difference at 5% between the U.S. and W.E. samples; and *** indicates significant difference at 1% between the U.S. and W.E. samples.

The dependent variable credit spread shows a mean of 13.40bps for MBS, 2.90bps for ABS and 91.58bps for CDOs in the U.S. Indeed, CDOs are the security type with a higher pricing, being in fact, the riskiest security type. In W.E., we can also see that the average value for credit spread on CDOs is 68.35bps, by far the biggest if we compare to the average credit spread of -0.29bps for MBS, and 10.09bps for ABS. Hence, in W.E. MBS turns out to be the less costly security rather than ABS in the U.S. and in general, as we have concluded in the previous table the credit spread in W.E. is lower than in the U.S.

Credit rating is higher for CDOs, in both the U.S. (5.15) and W.E. (5.16). For MBS, we have an average value of 1.60 in the U.S. and a significantly higher one for that kind of security in W.E., 4.50, on average. Moreover, ABS average credit

rating is also lower in the U.S., 3.87, rather than in W.E., 4.38. As a matter of fact, by analysing the first two variables we can verify that even in the U.S. the credit spread being higher for MBS and CDOs, the credit rating is in fact lower for this kind of securities. Thus, it is evident that when analysing the rating for these securities the rating agencies consider W.E. riskier for AS bonds issuances.

Looking at maturity of the AS bonds, we can verify that in the U.S. the maturity for MBS is on average lower than in W.E., 25.87 years, and 34.60 years, respectively. However, for ABS and CDOs the maturity in W.E. is lower than the one in the U.S. For instance, ABS have an average maturity of 24.61 years in the U.S. and 16.98 years in W.E., while CDOs maturity is, on average, 21.31 years in the U.S. and 19.37 years in W.E.

Regarding number of banks our results show that for MBS and CDOs the average number is higher in W.E., rather than in the U.S, being the opposite verified for ABS. Essentially, the average number of banks involved in an MBS transaction in the U.S. is 1.84, different from the 3.12 in W.E. In CDOs this number turns out to be 1.21 in the U.S. and 1.63 in W.E. Finally, for MBS we have an average of 2.61 number of banks running the operation in the U.S., contrasting with the 2.44 in W.E.

Paying attention to the transaction size we find out that in W.E. the average transaction size in million dollars is higher for all types of securities, if we compare with the U.S. market. In the U.S. an average transaction size for MBS, involves $725 million, whereas in W.E. this value increases for $2,629 million. For ABS, the average value is $930 million in the U.S., smaller than $988 million in W.E. Finally, for CDOs, an average transaction reaches the value of $573 million in the U.S., jumping to $640 million in W.E.

Regarding tranche to transaction, MBS is the security type with the highest value for both regions, yielding an average of 73.39% in the U.S. and 20.44% in W.E. With lower values for ABS, averaging 15.36% in the U.S. and 38.92% in W.E.,

and for CDOs, 16.57% in the U.S. and 20.23% in W.E., we can say that the distribution of the total transaction amount per tranche is more split in these past two security types.

A variable that is related to tranche to transaction is the tranche size, that in fact, reveals the same pattern as the previous described variable. For instance, MBS continues to be the security type that leads in the amount per tranche. An average tranche has an amount of $493 million and $313 million in the U.S. and W.E., respectively. For ABS and CDOs we can verify that they have a higher tranche size value in W.E. rather than in the U.S.: ABS with an average tranche size of $299 million in W.E., higher than $114 million in the U.S; and CDOs with $114 million in W.E., also above $86 million in the U.S.

Considering the variable number of tranches, it is possible to see that in the U.S., ABS lead with an average of 11.23 tranches per transaction, whereas in W.E., MBS are the security type that assumes the highest value, with on average 7.23 tranches per transaction. With respect to MBS and CDOs in the U.S. the values are on average, 4.57 and 7.35, respectively. Differently, in W.E. the average number of tranches is 3.87 for ABS and 6.53 for CDOs.

To end the analysis for the continuous variables, the country risk in W.E. is on average 2 for ABS, being the security type with more exposure to this factor. Subsequently, CDOs come on the second position, with an average country risk of 1.71, followed by MBS with a value of 1.39.

Starting our analysis for the dummy variables, we have a clear evidence that in the U.S. for MBS and ABS the use of fixed rate issuances is more common than in W.E, being the opposite true for CDOs. Looking at the numbers, it is possible to perceive that 73.80% of the issuances in the U.S. for MBS are fixed rate (the vast majority), different from 2.46% in W.E., where the clear preference of the issuers is floating rate. Regarding ABS, in the U.S. we have 27.09% of the issuances being fixed rate and 13.14% in W.E. With no doubt the preference here is to issue

floating rate notes in both regions. We can verify the same preference for CDOs, in which the fixed rate issuances get the value of 7.79% in the U.S. and 10.14% in W.E.

The currency risk, if we just take into consideration the U.S. market is almost null, 0.29% of issuances made in a different currency than US dollars for MBS, 0.23% for ABS, and 4.62% for CDOs. If we look to W.E. region, the currency risk impact is higher for all types of securities. For MBS, we get a value of 20.89% 8.95% for ABS and 36.36% for CDOs.

Regarding callability, both in the U.S. and W.E., for MBS and ABS the majority of the issuances were callable. However, for CDOs, we can say the opposite. For instance, 53.43% of MBS issuances in the U.S. were callable, and 58.72% in W.E. For ABS we see the values of 83.71% and 50.99%, for the U.S. and W.E., respectively. Finally, for CDOs the value is below fifty percent, in fact 18.495 in the U.S. and 47.55% in W.E. Clearly the last-mentioned security type is different from the two others. We have verified before that the market considers CDOs has the riskiest security type among the three analysed ones and also the issuers do not consider a benefit to call back CDOs in a scenario of interest rate decreased to issue again with lower interest rates.

The last variable U.K. Borrowers allows us to perceive that in our sample MBS issuances in the U.K. represent 51.33% of the issuances made in W.E. region. ABS issued in the U.K., represent 17.62% of this type of security issuances in W.E. Finally, CDOs issuances in the U.K. stand for 37.77%.

Table 3.3.3 show how core variables change between pre-crisis and crisis (2007-2008 financial crisis and the subsequent sovereign debt crisis) periods per region of issuance (U.S. versus W.E.) and security type (ABS, MBS or CDO).

Table 3.3.3.: Descriptive Statistics for ABS, MBS, and CDOs in the U.S. and W.E. before and crisis

	U.S.												W.E.											
	MBS				ABS				CDO				MBS				ABS				CDO			
Continuous variables: t test	Number	Mean	Median	T Test	Number	Mean	Median	T Test	Number	Mean	Median	T Test	Number	Mean	Median	T Test	Number	Mean	Median	T Test	Number	Mean	Median	T Test
Credit spread (bps)																								
pre-crisis	7,263.00	27.96	55.60	***	29,419.00	-1.57	22.27	***	6,948.00	80.93	79.27	***	5,047.00	12.26	8.60	***	1,232.00	19.14	2.45	***	1,678.00	33.49	-0.85	***
crisis	6,177.00	-3.71	7.60		3,508.00	40.35	24.39		1,812.00	132.44	115.99		1,454.00	-43.85	-72.43		1,294.00	1.47	-6.20		522.00	180.41	154.80	
Credit rating [1-22 weak]																								
pre-crisis	7,263.00	1.49	1.00	***	29,419.00	3.96	3.00	***	6,948.00	4.88	3.00	***	5,047.00	4.66	3.00	***	1,232.00	5.02	5.00	***	1,678.00	4.90	3.00	***
crisis	6,177.00	1.74	1.00		3,508.00	3.06	1.00		1,812.00	6.25	6.00		1,454.00	3.86	1.00		1,294.00	3.69	1.00		522.00	6.01	6.00	
Maturity (years)																								
pre-crisis	7,263.00	26.93	30.00	***	29,419.00	26.43	30.00	***	6,948.00	23.87	15.00	***	5,047.00	32.68	34.00	***	1,232.00	18.91	13.00	***	1,678.00	20.77	16.00	***
crisis	6,177.00	24.62	29.00		3,508.00	9.29	5.00		1,812.00	11.50	12.00		1,454.00	41.26	40.00		1,294.00	15.14	10.00		522.00	14.87	13.00	
Number of banks																								
pre-crisis	7,263.00	1.50	1.00	***	29,419.00	2.33	2.00	***	6,948.00	1.24	1.00	***	5,047.00	3.38	3.00	***	1,232.00	2.71	2.00	***	1,678.00	1.80	1.00	***
crisis	6,177.00	2.24	2.00		3,508.00	5.03	5.00		1,812.00	1.10	1.00		1,454.00	2.19	2.00		1,294.00	2.18	1.00		522.00	1.07	1.00	
Transaction size																								
pre-crisis	7,263.00	753.09	582.58	***	29,419.00	945.08	800.00	***	6,948.00	592.03	461.09	***	5,047.00	2,477.96	1,194.93	***	1,232.00	1,004.85	660.20		1,678.00	650.59	452.33	
crisis	6,177.00	693.99	610.03		3,508.00	798.97	764.82		1,812.00	498.84	463.80		1,454.00	3,155.48	1,358.90		1,294.00	971.86	759.99		522.00	606.87	459.60	
Tranche to transaction (%)																								
pre-crisis	7,263.00	77.45	100.00	***	29,419.00	13.22	4.02	***	6,948.00	16.84	6.07	**	5,047.00	19.08	5.69	***	1,232.00	31.64	10.42	***	1,678.00	21.27	7.87	***
crisis	6,177.00	68.62	100.00		3,508.00	33.29	20.71		1,812.00	15.52	6.39		1,454.00	25.15	9.91		1,294.00	45.86	30.00		522.00	16.87	6.36	
Tranche size ($ million)																								
pre-crisis	7,263.00	556.89	395.27	***	29,419.00	100.62	29.68	***	6,948.00	88.95	30.00	***	5,047.00	274.95	62.68	***	1,232.00	258.53	59.55	***	1,678.00	111.36	34.01	
crisis	6,177.00	417.55	255.99		3,508.00	227.09	142.36		1,812.00	76.84	31.04		1,454.00	445.62	199.48		1,294.00	337.58	143.09		522.00	122.56	30.57	
Number of tranches																								
pre-crisis	7,263.00	5.26	1.00	***	29,419.00	12.02	13.00	***	6,948.00	7.33	7.00	**	5,047.00	7.71	6.00	***	1,232.00	4.34	4.00	***	1,678.00	6.22	6.00	***
crisis	6,177.00	3.76	1.00		3,508.00	4.68	5.00		1,812.00	7.43	7.00		1,454.00	5.55	5.00		1,294.00	3.43	3.00		522.00	7.52	8.00	
Country risk [1-22 weak]																								
pre-crisis	7,263.00	1.00	1.00	-	29,419.00	1.00	1.00	-	6,948.00	1.00	1.00	-	5,047.00	1.26	1.00	***	1,232.00	1.55	1.00	***	1,678.00	1.18	1.00	***
crisis	6,177.00	1.00	1.00		3,508.00	1.00	1.00		1,812.00	1.00	1.00		1,454.00	1.87	1.00		1,294.00	2.43	1.00		522.00	3.38	2.00	

	U.S.												W.E.											
	MBS				ABS				CDO				MBS				ABS				CDO			
Dummy Variables	Number	% of total	Number (D=1)	Fisher's Exact test	Number	% of total	Number (D=1)	Fisher's Exact test	Number	% of total	Number (D=1)	Fisher's Exact test	Number	% of total	Number (D=1)	Fisher's Exact test	Number	% of total	Number (D=1)	Fisher's Exact test	Number	% of total	Number (D=1)	Fisher's Exact test
Fixed rate issue																								
pre-crisis	7,263.00	66.24	4,811	***	7,263.00	21.53	6,334	***	7,263.00	8.69	604	***	7,263.00	1.60	81	***	7,263.00	8.69	107	***	7,263.00	9.77	164	
crisis	6,177.00	82.69	5,108		6,177.00	73.66	2,584		6,177.00	4.30	78		6,177.00	5.43	79		6,177.00	17.39	225		6,177.00	11.30	59	
Currency risk																								
pre-crisis	7,263.00	0.32	23		7,263.00	0.19	56	***	7,263.00	5.00	347	***	7,263.00	24.13	1,218	***	7,263.00	10.63	131	***	7,263.00	31.47	528	***
crisis	6,177.00	0.26	16		6,177.00	0.57	20		6,177.00	3.15	57		6,177.00	9.62	140		6,177.00	7.34	95		6,177.00	52.11	272	
Callable																								
pre-crisis	7,263.00	76.29	5,541	***	7,263.00	89.86	26,436	***	7,263.00	20.85	1,449	***	7,263.00	56.41	2,847	***	7,263.00	53.65	661	**	7,263.00	43.62	732	***
crisis	6,177.00	26.55	1,640		6,177.00	32.18	1,129		6,177.00	9.44	171		6,177.00	66.71	970		6,177.00	48.45	627		6,177.00	60.15	314	
UK Borrowers																								
pre-crisis	7,263.00	-	-		7,263.00	-	-		7,263.00	-	-		7,263.00	53.77	2,714	***	7,263.00	18.59	229		7,263.00	33.02	554	***
crisis	6,177.00	-	-		6,177.00	-	-		6,177.00	-	-		6,177.00	42.85	623		6,177.00	16.69	216		6,177.00	53.07	277	

Note: This table presents the mean and the median for our core variables. Also, the tests for similar distributions in bond characteristics across samples are the Wilcoxon Rank-Sum test for continuous variables and the Fisher's exact test for discrete variables. * indicates significant difference at 10% between the U.S. and W.E. samples; ** indicates significant difference at 5% between the U.S. and W.E. samples; and *** indicates significant difference at 1% between the U.S. and W.E. samples.

The statistics for credit spread yield that for MBS issuances in the U.S. the spread was lower before the crisis period, on average 27.96 bps than during the crisis, -3.71 bps. However, this variable was on average higher during the crisis period for ABS and CDOs. ABS had an average credit spread of -1.57 bps before the crisis and 40.35 bps during, whereas CDOs had 80.93 bps and 132.44 bps, respectively. In the W.E. region we can state that for MBS, the average credit spread reduced from 12.26 bps, before the crisis period, to -43.85 bps during the crisis period. This also happened with ABS, in which the average credit spread decreased from 19.14 bps before the crisis period to 1.47 bps during the crisis period. On the contrary the average credit spread for CDOs increased in W.E. from 33.49 bps during the crisis period to 180.41 bps during the crisis period. Once more, it is possible to corroborate the analysis done in credit spread analysis section, in which is evident that CDOs are the riskiest securities, due to higher credit spreads than ABS and MBS. Moreover, for ABS and MBS the average credit spreads during the crisis period tend to be higher in the U.S. rather than in W.E., where the average credit spread for CDOs is actually higher.

Looking now at credit rating, we can see that in the U.S. for MBS and CDOs, the average credit rating increased from 1.49 to 1.74 and 4.88 to 6.25, respectively. It is understandable since the financial crisis tarnished the image of these products. On the opposite for ABS issued in the U.S. the average credit rating, actually decreased from 3.96 before the crisis to 3.06 during the crisis. In W.E. we can assist to a reduction of the average credit spread comparing the before crisis and during crisis periods. On MBS from 4.66 to 3.86 and ABS from 5.02 to 3.69. As in the U.S. CDOs suffered an increase in credit rating during the crisis period from 4.90 to 6.01. Again, CDOs represent the security type with the highest downgrade in credit rating not just in the U.S. but also in W.E. and it is possible to perceive that in the period before crisis as well as in the period during the crisis

the average credit rating is always lower in the U.S. rather than in W.E., no matter the type of security we are analysing.

In relation to maturity, on average, we can assist at a reduction of the years to maturity of an AS bond issuance. In the U.S. for all security types the time to maturity reduces comparing the before crisis period to the during crisis period. For instance, MBS reduce from 26.93 to 24.62 years, ABS from 26.43 to 9.29 years and CDOs from 23.87 to 11.50. In the W.E. region for ABS and CDOs the same thing happens, having ABS a reduction from 18.91 to 15.14 years and CDOs from 20.77 to 14.87 years. By contrast the maturity of MBS in W.E. increased from 32.68 years before the crisis period to 41.26 years during the crisis period. As previously stated by the literature, the maturity of an AS bond is normally the same as the securities used as collateral.

Turning our attention to the variable number of banks, that is seen as better if the operation is certificated by a considerable number of banks we can verify that in the U.S. for MBS and CDOs the average number of banks involved in the operation increased from the period before the crisis to the period during the crisis, from 1.50 to 2.24 for MBS and 2.33 to 5.03 in ABS. Nonetheless, for CDOs in the U.S. and for all security types in W.E. we can assist to a reduction on the average number of banks running the operation comparing the pre-crisis and post crisis periods. For CDOs in the U.S. the number decreased from 1.24 to 1.10, for MBS in W.E., from 3.38 to 2.19, ABS in W.E., from 2.71 to 2.18, and CDOs in W.E. from 1.80 to 1.07. It is also possible to conclude that before the crisis the average number of banks running the operation in W.E. was higher than the one in the U.S. for all types of securities. However, after the crisis the average number of banks involved in the operation was higher in the U.S. This can represent a factor of U.S. becoming a riskier market after the crisis and to increase the degree of certification of AS bonds issued in this country more banks were involved in the transactions.

Transaction size was also a variable to take into consideration. Here, we can observe a decrease of the amounts per transaction on average, if we compare the before crisis to the post crisis periods in both markets (U.S. and W.E.) for all types of securities, with the exception of MBS issued in W.E., in which the number increased from 2,477.96 million dollars average transaction to 3,155.48 million dollars. Furthermore, the analysis allows us to say that the transaction size amounts are always higher in W.E. rather than in the U.S. no matter the time period. Also, in the U.S., ABS are the security with the highest transaction size value, whereas in W.E., MBS turns out to be the one with the highest value, on average.

Another important variable associated with the transaction size is the tranche to transaction. Firstly, we can say that in the North American country MBS are the security type with more tranche to transaction size on average. Although, this value reduced from 77.45% to 68.62% if we compare the pre-crisis and post-crisis periods. Secondly for CDOs issued in the U.S. and W.E., we also noticed a reduction from 16.84% to 15.52% and 21.27% to 16.87%, respectively. Thirdly, for ABS issued in the U.S. and in W.E., as well as for MBS issued in W.E. we had an increase in the average tranche to transaction size, if we compare the periods before crisis and crisis. For ABS in the U.S., the value jumped from 13.22% to 33.29%. Regarding MBS in W.E. it increased from 19.08% to 25.15% and finally for ABS in W.E. the value climbed from 31.64% to 45.86%. Looking at these values we can state that in W.E. ABS are the security type with the highest tranche to transaction value.

The tranche size, both in the U.S. and W.E. is higher for MBS from 2000 to 2016. However, it is important to refer that in W.E. the tranche size values increased for all types of securities if we compare the pre-crisis and post crisis periods. This pattern is also the same for ABS issuances in the U.S., whereas for MBS and CDOs issuances in the previous mentioned country the value actually increased.

The last analysed variable related to the issuance process was the number of tranches, in which the pattern was very similar for the U.S. and W.E. Indeed, the number of tranches for MBS and ABS decreased from the pre-crisis period to the crisis period in W.E. and the U.S. Even though, for CDOs issued in the U.S. and W.E. this value increased. Before the crisis in the U.S., ABS were the security type with the highest value 12.02, on average, but after the crisis CDOs turned out to be the security type with the highest number of tranches, 7.43. In W.E., before the crisis MBS had the highest number of tranches 7.71, but as it happened in the U.S. CDOs became the security type high the highest value 7.52.

Finally, country risk was the last continuous variable analysed and of course, it does not make sense to comment the values of this variable for the U.S., since the risk of this country was always one during the entire period of analysis of this research. Although, for W.E., we can notice a boost in this value if we compare the pre-crisis and crisis periods for all types of securities. In fact, in the pre-crisis period ABS were the security type with more country risk associated, 1.55, raising to 2.43 during the crisis. However, crisis was responsible for the jump in country risk values for CDOs that went from 1.18 to 3.38. MBS also suffered a hike from 1.26 to 1.87, pre-crisis to crisis.

Turning now our attention to the discrete variables, it is important to understand the differences in the type of issuances made (fixed rate and floating rate). Thus, we can verify that just for MBS issued in the U.S. the number of fixed rate issuances (66.24%) is higher than the one of floating rate issuances, if we take into consideration the pre-crisis period. However, during the crisis period not just fixed rate MBS issued in the U.S. (82.69%) had more issuances than floating rates ones, but also fixed rate ABS issued in the U.S. (73.66%). In general, in W.E. the percentage of fixed rate issuances was very low for both periods, which also happened in the U.S. for CDOs.

Currency risk was another analysed dummy variable. In the U.S. this impact is also insignificant, because the vast majority of issuances were made in USD. Although, in W.E., since it is divided in two main currencies (Euro and GBP), and being the USD the most used currency in this kind of deals we have different values for this variable. Therefore, before the crisis the percentage of issuances made in W.E. with a different currency from the issuer country were 24.13% for MBS, 10.63% for ABS and 31.47% for CDOs. During the crisis this value decreased for MBS and ABS, 9.62% and 7.34%, respectively, though it increased for CDOs, in which the percentage turned out to be 52.11%, which means that in W.E. during the crisis period, for CDOs the majority of the issuances were exposed to currency risk.

The third dummy variable analysed was if the issuance was callable or not. Starting by the U.S. market it is possible to see that for MBS and ABS before the crisis 76.29% and 89.86% of the issuances were callable, respectively. Although the value decreased to 26.55% and 32.18% during the crisis period. If we look at CDOs, issued in the U.S., 20.85% were callable before the crisis and 9.44% could be called back during the crisis. Indeed, the callability option embedded in all kind of securities in the U.S. was not so common to use during the crisis period. In W.E., we do not have so many discrepancies if we compare pre-crisis with crisis periods, For MBS the value increase from 56.41% before the crisis to 66.71% after the crisis. For ABS it decreased from 53.65% to 48.45% and finally for CDOs it jumped from 43.62% to 60.15%. As a matter of fact, in W.E. during the crisis it became more common to issue callable MBS and CDOs than in the U.S. for the same period.

Finally, the last dummy variable analysed was UK Borrowers, that, in fact just makes sense to interpret the outcome for issuances made in the W.E., since it analyses the deals made in U.K. Regarding our sample, we can see that in the pre-crisis period 53.77% of MBS, 18.59% of ABS and 33.02% of CDOs deals were

made in the U.K., whereas during the crisis period, 42.85% of MBS, 16.69% of ABS, and 53.07% of CDOs deals were issued in the U.K.

4 Multivariate Analysis

4.1 Regression Analysis

In this section we used the sample with available information on credit spread, to perform some OLS regression analyses, with the goal to test our three hypotheses. Since this sample contains tranches some belonging to the same deal, it is expected that the standard errors between tranches are correlated. To avoid this collinearity, we decided to cluster standard errors by deal and by year. Thus, our initial core model is the following:

$Credit\ Spread_{i=}\ \alpha$ + β_1 W.E. bef crisis + β_2 W.E. crisis + β_3Rated
+ β_4 Rated Rating + β_5 Transaction Size + β_6 Tranche to Transaction
+ β_7 Callable + β_8 ABS + β_9 MBS + β_{10} Number of banks + β_{11} Currency Risk
+ β_{12} Maturity + β_{13} Subordinated Debt + β_{14} Fixed Rate + β_{15} Country Risk
+ β_{16} Risk free + β_{17} Volatility + β_{18} Government Yield + β_{19} GDP per capita
+ β_{20} Creditor Rights L + β_{21} UK Borrowers

With this core model we intend to test hypothesis one and two; i.e., to understand the differences between the pricing and pricing determinants in the U.S. vis-à-vis with W.E., including also the U.K. Borrower's variable to catch the differences of AS bonds issuances in this region. In order to test the third hypothesis, our model was split in a way to get the credit spread of ABS, MBS, and CDOs analyzed separately, and was also divided into two periods, before crisis or pre-crisis period and crisis period, with this last period including the 2007-2008 financial crisis and the subsequent European sovereign debt crisis. Again, some regression analysis were performed in order to compare these two distinct periods in the sample. In addition, some robustness checks were also

performed, such as the adjusted spread test, in which floating to fixed rate swaps were used in order to compare the spreads of the two issuance types, by converting the floating rate notes' spread in a fixed rate note's spread. Also, Laporta creditor rights scale (La Porta, Lopez ‐ de ‐ Silanes, et al., 1998) was substituted by Spamman creditor rights scale, and finally we introduced issuer parent details such as: (1) the natural logarithm of total assets (Ln TA); (2) the ratio of net loans to Total Assets (Net Loans/TA); (3) the ratio Liquid Assets to Deposits and Short-Term Funding (Liquid A/Deposits); (4) the ratio Net Loans to Deposits and Short-Term Funding (Loans/Deposits); (5) the capital ratio (Equity/TA); and (6) the cost to income (Cost to Income).

Regression Results

In order to compare W.E. and the U.S, the variables W.E. before crisis and W.E. crisis were introduced. Moreover, to catch the differences in pricing factors between the U.K., within W.E. market the variable U.K. Borrowers was also added to the models. Thus, in table 4.1.1, is possible to understand the difference in pricing factors between a model without U.K. and other with U.K.

Table 4.1 1.: Regression analysis on the impact of the independent variables on the credit spread

Dependent variable:	[1]	[2]
Credit Spread (bps)	ABS, MBS and CDO	ABS, MBS and CDO
Independent variables:		
Intercept	-190.23 ***	-12.17
	(-7.78)	(-0.44)
W.E. before crisis	26.60 ***	-45.98 ***
	(4.30)	(-6.23)
W.E. crisis	74.16 ***	20.88 ***
	(10.72)	(2.62)
Rated	-74.55 ***	-73.39 ***
	(-10.39)	(-10.10)
Rated Rating	21.10 ***	21.31 ***
	(75.31)	(76.32)
Transaction Size	0.00	0.00
	(1.51)	(1.04)
Tranche to transaction	-0.03	0.03
	(-1.14)	(1.09)
Callable	4.60 **	6.20 ***
	(2.10)	(2.91)
ABS	-56.79 ***	-57.91 ***
	(-18.83)	(-19.84)
MBS	-49.00 ***	-58.28 ***
	(-12.79)	(-15.79)
Number of banks	-3.31 ***	-3.98 ***
	(-6.34)	(-7.64)
Currency Risk	-25.49 ***	-64.88
	(-4.13)	(-10.40)
Maturity	-1.55 ***	-1.46 ***
	(-18.35)	(-17.33)
Subordinated Debt	22.27 ***	23.04 ***
	(9.65)	(9.98)
Fixed Rate	143.53 ***	146.93 ***
	(54.65)	(55.41)
Country Risk	8.54 ***	9.87 ***
	(5.72)	(6.34)
Risk Free Rate	51.20 ***	50.97 ***
	(23.72)	(23.58)
Volatility	2.50 ***	2.530 ***
	(11.56)	(11.53)
Government Yield	-7.46 **	-14.63 ***
	(-2.55)	(-4.41)
GDP per capita	0.00 ***	0.00 ***
	(11.25)	(3.83)
Creditor Rights	-4.64 ***	-18.90 ***
	(-3.33)	(-12.31)
UK Borrowers	-	130.61 ***
	-	(17.74)
Year fixed effects	Yes	Yes
Number of observations	66,262	66,262
Adjusted R^2	0.58	0.59

Note: Table 4.1.1 presents the results of OLS regression analysis of the determinants of Asset Securitization Bonds credit spread in the 2000-2016 period. Credit Spread is computed as the margin yielded (in bases points) by the security at issue above a corresponding currency treasury benchmark with a comparable maturity. W.E. before crisis is computed by giving 1 to all the observations of W.E. occurred before September 15th 2008. W.E. crisis is computed by giving 1 to all the observations of W.E. occurred before September 15th 2008. Rated takes the value 1 if the tranche is rated. Rated Rating gives the rating according to the S&P credit rating scale at the time of the bond issuance; the rating is converted as follows: AAA=Aaa=1, AA+=Aa1=2, and so on until D=22. Transaction Size gives the value of the transaction at the time of issuance in USD. Tranche to transaction is the percentage that the tranche has in the transaction. Callable takes the value one if the tranche is callable. ABS take the value one if the tranche refers to an ABS issuance. MBS takes the value one if the tranche refers to an MBS issuance. Number of banks gives the number of banks involved in the deal. Currency Risk takes the value 1 if the deal was done in a currency different from the one used in the country of issuance. Maturity is the maturity of the tranche in years. Subordinated Debt takes the value one if the debt related to the tranche is the last one to be paid. Fixed Rate takes the value one if the coupon of the tranche is a fixed rate one. Country Risk follows a scale of the risk of the country according to the year. Risk Free Rate gives the rate of the US 3-month treasury bills according t the time of the issuance. Volatility refers to the values of the Volatility Index (VIX). Government Yield presents the 10-year government yield of the country in which the bond was issued. GDP per capita per country in which the tranche was issued. Creditor Rights follows the Laporta's Creditor Rights Scale. UK Borrowers takes the value one if the tranche was issued in the UK. ***, ** and * indicates that the reported coefficients are significantly different from zero at the 1%, 5% and 10% levels, respectively. The t-statistics reported in parentheses are based on heteroskedasticity-consistent standard errors clustered by transaction.

Table 4.1.1 shows that in model [1] the variable W.E. before crisis takes the value of 26.60 (significant at 1% level), whereas if we add the variable *U.K. Borrowers*, like it was done in model [2] we can see that this value drops to -45.98 (significant at 1% level). This means that the U.K. is strongly responsible for the increase on the credit spread for AS bonds. In fact, the variable *U.K. Borrowers* in model [2] states that an issuance made in the U.K. has, on average, a credit spread

130.61 bps (significant at 1% level) higher if we compare to an issuance made in the remaining W.E. countries or in the U.S.

In the same table is also possible to analyse the effects of the other pricing factors. If we take a look to the variable W.E. crisis, in model [1] it is evident that the value is on average higher in W.E. than in the U.S., adding 74.16 bps (significant at 1% level) more to the credit spread of AS bonds issued in W.E in that period. If we control for the *U.K. Borrowers'* variable, looking at model [2] we can perceive once more that the value decreases to 20.88 (significant at 1% level) in W.E. crisis. Though, the value is still positive, yielding that issuances in Continental Europe during crisis add, on average, more 20.88 bps than in the U.S.

Our results are in line with the previous literature which found that credit rating is one of the most important determinant of credit spread. Therefore, as we can see, rated tranches have on average a credit spread lower than not rated ones. For instance, in model [1], on average, rated tranches have a lower credit spread than not rated ones, -74.55 (significant at 1% level) whereas the value is very similar, -73.39 (significant at 1% level) in model [2]. In addition, rating is also related to credit spread. Hence, the variable *Rated Rating* allows us to compare the differences in pricing among the rating classes of the rated tranches. As for rated variable, the significance and magnitude of the coefficient for the model with and without U.K. are very similar. Essentially, a unit downgrade from AAA to AA+ increases credit spread by 21.10 bps (significant at 1% level) in the first model and 21.31 bps (significant at 1% level) in the second one.

The next two controllers used in these two regression models were the *Transaction Size* and *Tranche to Transaction*. Although, there is an insignificant relationship between transaction size and tranche to transaction variables on credit spread.

In models [1] and [2] we decided to include the variables *ABS* and *MBS* in order to compare the pricing of the three security types (ABS, MBS, and CDOs).

ABS and *MBS* have a negative and significant impact on credit spread, which means that CDOs are the security type with the higher credit spread. Once more, it is expected since CDOs represent the riskiest type of security and the one with the most tarnished image. In fact, in model [1] ABS get the coefficient value of -56.79 (significant at 1% level), similar to the one achieved in model [2], -57.91 (significant at 1% level). For MBS the coefficient values are also similar, -49.00 (significant at 1% level) in model [1] and -58.28 (significant at 1% level) in model [2].

Regarding *Number of Banks*, our results corroborate the idea that a higher number of banks increase the certification of the operation. A transaction with one additional bank lowers the credit spread, on average, in -3.31 bps (significant at 1% level) and -3.98 bps (significant at 1% level) in models [1] and [2], respectively.

Currency Risk behaves differently in the two models. While in model [1] currency risk and credit spread have a significant negative relationship, yielding the value of -25.49 (significant at 1% level), the impact of currency risk in model [2] is insignificant.

As we expected based on extant AS literature, the impact of *Maturity* on credit spread is negative, by -1.55 bps (significant at 1% level) in model [1] and -1.46 bps (significant at 1% level) in model [2].

Subordinated bonds have a 22.27 bps (significant at 1% level) and 23.04 bps (significant at 1% level) average increase on credit spread than senior ones in models [1] and [2], respectively.

As seen in the variable analysis section, floating rate issuances have a lower credit spread since the issuers are exposed to the interest rate risk, while in fixed rate issuances they do not face this risk. Indeed, fixed rate ones are much more penalized in terms of credit spread than floating rate tranches. For the first model a fixed rate issuance increments the spread in more 143.53 bps (significant at 1%

level) than a floating rate one, whereas in the second model it increases the spread in more 146.93 bps (significant at 1% level) in comparison to a floating rate issuance. In fact, the issuers of fixed rate AS bonds have to pay an additional premium that is embedded in the credit spread in order to not be exposed to the interest rate risk during the life of a bond, which would be different if they issued floating rate notes.

Country Risk also impacts positively and significantly the credit spread: an increase of rating scale in the country risk increases the credit spread by 8.54 bps (significant at 1% level) in the first model and 9.87 bps (significant at 1% level) in the second one.

Both the level of Risk Free interest rates and market volatility have a significant positive impact on credit spreads. For instance, the coefficient of *Risk Free Rate* in model [1] is 51.20 (significant at 1% level), and 50.97 (significant at 1% level) in model [2]. For *Volatility*, it yields 2.50 (significant at 1% level) in mode [1] and 2.53 (significant at 1 % level) in model [2].

The next pricing determinant of the credit spread is the *Government Yield*, for which, as expected, we find that an increase in the government yield slope (an increase in the differences between the 10 years yield curve and the 3-month yield curve) decreases the credit spread by 7.46 bps (significant at 5% level) and 14.63 bps (significant at 1% level) in models [1] and [2], respectively.

The last two variables, *GDP per capita* and *Creditor Rights*, represent two macroeconomic variables, significant and positively and negatively correlated with the credit spread, respectively. On the one hand, a GDP per capita increase is not noticeable in the boost of the credit spread of an AS bond, 0.004 bps (significant at 1% level) increase model [1] and 0.002 bps (significant at 1% level) in model [2]. On the other hand, an increase of one point in Laporta's creditor rights scale represents a 4.64 bps (significant at 1% level) decrease in model [1] and 18.90bps (significant at 1% level) decrease in model [2].

Two additional models were performed and presented in the appendix section. On the one hand, model [1b][4], composed by the observations of all security types with available credit spread in the U.K. and in the U.S. The main findings are: (1) the substantial difference between the credit spread in the two countries, higher in the U.K. before the crisis (88.77 bps) (significant at 1% level) and also in the crisis period (67.18 bps) (significant at 5% level; (2) the country risk higher in the UK, boosting the spread 66 bps (significant at 1% level) if we compare with the US. This is an evidence that the credit spread in the U.K. is the main responsible one to increase the credit spread for W.E. region.

On the other hand, a model just including AS bonds' issuances before the crisis, model [1c][5], was also performed and presented in the appendix. The main conclusion that we can take is that the value of the variable W.E. before crisis becomes even more positive (from 26.60 bps in model [1] to 41.71 bps in this model) (significant at 1% level), stating that the issuances in W.E. in comparison to the ones in the U.S. have a higher credit spread, mainly because of the issuances in the U.K.

[4] Model [1b] presented in table 7.3, and model [6a] presented in table 7.4, regress the credit spread and the adjusted spread, respectively for issuances of AS bonds made in the U.K and in the U.S. Presented in the appendix section.
[5] Model [1c] presented in table 7.3, and model [6b] presented in table 7.4, regress the credit spread and the adjusted spread, respectively for issuances of AS bonds before crisis. Presented in the appendix section.

Table 4.1 2.: Regression analysis on the impact of the independent variables on the credit spread for each security type, ABS, MBS, and CDOs

Dependent variable:	[3]	[4]	[5]
Credit Spread (bps)	ABS	MBS	CDO
Independent variables:			
Intercept	-174.50 ***	-188.63 ***	33.57
	(-2.74)	(-3.98)	(0.34)
W.E. before crisis	-22.32	13.31	-126.41 ***
	(-1.44)	(1.28)	(-8.58)
W.E. crisis	21.49 **	18.84	-23.89
	(2.11)	(1.37)	(-0.98)
Rated	-61.95 ***	-112.09 ***	-22.93
	(-7.45)	(-8.31)	(-1.47)
Rated Rating	18.40 ***	17.33 ***	29.90 ***
	(56.37)	(26.58)	(47.49)
Transaction Size	0.00	0.00	-0.01
	(-1.49)	(0.62)	(-1.39)
Tranche to transaction	-0.23 ***	0.05 ***	0.03
	(-7.03)	(-2.86)	(0.48)
Callable	0.60 **	14.23 ***	-26.75 ***
	(0.18)	(4.90)	(-4.53)
Number of banks	-2.80 ***	-1.44	-13.25 ***
	(-4.31)	(-1.54)	(-4.51)
Currency Risk	-5.51	-116.37 ***	-36.07 ***
	(-0.43)	(-15.07)	(-2.78)
Maturity	-1.42 ***	-1.38 ***	-0.54 ***
	(-10.25)	(-8.53)	(-3.61)
Subordinated Debt	4.47	20.94 ***	5.80
	(1.53)	(3.92)	(1.02)
Fixed Rate	153.57 ***	147.64 ***	116.68 ***
	(37.59)	(36.23)	(12.49)
Country Risk	13.25 ***	16.03 ***	7.11 **
	(4.45)	(5.68)	(2.00)
Risk Free Rate	66.20 ***	21.77 ***	45.83 ***
	(23.39)	(6.71)	(6.80)
Volatility	2.428 ***	2.12 ***	3.18 ***
	(7.52)	(6.50)	(5.69)
Government Yield	-27.72 ***	-8.26 *	-23.13 ***
	(-5.14)	(-1.69)	(-3.56)
GDP per capita	0.00	0.00 ***	0.00 **
	(1.56)	(7.81)	(-2.47)
Creditor Rights	-19.95 ***	3.86 **	-40.63 ***
	(-6.96)	(2.12)	(-9.41)
UK Borrowers	92.83 ***	86.90 ***	176.30 ***
	(6.56)	(9.24)	(8.70)
Year fixed effects	Yes	Yes	Yes
Number of observations	35,445	19,908	10,909
Adjusted R^2	0.67	0.48	0.64

Note: Table 4.1.2 presents the results of OLS regression analysis of the determinants of Asset Securitization Bonds from 2000 to 2016, split by security type. Credit Spread is computed as the margin yielded (in bases points) by the security at issue above a corresponding currency treasury benchmark with a comparable maturity. W.E. before crisis is computed by giving 1 to all the observations of W.E. occurred before September 15th 2008. W.E. crisis is computed by giving 1 to all the observations of W.E. occurred before September 15th 2008. Rated takes the value 1 if the tranche is rated. Rated Rating gives the rating according to the S&P credit rating scale at the time of the bond issuance; the rating is converted as follows: AAA=Aaa=1, AA+=Aa1=2, and so on until D=22. Transaction Size gives the value of the transaction at the time of issuance in USD. Tranche to transaction is the percentage that the tranche has in the transaction. Callable takes the value one if the tranche is callable. Number of banks gives the number of banks involved in the deal. Currency Risk takes the value 1 if the deal was done in a currency different from the one used in the country of issuance. Maturity is the maturity of the tranche in years. Subordinated Debt takes the value one if the debt related to the tranche is the last one to be paid. Fixed Rate takes the value one if the coupon of the tranche is a fixed rate one. Country Risk follows a scale of the risk of the country according to the year. Risk Free Rate gives the rate of the US 3-month treasury bills according t the time of the issuance. Volatility refers to the values of the Volatility Index (VIX). Government Yield presents the 10-year government yield of the country in which the bond was issued. GDP per capita per country in which the tranche was issued. Creditor Rights follows the Laporta's Creditor Rights Scale. UK Borrowers takes the value one if the tranche was issued in the UK. ***, ** and * indicates that the reported coefficients are significantly different from zero at the 1%, 5% and 10% levels, respectively. The t-statistics reported in parentheses are based on heteroskedasticity-consistent standard errors clustered by transaction.

Table 4.1.2 shows the differences between the pricing factors of ABS, MBS and CDOs in the U.S. vis-à-vis with W.E., presented in models [3], [4], and [5].

Starting with the main analysis, we can see that an issuance of ABS and CDOs in Continental Europe before the crisis represents a decrease of -22.32 bps (not significant) in model [3] and -126.41bps (significant at 1% level) in model [5] in the credit spread, respectively, if we compare with the North American market. In relation to MBS, model [4], despite the fact that the value is not statistically

significant we can verify that an issuance of this kind of security in Continental Europe adds on average more 13.31 bps on the credit spread than an issuance in the U.S. Being this variable only significant in model [5] we can state that CDOs have a lower credit spread before crisis in Continental Europe.

If we take a look at the issuances during crisis, it turns out that for ABS issued in Continental Europe (*W.E. crisis*), model [3], the credit spread increases 21.49 bps (significant at 5% level) in comparison to an issuance of this security type in the U.S. for the same period. For MBS and CDOs, the values are not significant during this period.

After the first analysis of this table, the comparison between Continental Europe (W.E.) and the U.S. markets, it is important to refer the results that we achieved for the U.K. market. As it was evident in the model [2] from table 4.1.1 the variable *U.K. Borrowers* was strongly responsible for increasing the value of the credit spreads (significant at 1% level). With no surprise, again in this table for the three security types, models [3], [4], and [5], the values for the U.K. are statistically significant and drastically positive. For instance, we can state that an issuance of ABS, model [3], made in the U.K. adds 92.83 bps (significant at 1% level) to the credit spread if we compare with the U.S. or W.E (Continental Europe). It takes the value of 86.91 bps (significant at 1% level) for MBS and 176.30 bps (significant at 1% level) for CDOs. Again, we corroborate the findings of table 4.1.1, in which the U.K., the credit spreads are higher for AS bonds if we compare to the other two analysed regions.

Introducing the variable *Rated* to this table, we can easily perceive that the main impact is seen in MBS, in model [4], being the impacts for all security types statistically significant at 1% level except for CDOs. Rated MBS have on average a reduction of -112.09 bps in the credit spread if we compare with not rated ones. For ABS the value is also negative, but just -61.95 and for CDOs the value continues to be negative but not so low as the previous security types, -22.93. One

more time we corroborate the fact that rated tranches have a lower credit spread than not rated ones.

Regarding the rating of the rated tranches, as it happened in the previous table the relationship between rating and credit spread is positive and significant (the rating increases, increasing as well the expected probability of default, the spread also increases, revealing the market penalization for that probability increase). Thus, CDOs, model [5], being the riskiest security type, have the highest impact in this variable, 29.90 (significant at 1% level), meaning that an increase of one point in the rating scale, turns out to be an increase, on average, of 29.90 bps in the credit spread. Followed by ABS, model [3] with an impact of 18.40 (significant at 1% level) and MBS yielding a value of 17.33 (significant at 1% level).

Transaction Size, as before is not a statistically significant variable, and also its impact in credit spread is quite null.

As opposite from the first commented regression table, the variable *Tranche to transaction* is statistically significant for ABS and MBS. However, it turns out to not be significant for CDOs. It has a positive correlation for MBS, model [4], meaning that if the tranche to transaction increases by 1%, the credit spread of that tranche also increases, on average 0.05 bps (significant at 1% level). In contrast it has a negative correlation of -0.23 bps (significant at 1% level) per 1% increase, in ABS, model [3].

The callability factor of a tranche continues to be significant as before and has a positive correlation with the credit spread for ABS (0.60) (significant at 5% level) and MBS (14.23) (significant at 1% level). By contrast, for CDOs it has a negative correlation (-26.75) (significant at 1% level).

The next variable introduced in the models was the *Number of banks*. Significant at 1% level for ABS and CDOs, models [3] and [5] and not significant for MBS, model [4]. As expected, this variable is inversely correlated with the credit spread (more banks involved in an AS bond transaction, the degree of

certification of the transaction tends to increase, leading to a decrease on the credit spread), yielding a value of -2.80 bps in model [3] and -13.248 bps in model [5]. In model [4], the value turns out to be -1.44 bps. As it can be understood CDOs, being the security type with more risk perceived by the market, require a very good certification of the transaction. Therefore, the increase of the number of banks involved, on average, decreases more the credit spread than on the other security types.

Regarding *Currency Risk*, this variable is significant for model [4] and model [5] being the correlation with this variable and the credit spread negative for the three security types. By far, MBS, represented in model [4], are the security type in which the credit spread decreases more, if we compare a tranche with currency risk and another without this factor, being the difference -116 bps (significant at 1% level) in credit spread. The difference reduces if we compare with model [5], -36.00 bps (significant at 1% level) and it reduces even more in model [3], -5.51 bps (insignificant).

By contrast with a plain vanilla bond, where if the maturity increases, the credit spread tends to increase as well, in AS bonds we found the opposite. In part, because the maturity in AS bonds is not completely dependent with an increase of uncertainty to forecast distant cash flows, but, in fact, it is dependent in the maturity of the collateral assets. Thus, we can predict better the value of these collateral assets when the AS bond matures. For the three analysed models, [3], [4], and [5], maturity turns out to be a significant (at 1%level) and negatively correlated variable with credit spread. In fact, an increase of 1% in the maturity yields a reduction of -1.42 bps on ABS, -1.38 bps on MBS and -0.54 bps on CDOs.

Subordinated Debt has a positive correlation with credit spread in the three models but is only statistically significant (at 1% level) in model [4]. As known, this kind of debt is the most junior one, meaning that is the last one to be paid after the liquidation of the assets in case of default. It makes sense that a bond

like this should be penalized in terms of spread. Thus, in model [4] the value is positive 20.94 bps (in model [3] takes the value of 4.47bps and in model [5], 5.80bps), which means that on average the credit spread for a subordinated tranche is higher 20.94 bps if we compare with a tranche with no subordinated debt.

Fixed rate, once more as a highly significant (significant at 1% level) and positive impact on credit spread for all models [3], [4], and [5]. As it is expected the market castigates severally tranches with fixed rate issuances, since these tranches are not protected against interest rate movements as floating rate ones are. In a case of interest rate increase this is good for the issuer that does not have to pay it since the coupon rate is fixed. Although, if the interest rate decreases the issuer has to pay the agreed coupon, whereas it could pay a lower one if it was a floating rate issuance. Just in the case that if this fixed rate issuance is callable, the issuer is in part protected against interest rate movements. In model [3] the credit spread jumps 154 bps if we compare a fixed rate to a floating rate note, 148 bps in model [4] and 117 bps if we look at model [5]. Indeed, we corroborate the à-priori expectation that fixed rate has a positive relation with credit spread.

Country risk is also significant (at 1% level for models [3] and [4] and 5% level for model [5]) and positive for the three models, [3], [4], and [5]. As it was expected if the risk of a country increases, it also increases the expected probability of default. The treasury rates increase and the rates of the bond issued on that country also increase. Model [4], that shows the pricing determinants impacts for MBS, states that this security type is the most jeopardized one in a scenario of a country risk increase. An increase of one percent in the country risk scale, leads to an increment of 16.03 bps in the credit spread of an MBS, followed by 13.25 bps increase in the credit spread of an ABS, model [3] and 7.11 bps boost in the credit spread of a CDO, model [5]. In fact, we can corroborate the fact that country risk influences positively the credit spread in an AS bond transaction.

Regarding the *Risk-Free Rate*, used to compute the credit spread, once more, its correlation with the pricing of an AS bond is positive and significant. For model [3], we have the highest impact, an increase of 66.20 bps (significant at 1% level) per 1% increase in the risk-free rate, on average. Followed by model [5], 45.83 bps (significant at 1% level) and model [4] 21.77 bps (significant at 1% level). We can also corroborate the idea that the risk-free rate increases the credit spread in an AS transaction (it should be since the risk-free rate is also embedded in the computation of the credit spread).

Volatility plays also a significant role in the determination of the credit spread, being its impact positive and statistically significant (at 1% level), in the three analysed models of table 4.1.2. In model [5], as we know CDOs are proved to be the riskiest security among the ones analysed, thus without no amazement per 1% increase in the VIX index we expect a 3.18 bps increase, on average, in the credit spread of a CDO, holding all other variables constant. The value decreases to 2.43 bps if we analyse model [3] and gets even lower if look at model [4], yielding 2.12 bps. We can corroborate that an increase in volatility, leads to an increase of the credit spreads of AS bond (more uncertainty, means more risk, so the issuers have to pay a premium for that).

Government yield, negatively correlated with the credit spread, being significant at the three classical levels for models [3] and [5] and just significant at 10% level in model [4]. It is normal that we have a negative relation between government yield and credit spread, because the spread is no more than the gap between YTM and government yield. Therefore, if the difference between the long-term government yield and the short-term one increases, this gap decreases. The highest value for this variable can be seen in model [3], -27.72 bps, followed by model [5], -23.13 bps and finally, model [4] -8.26 bps. Once more we corroborate that an increase in the gap between the long-term and short-term

government yield of a country reduce the credit spread of an AS bond transaction.

GDP per capita turns out to be insignificant in model [3], and significant at 1% level in models [4] and [5]. However, its impact on credit spread is very weak, being almost zero. Indeed, we can conclude that GDP per capita influences the credit spread but we cannot state that it has a visible impact on it.

Creditor Rights, has a significant impact (at 1% level for models [3] and [5] and 5% level for model [4]) on credit spread for all the security types. In models [3] and [5] this impact is negative, although in model [4] it turns out to be positive. The values are -19.95 bps for model [3] and -40.63 bps for model [5], being the value for model [4], 3.86 bps. Hence, we can corroborate that for ABS and CDOs we have a negative impact on credit spread due to Laporta Creditor Rights, although we verify that for MBS we have a positive impact.

4.2 Robustness Checks

In order to analyse the robustness of our results in the previous chapter we implemented two robustness checks.

In the first robustness check we started by using the adjusted spread, in which floating rate bond spreads were converted into fixed rate bond spread using floating to fixed rate swaps, in order to standardize the issuance type in just one type. Therefore, we re-ran models [1] to [5] from tables 4.1.1 and 4.1.2, but this time the dependent variable was not the credit spread but in fact, the adjusted spread.

In the second robustness check, we again re-ran model [2] from table 4.1.1 and models [3], [4], and [5] from table 4.1.2, but this time we add controller variables related to the bank issuer parent accounting and controllers for market characteristics. Moreover, the dependent variable of these linear regression was not the credit spread but the adjusted spread.

For the issuer parent accounting variables, we used some key accounting ratios and variables, such as: Logarithm of Total Assets (Ln TA), Net Loans/ Total Assets (Net Loans/TA), Liquid Assets/ Deposits & Short-Term Funding (Liquid A/Deposits), Loans/Deposits & Short-Term Funding (Loans/Deposits), Equity/Total Assets (Equity/TA), and Cost to Income.

The first robustness check table, table 4.2.1 regresses the adjusted spread on the same variables and controllers from models used in models [1] and [2] presented in table 4.1.1.

Table 4.2.1: Regression analysis on the impact of the independent variables on the adjusted spread

Dependent variable: Adjusted Spread (bps)	[6] ABS, MBS and CDO	[7] ABS, MBS and CDO with UK
Independent variables:		
Intercept	113.75 ***	149.21 ***
	(5.10)	(6.35)
W.E. before crisis	-50.51 ***	-65.80 ***
	(-9.69)	(-11.79)
W.E. crisis	-7.07	-22.36 ***
	(-1.17)	(-3.29)
Rated	-78.31 ***	-77.11 ***
	(-10.87)	(-10.65)
Rated Rating	21.57 ***	21.63 ***
	(78.55)	(78.86)
Transaction Size	0.00	0.00
	(-1.01)	(-1.05)
Tranche to transaction	-0.21 ***	-0.19 ***
	(-8.97)	(-8.29)
Callable	7.90 ***	8.14 ***
	(4.62)	(4.77)
ABS	-53.33 ***	-53.43 ***
	(-21.79)	(-21.94)
MBS	-43.71 ***	-45.44 ***
	(-14.86)	(-15.45)
Number of banks	-3.16 ***	-3.29 ***
	(-7.45)	(-7.65)
Currency Risk	13.05 **	-10.54 *
	(2.52)	(-1.79)
Maturity	-0.57 ***	-0.55 ***
	(-8.42)	(-8.09)
Subordinated Debt	0.91	2.12
	(0.45)	(1.05)
Fixed Rate	-61.36 ***	-61.01 ***
	(-32.79)	(-32.58)
Country Risk	7.64 ***	8.51 ***
	(5.37)	(5.97)
Risk Free Rate	-0.08	-0.33
	(-0.05)	(-0.21)
Volatility	0.49 **	0.52 ***
	(2.45)	(2.65)
Government Yield	-8.60 ***	-10.10 ***
	(-3.06)	(-3.49)
GDP per capita	0.00 ***	0.00 ***
	(7.99)	(6.13)
Creditor Rights	-4.28 ***	-8.83 ***
	(-3.33)	(-6.70)
UK Borrowers	-	51.22 ***
	-	(7.83)
Year fixed effects	Yes	Yes
Number of observations	62,121	62,151
Adjusted R^2	0.51	0.52

Note: Table 4.2.1 presents the results of OLS regression analysis of the determinants of Asset Securitization Bonds from 2000 to 2016. Adjusted Spread is computed as the margin yielded (in bases points) by the security at issue above a corresponding currency treasury benchmark with a comparable maturity and in case of being a floating spread is added a floating to fix swap at the time of issuance with the corresponding maturity and floating rate to fix the coupon rate. W.E. before crisis is computed by giving 1 to all the observations of W.E. occurred before September 15th 2008. W.E. crisis is computed by giving 1 to all the observations of W.E. occurred before September 15th 2008. Rated takes the value 1 if the tranche is rated. Rated Rating gives the rating according to the S&P credit rating scale at the time of the bond issuance; the rating is converted as follows: AAA=Aaa=1, AA+=Aa1=2, and so on until D=22. Transaction Size gives the value of the transaction at the time of issuance in USD. Tranche to transaction is the percentage that the tranche has in the transaction. Callable takes the value one if the tranche is callable. ABS take the value one if the tranche refers to an ABS issuance. MBS takes the value one if the tranche refers to an MBS issuance. Number of banks gives the number of banks involved in the deal. Currency Risk takes the value 1 if the deal was done in a currency different from the one used in the country of issuance. Maturity is the maturity of the tranche in years. Subordinated Debt takes the value one if the debt related to the tranche is the last one to be paid. Fixed Rate takes the value one if the coupon of the tranche is a fixed rate one. Country Risk follows a scale of the risk of the country according to the year. Risk Free Rate gives the rate of the US 3-month treasury bills according t the time of the issuance. Volatility refers to the values of the Volatility Index (VIX). Government Yield presents the 10-year government yield of the country in which the bond was issued. GDP per capita per country in which the tranche was issued. Creditor Rights follows the Laporta's Creditor Rights Scale. UK Borrowers takes the value one if the tranche was issued in the UK. ***, ** and * indicates that the reported coefficients are significantly different from zero at the 1%, 5% and 10% levels, respectively. The t-statistics reported in parentheses are based on heteroskedasticity-consistent standard errors clustered by transaction.

In the above table, table 4.2.1, looking in general, the first thing that catches the attention is that fact that for both models, [6] and [7] the coefficients for variables W.E. before crisis and W.E. crisis are negative. This is in fact different from the analysis that we took from table 4.1.1

Looking deeply at models [6] and [7] (model without U.K. borrowers and with U.K. borrowers) presented on table 4.2.2, we verify that the variable W.E. before crisis is significant at the three classical levels and takes the value of -50.51bps in model [6] and -65.81bps in model [7]. In comparison to models [1] and [2] from table 4.1.1 we can see a reduction from 26.60bps (model [1]) to -50.51bps (model [6]) and a decrease from -45.98bps (model [2]) to -65.80bps (model [7]). Regarding the variable W.E. crisis, it is insignificant in model [6] and significant at 1% level in model [7]. Again, the variable takes negatives values, -7.07bps in model [6], and -22.36bps in model [7]. Comparing to models [1] and [2] it is easy to conclude that we have a decrease in values again from 74.16 in model [1] to -7.07 in model [6] and from 20.88 in model [2] to -22.36 in model [7]. Hence, this allows us to say that we cannot corroborate the findings of table 4.1.1 regarding the credit spread of AS bonds issued in W.E. being higher than the ones for AS bonds issued in the U.S. (model [1] vis-à-cis with model [6]). Although, we can corroborate the findings from table 4.1.1 model [2], where we concluded that the fact of an AS bond being issued in Continental Europe reduces the credit spread of the tranche.

Taking a look now at the variable UK borrowers presented in model [7], we can see that the value remains positive (with a significance level of 1%), 51.22bps but if we compare with model [2], we conclude that we had a substantial difference, since the value for this variable was 130.61bps. Henceforth, we can corroborate the fact that the U.K. is responsible for highest credit spreads and is the region that increases the credit spreads for AS bonds issued in W.E.

Regarding the other control variables used in models [1] and [2], from table 4.1.1], and also in models [6] and [7], shown in table 4.2.1, if we consider *Rated, Rated Rating, Transaction Size, Tranche to Transaction, Callable, ABS, MBS, Number of Banks, Maturity, Country Risk, Volatility, Government Yield, GDP per capita,* and *Creditor Rights* the differences between models are not significant.

For *Rated*, the coefficients continue to be negative (significant at 1% level), if we compare models [1] with [6] and [2] with [7]. Therefore we corroborate the findings in table 4.1.1 stating that rated tranches have a lower credit spread than not rated ones.

Analysing *Rated Rating*, the coefficients for this variable in all models, [1], [2], [6], and [7] are positive (significant at 1% level), which means that we also corroborate the allegation that if rating is downgraded the credit spread increases (if rating increases in our scale, credit spread also increases).

Regarding *Transaction Size*, the coefficients in models [6] and [7] are not significant as it happened in models [1] and [2], so we continue to not validate the hypothesis that transaction size affects the credit spread.

Looking at variable *Callable*, the coefficients are positive (significant at 1% level) in models [6] and [7] and were also positive in models [1] (significant at 5% level) and [2] (significant at 1% level), which lead us to the conclusion that callability impacts positively the credit spread.

For variables *ABS* and *MBS*, the values continue to be negative (significant at 1% level) as it was for models [1] and [2], which allow us to verify that CDOs are the security type associated with the highest credit spread.

For the variable *Number of Banks*, the coefficients for this variable in models [6] and [7] remain negative (significant at 1 % level) as it happened for models [1] and [2]. Once more we corroborate the fact that an increase in the number of banks running the operation decreases the credit spread of the issuance.

Regarding *Maturity*, we can also verify that the coefficients in models [6] and [7] remain negative (significant at 1% level) as they were in models presented in table 4.1.1, therefore we can validate the findings in that table, in which an increase in maturity reflects a decrease in the credit spreads.

Country Risk coefficients for models in table 4.2.1 continue to be positive (significant at 1% level) like the ones for the same variable in models [1] and [2].

Hence we can verify table 4.1.1 findings in which an increase in the country risk is associated to an increase in the credit spread.

Nonetheless, for currency risk we can see that the value in model [1] was -25.49bps (significant at 1% level), whereas in model [6] it changed to 13.05bps (significant at 5% level). Regarding model [7] the value of this variable is -10.54bps (significant at 10% level), contrasting with -64.88bps (not significant) in model [2].

Also, for subordinated debt we assist to a strong change. The values in model [1] and [2] for this variable, 22.27bps (significant at 1% level) and 23.04bps (significant at 1% level), respectively, changed to 0.91bps (not significant) in model [6] and 2.12bps (not significant) in model [7].

Moreover, fixed rate variable changes from 143.53bps (significant at 1% level) in model [1] and 146.93bps (significant at 1% level), to -61.36bps (significant at 1% level) in model [6] and -61.01bps (significant at 1% level) in model [7].

Finally, Risk Free Rate coefficients also change from models [1] and [2] presented in table 4.1.1, if we compare the coefficients for the same variable in models [6] and [7] from table 4.2.1. In fact, in model [1] that value is 51.20 (significant at 1% level), and 50.97 (significant at 1% level) in model [2]. In model [6] the coefficient is now -0.08 (not significant) and -0.33 in model [7] (not significant).

Looking at *Volatility*, the coefficients are still positive in model [6] (significant at 5% level) and model [7] (significant at 1% level), as the one in models [1] and [2] (significant at 1% level). Henceforth, we corroborate the fact that volatility impacts positively the credit spread.

For *Government Yield*, the coefficients are negative in models [6] and [7] (significant at 1% level), the same as in model [1] (significant at 5% level) and model [2] (significant at 1% level). Therefore, we can corroborate that an increase

in the gap between the long-term yield and short-term yield, reduces the credit spread.

Regarding *GDP per capita*, the coefficients continue to be roughly zero (significant at 1% level) as for models [1] and [2] (significant at 1% level), which means that we corroborate the findings of table 4.1.1 for this variable, having *GDP per capita* a very slightly positive impact on credit spread.

For *Creditor Rights*, the coefficients for this variable in models [6] and [7] are negative (significant at 1% level), as they were in models [1] and [2] (significant at 1% level). Consequently, we corroborate the findings of table 4.1.1 in which an increase in *Creditor Rights* is associated to a decrease in the credit spread.

Table 4.2.2.: Regression analysis on the impact of the independent variables on the adjusted spread for each security type, ABS, MBS, and CDOs

Dependent variable:	[8]	[9]	[10]
Adjusted Spread (bps)	ABS	MBS	CDO
Independent variables:			
Intercept	94.65 **	160.46 ***	341.36 ***
	(2.10)	(4.01)	(5.10)
W.E. before crisis	-7.86	-77.86 ***	-89.00 ***
	(-0.63)	(-9.25)	(-7.04)
W.E. after crisis	-12.04	-0.27	-41.38 *
	(-1.37)	(-0.02)	(-1.91)
Rated	-75.31 ***	-109.24 ***	-6.68
	(-8.84)	(-7.57)	(-0.43)
Rated Rating	19.51 ***	14.64 ***	29.66 ***
	(62.04)	(21.83)	(48.55)
Transaction Size	-0.01 ***	0.00	0.00
	(-3.89)	(0.52)	(-1.00)
Tranche to transaction	-0.27 ***	-0.31 ***	-0.09
	(-10.36)	(-6.92)	(-1.47)
Callable	0.08	12.96 ***	-11.59 **
	(0.18)	(5.26)	(-2.34)
Number of banks	-1.35 ***	-1.32	-13.63 ***
	(-2.80)	(-1.43)	(-6.18)
Currency Risk	-4.83	4.41	-32.53 ***
	(-0.46)	(0.57)	(-3.40)
Maturity	0.41 ***	-1.41 ***	0.30 **
	(4.10)	(-9.63)	(2.30)
Subordinated Debt	-16.72 ***	21.24 ***	-1.74
	(-6.93)	(4.10)	(-0.36)
Fixed Rate	-50.32 ***	-57.61 ***	-84.39 ***
	(-20.20)	(-18.07)	(-12.12)
Country Risk	17.54 ***	7.81 **	0.71
	(7.12)	(2.33)	(0.20)
Risk Free Rate	1.32	3.18	-9.37 *
	(0.64)	(1.26)	(-1.84)
Volatility	0.67 **	0.13	1.65 ***
	(2.59)	(0.42)	(3.18)
Government Yield	-10.54 ***	-13.72 **	-6.23
	(-3.72)	(-2.17)	(-1.06)
GDP per capita	0.01 ***	0.00 ***	0.00
	(6.48)	(3.80)	(-1.26)
Creditor Rights	-7.26 ***	-4.31 ***	-17.09 ***
	(-2.69)	(-2.64)	(-5.11)
UK Borrowers	65.34 ***	13.73	88.90 ***
	(5.76)	(1.44)	(5.70)
Year fixed effects	Yes	Yes	Yes
Number of observations	34,811	17,396	9,914
Adjusted R^2	0.51	0.33	0.63

Note: Table 4.2.2 presents the results of OLS regression analysis of the determinants of Asset Securitization Bonds from 2000 to 2016, split by security type. Adjusted Spread is computed as the margin yielded (in bases points) by the security at issue above a corresponding currency treasury benchmark with a comparable maturity and in case of being a floating spread is added a floating to fix swap at the time of issuance with the corresponding maturity and floating rate to fix the coupon rate. W.E. before crisis is computed by giving 1 to all the observations of W.E. occurred before September 15th 2008. W.E. crisis is computed by giving 1 to all the observations of W.E. occurred before September 15th 2008. Rated takes the value 1 if the tranche is rated. Rated Rating gives the rating according to the S&P credit rating scale at the time of the bond issuance; the rating is converted as follows: AAA=Aaa=1, AA+=Aa1=2, and so on until D=22. Transaction Size gives the value of the transaction at the time of issuance in USD. Tranche to transaction is the percentage that the tranche has in the transaction. Callable takes the value one if the tranche is callable. Number of banks gives the number of banks involved in the deal. Currency Risk takes the value 1 if the deal was done in a currency different from the one used in the country of issuance. Maturity is the maturity of the tranche in years. Subordinated Debt takes the value one if the debt related to the tranche is the last one to be paid. Fixed Rate takes the value one if the coupon of the tranche is a fixed rate one. Country Risk follows a scale of the risk of the country according to the year. Risk Free Rate gives the rate of the US 3-month treasury bills according t the time of the issuance. Volatility refers to the values of the Volatility Index (VIX). Government Yield presents the 10-year government yield of the country in which the bond was issued. GDP per capita per country in which the tranche was issued. Creditor Rights follows the Laporta's Creditor Rights Scale. UK Borrowers takes the value one if the tranche was issued in the UK. ***, ** and * indicates that the reported coefficients are significantly different from zero at the 1%, 5% and 10% levels, respectively. The t-statistics reported in parentheses are based on heteroskedasticity-consistent standard errors clustered by transaction.

In table 4.2.2 we have the same variables as in table 4.1.2, but this time as we previously did in table 4.2.1, we regressed adjusted spread instead of credit spread for models [8], [9], and [10], in order to compare the difference in coefficients for the same variables that we had in table 4.1.2. Therefore, we aim to compare model [8] with model [3], model [9] with model [4] and model [10] with model [5].

Starting with the variable W.E. before crisis is possible to see that the coefficients are all negative for models [8], [9] and [10]. Comparing these models with models from table 4.1.2, we see that the value changes from -126.41bps (significant at 1% level) in model [5] to -89.00bps (significant at 1% level) in model [10], and we can corroborate the idea that the spreads for CDOs issued in Continental Europe before crisis are lower than the ones in the U.S. and in the U.K. However, the coefficient for W.E. before crisis changes from 13.31bps (not significant) in model [4] to -77.86bps (significant at 1% level) in model [9]. Hence, since the coefficient was not significant in model [4] and is now in model [9] we can conclude that the credit spreads for MBS issued in Continental Europe before crisis are lower than the ones for MBS issuances in the U.S. and in the U.K. Finally, in model [8] from table 4.2.2 the value for W.E. before crisis is -7.86 (not significant), contrasting with the value of -22.32 (not significant) in model [3]. Henceforth, since the variable's coefficient continues to be insignificant we cannot take any conclusion.

Looking at W.E. crisis, starting with model [8], the coefficient is now -12.04 (not significant), different from 21.49 (significant at 5%) in model [3]. Regarding model [9] coefficient for this variable it is -0.27 (not significant), contrasting with 18.84 (not significant) in model [4]. Finally, for W.E. crisis the coefficient in model [10] is -41.38 (significant at 10%), distinct from -23.89 (not significant) in model [5]

Looking now at U.K. Borrowers' variable it is evident that the coefficients for all models in table 4.2.1.2 continue to be positive. In relation to model [8] the value does not suffer considerable alterations if we compare with model [3]. It changes from 92.83bps (significant at 1% level) in model [3] to 65.34bps (significant at 1% level) in model [8]. We can corroborate the hypothesis that the credit spreads for ABS issued in the U.K. are indeed higher than the ones for ABS issuances in the U.S. and Continental Europe. If we analyse models [4] and [9]

the shift from 86.90bps (significant at 1% level) in model [4] to 13.73bps (not significant) in model [9] is more considerable. However, we cannot corroborate the previous conclusions of table 4.1.2 since the value in table 4.2.2 is not significant. Lastly, for models [5] and [10] the value decreases from 176.30bps (significant at 1% level) in model [5] to 88.90bps (significant at 1% level) in model [10]. Therefore, we can also corroborate the hypothesis that credit spreads for CDOs issued in the U.K. are higher than the ones for CDOs issued in the U.S. and Continental Europe.

For the variables *Rated, Rated Rating, Transaction Size, Tranche to Transaction, Callable, Number of Banks, Maturity, Volatility,* and *GDP per capita* the differences between models are not significant. Therefore, we can corroborate the findings of table 4.1.2.

For the variable *Rated* we can corroborate the hypothesis that for ABS and MBS issuances, the fact that tranche is rated reduces the credit spread of the issuance. Moreover, for CDOs, since in both models, [5] and [10] the values are not significant we cannot conclude anything.

Regarding the variable *Rated Rating*, the main conclusion is that we corroborate the fact that for all the three types of securities if the rating is downgraded the credit spread of the tranche increases.

If you compare *Tranche to Transaction* between tables 4.1.2 and 5.2 we can corroborate the fact that for ABS if the tranche to transaction increases, it leads to a reduction in the credit spread.

Regarding the variable *Callable* it is also possible to corroborate that if we are analysing an MBS issuance, the fact of being callable increases the credit spread of the tranche. By contrast if we are talking about a CDOs issuance the callability option in the issuance reduces the credit spread.

Analysing the *Number of Banks* variable, it is possible to corroborate that for ABS and CDOs issuances the increase in the number of banks running the operation leads to a decrease in the credit spread.

In terms of *Maturity*, we can only corroborate that for an MBS issuance if the maturity increases the credit spread of the issued tranche decreases.

Regarding *Volatility* we can corroborate the previous findings of table 4.1.2 for ABS and CDOs issuances that state that if the volatility increases it happens the same to the credit spread.

For Currency Risk, we can assist at a significant change if we compare the values between models [4] and [9]. In fact, the coefficient from this variable changes from -116.37 (significant at 1% level) in model [4] to 4.41 (not significant) in model [9]. Regarding model [5], in which the coefficient is -36.07 (significant at 1% level), it roughly keeps the same value -32.53 (significant at 1% level) in model [10]. We can corroborate that currency risk decreases the credit spread of a CDOs issuance

Subordinated Debt changes are also evident for model [8]. Firstly, the coefficient for this variable changes from 4.47bps (not significant) in model [3] to -16.72bps (significant at 1% level) in model [8], meaning that now subordinated debt for this security type has in fact a negative impact in the credit spread.

Fixed rate is a variable that accuses the differences in terms of credit spread vis-à-vis with adjusted spread for all security types. For model [3], the initial coefficient was 153.57bps (significant at 1% level) yielding now -50.32bps (significant at 1% level) in model [8]. The same happened between model [4], in which the value for the variable was 147.64 (significant at 1% level) and it is -57.61 (significant at 1% level) in model [9]. Additionally, this decrease in coefficient values is also evident between model [5], where the coefficient is 116.68 (significant at 1% level), contrary to the coefficient of -84.39 (significant at 1% level) in model [10]. In fact, the values became negative if we use the adjusted

spread instead of credit spread, stating that fixed rate as indeed a negative impact in the spread of the bonds. We cannot corroborate the idea that fixed rate positively influences the credit spread.

In addition, Country Risk variable suffers expressive changes in the coefficients for models [9] and [10]. In model [4] the value was 16.03 (significant at 1% level) and in model [9] it continues to be positive, 7.81 (significant at 5% level). In model [5] the coefficient of this variable, decreases from 7.11bps (significant at 5% level) to 0.71 in model [10] (insignificant). If we compare models [3] and [8] we can corroborate that for ABS issuances the *Country Risk*, indeed increases the credit spread. We can also corroborate the fact that for MBS issuance, the country risk increases the credit spread.

The next variable in which is possible to see the changes from table 4.1.2 to table 4.2.2 is the Risk-Free Rate. Starting with the comparisons between models [3] and [8], the coefficients were 66.20 (significant at 1% level) in model [3], different from 1.32 (insignificant) in model [8]. In model [4] the value was 21.77 (significant at 1% level), contrasting with 3.18 (insignificant) in model [9]. Finally, the coefficient was also positive, 45.83 (significant at 1% level) in model [5], and -9.37 (significant at 10% level) in model [10]. Therefore, we cannot corroborate the findings in table 4.1.2, regarding the variable Risk-Free Rate.

Government Yield also suffers some changes in all the three models from table 4.2.2 in comparison to table 4.1.2. Firstly, comparing model [3], in which the coefficient for this variable yield -27.72 (significant at 1% level) with model [8], where the coefficient takes the value of -10.54 (significant at 1% level) we can corroborate the hypothesis that *Government Yield* decreases the credit spread for ABS issuances. Moreover, in model [4] the coefficient for this variable takes the value of -8.26 (significant at 10% level), whereas in model [9] the value is now -13.72 (significant at 5% level). Naturally, we can corroborate the hypothesis that *Government Yield* increases, also reduce the credit spread for MBS issuances.

Finally, if we compare model [5], in which the coefficient takes the value of -23.13 (significant at 1% level) with model [10] in which the value for this variable is -6.23 (not significant) we do not corroborate the hypothesis that Government Yield reduces the credit spread of a CDOs issuance.

The last variable that evidences the changes between the use of adjusted spread in comparison with the use of credit spread is *Creditor Rights*. In fact, in model [3] it takes the value of -19.95 (significant at 1% level), whereas in model [8] it takes the value of -7.26 (significant at 1% level). By contrast the coefficient is positive in model [4], 3.86 (significant at 1% level) and negative in model [9], -4.31 (significant at 1% level). In model [5] the value is -40.63 (significant at 1% level, continuing to be negative in model [10], -17.09 (significant at 1% level). Indeed, we can corroborate that in countries in which the Creditor Rights are higher, it is reflected in a credit spread reduction for ABS and CDOs issuances, although regarding MBS issuances we cannot corroborate the findings of table 4.1.2.

Table 4.1.3: Regression analysis on the impact of the independent variables plus the issuer parent details on the adjusted spread

Dependent variable:	[11]	[11a]	[11b]	[11c]
Adjusted Spread (bps)	ABS, MBS and CDO	ABS	MBS	CDO
Independent variables:				
Intercept	214.77 ***	-89.39	284.79 **	86.64
	(2.93)	(-1.02)	(2.49)	(0.43)
W.E. before crisis	-42.44 ***	44.22 **	-65.98 ***	-34.27
	(-3.50)	(2.39)	(-3.34)	(-1.36)
W.E. crisis	-51.82 ***	9.98	-83.02 **	5.42
	(-2.84)	(0.53)	(-2.44)	(0.14)
Rated	-81.33 ***	-82.72 ***	-99.78 ***	-44.11
	(-4.83)	(-5.69)	(-3.73)	(-0.57)
Rated Rating	19.16 ***	18.68 ***	17.34 ***	28.43 ***
	(41.84)	(40.20)	(14.29)	(13.81)
Transaction Size	0.00 ***	-0.01 ***	0.00	-0.01
	(-2.77)	(-3.52)	(-0.85)	(-1.50)
Tranche to transaction	-0.09 **	-0.23 ***	0.52 ***	0.07
	(-2.23)	(-4.60)	(5.80)	(0.45)
Callable	-0.33	1.71	13.98 **	-36.76 ***
	(-0.08)	(0.36)	(1.86)	(-2.66)
ABS	-41.57 ***	-	-	-
	(-5.40)	-	-	-
MBS	-29.15 ***	-	-	-
	(-3.52)	-	-	-
Number of banks	-1.49	1.23	-0.25	2.65
	(-1.59)	(1.32)	(-0.14)	(0.52)
Currency Risk	11.74	1.26	23.98 ***	15.30
	(1.38)	(0.10)	(2.57)	(0.69)
Maturity	-0.51 ***	0.35	-2.09 ***	-0.40
	(-3.49)	(1.58)	(-7.63)	(-0.94)
Subordinated Debt	-11.03 ***	-17.73 ***	11.24	-16.67
	(-2.74)	(-4.54)	(1.23)	(-1.33)
Fixed Rate	-78.45 ***	-68.79 ***	-61.37 ***	-68.07 ***
	(-16.12)	(-10.58)	(-6.60)	(-3.70)
Country Risk	9.70 ***	19.32 ***	6.79	-61.89 ***
	(4.20)	(5.29)	(1.36)	(-3.26)
Risk Free Rate	-5.94 *	-1.11	-16.75 ***	-22.16
	(-1.85)	(-0.31)	(-2.61)	(-1.56)
Volatility	0.40	1.23 ***	-0.43	2.20
	(1.12)	(2.86)	(-0.83)	(1.30)
Government Yield	3.02	-1.83	6.73	31.63 *
	(0.72)	(-0.51)	(0.86)	(1.76)
GDP per capita	0.00 ***	0.01 ***	0.00	0.00
	(2.80)	(5.11)	(-0.90)	(0.97)
Creditor Rights	-4.07 *	1.96	-9.36 **	-5.35
	(-1.67)	(0.30)	(-2.13)	(-0.76)
UK Borrowers	7.77	-7.73	30.00	-32.16
	(0.63)	(-0.47)	(1.52)	(-0.99)
Ln TA	-0.31	0.37	2.17	-1.12
	(-0.20)	-0.21	(0.69)	(-0.20)
Net Loans/TA	-0.50 **	-0.17	-0.61	-1.52 ***
	(-2.49)	(-0.68)	(-1.50)	(-2.78)
Liquid A/Deposits	-0.02	0.01	-0.10	-0.19
	(-0.35)	(0.15)	(-1.06)	(-0.98)
Loans/Deposits	0.04	0.00	0.25 **	-0.05
	(0.51)	(-0.04)	(1.96)	(-0.31)
Equity/TA	1.11 *	2.24 ***	0.40	1.71
	(1.78)	(2.97)	(0.37)	(0.98)
Cost to Income	-0.22 ***	0.46 **	-0.28 **	-1.62 **
	(-1.55)	(2.40)	(-2.07)	(-2.42)
Year fixed effects	Yes	Yes	Yes	Yes
Number of observations	13,213	9,263	3,172	778
Adjusted R^2	0.50	0.55	0.41	0.63

Note: Table 4.2.3 presents the results of OLS regression analysis of the determinants of Asset Securitization Bonds from 2000 to 2016, and also the split by security type. Adjusted Spread is computed as the margin yielded (in bases points) by the security at issue above a corresponding currency treasury benchmark with a comparable maturity and in case of being a floating spread is added a floating to fix swap at the time of issuance with the corresponding maturity and floating rate to fix the coupon rate. W.E. before crisis is computed by giving 1 to all the observations of W.E. occurred before September 15th 2008. W.E. crisis is computed by giving 1 to all the observations of W.E. occurred before September 15th 2008. Rated takes the value 1 if the tranche is rated. Rated Rating gives the rating according to the S&P credit rating scale at the time of the bond issuance; the rating is converted as follows: AAA=Aaa=1, AA+=Aa1=2, and so on until D=22. Transaction Size gives the value of the transaction at the time of issuance in USD. Tranche to transaction is the percentage that the tranche has in the transaction. Callable takes the value one if the tranche is callable. ABS takes the value one if the tranche refers to an ABS issuance. MBS takes the value one if the tranche refers to an MBS issuance. Number of banks gives the number of banks involved in the deal. Currency Risk takes the value 1 if the deal was done in a currency different from the one used in the country of issuance. Maturity is the maturity of the tranche in years. Subordinated Debt takes the value one if the debt related to the tranche is the last one to be paid. Fixed Rate takes the value one if the coupon of the tranche is a fixed rate one. Country Risk follows a scale of the risk of the country according to the year. Risk Free Rate gives the rate of the US 3-month treasury bills according t the time of the issuance. Volatility refers to the values of the Volatility Index (VIX). Government Yield presents the 10-year government yield of the country in which the bond was issued. GDP per capita per country in which the tranche was issued. Creditor Rights follows the Laporta's Creditor Rights Scale. UK Borrowers takes the value one if the tranche was issued in the UK. Ln TA presents the natural logarithm of total assets for the issuer bank at the year of issuance. Net Loans/TA provides the ratio of short and long-term loans divided by the Total Assets of the issuer bank at the time of the issuance. Liquid A/Deposits presents the assets that can be converted in cash instantaneously in cash divided by the total amount deposits of the issuer bank at the time of the issuance. Loans/Deposits presents the total amount of issued credit divided by the total amount of deposits of the issuer bank at the time of issuance. Equity/TA provides the capital ratio of the issuer bank at the time of the issuance. Cost to Income presents the ratio of operating costs over operating income for the issuer bank at the year of the issuance. ***, ** and * indicates that the reported coefficients are significantly different from zero at the 1%, 5% and 10% levels, respectively. The t-statistics

reported in parentheses are based on heteroskedasticity-consistent standard errors clustered by transaction.

The last robustness check is available in table 4.2.3, that contains four models, [11], [11a], [11b] and [11c]. As it was done before, we have in this table model [11] that regresses adjusted spread in order to the same independent variables as before. In addition, we used as additional controllers the issuer parent details mentioned before. For models [11a], [11b], and [11c], we used the same variables (dependent and independent), but this time each model just uses the observations of each security type as it was done in tables 4.1.2 and 4.2.2.

Starting with model [11] is possible to perceive that for the variable *W.E. before crisis* the coefficient is now, -42.44 (significant at 1% level), being -45.98 (significant at 1% level) in model [2] and -65.80 (significant at 1% level) in model [7]. Clearly, we can conclude that the credit spread of AS bonds issued in Continental Europe before crisis is lower than the one for AS bonds issued in the U.S. and in the U.K.

For the variable *W.E. crisis*, in model [11] the coefficient of this variable is now negative -51.82 (significant at 1% level), if we compare with models [2], in which the value was 20.88 (significant at 1% level) and model [7] in which it was also negative, -22.36 (significant at 1% level). Henceforth, we can corroborate the hypothesis presented in model [7], considering that the credit spreads in Continental Europe during the crisis period were lower than in the U.S. and in the U.K. However, this is against the findings presented in table 4.1.2

The last variable analysing the differences between regions is *UK Borrowers*. In model [11] the coefficient for this variable is now 7.77 (not significant). Though, using this information, model [11] cannot corroborate any findings presented in model [2] or [7].

Continuing the analysis of table 4.2.3, we should now look deeply into models [11a], [11b], and [11c], more specifically to the variables *W.E. before crisis*, *W.E. crisis* and *UK Borrowers*.

Starting with the variable *W.E. before crisis* in model [11a] we can perceive that it is positive, 44.22 (significant at 5% level), being -22.32 (not significant) in model [3] and -7.86 (not significant in model [8]). Clearly for ABS we cannot corroborate the initial idea from models [3] and [8] that the credit spreads in Continental Europe before crisis are not significant. If we now analyse the same variable for model [11b] it has a coefficient of -65.98 (significant at 1% level), similar to -77.86 (significant at 1% level) in model [9] and different from 13.31 (not significant) in model [4]. Once more the models presented in robustness checks give different values for this variable, which lead us to the conclusion that, in fact, the credit spreads for MBS issued in Continental Europe during crisis period are lower than the ones issued in the U.S and in the U.K. Finally, for model [11c] the variable takes now the value of -34.27 (not significant) different from -126.41 (significant at 1% level) in model [5] and -89.00 (significant at 1% level) in model [10]. Hence, since the coefficient for this variable is insignificant in model [11c] we cannot corroborate the initial statement that, indeed, the credit spread for CDOs issued in Continental Europe before crisis is lower than in the U.S and in the U.K.

Regarding *W.E. crisis*, and starting again with model [11a], the coefficient is positive, 9.98 (insignificant), previously negative, -12.04 (insignificant) in model [8] and positive 21.49 (significant at 5% level) in model [3]. In this case it is not possible to verify the conclusion taken in model [3], although, we can corroborate the findings of model [8]. We cannot take any conclusion on how this variable affects the credit spread since it is not significant. Turning our attention to model [11b], the variable *W.E. crisis* coefficient yield the value of -83.02 (significant at 5% level). Previously it took the coefficient of 18.84 (insignificant) in model [4] and -0.27 (not significant) in model [9]. Finally, for model [11c] the variable yields

5.42 (not significant), however in model [5] it was negative, -23.89 (insignificant), and also negative, -41.38 (significant at 10% level) in model [10]. Thus, we cannot state any evidence about the CDOs issuances in Continental Europe during crisis period.

Lastly, for the variable *UK Borrowers* in models [11a], [11b], and [11c] the coefficients are: -7.73 (not significant), 30.00 (not significant), and -32.16 (not significant), contrasting with, 65.34 (significant at 1% level) in model [8], 13.73 (not significant) in model [9], and 88.90 (significant at 1% level) in model [10], and 92.83 (significant at 1% level) in model [3], 86.90 (significant at 1% level) in model [4], and 176.30 (significant at 1% level) in model [5]. In fact, this model does not corroborate the thesis that issuances in the UK for ABS, MBS and CDOs have a higher credit spread, since the coefficients for this variable are insignificant.

5 Answers to the formulated hypotheses

1. Credit spreads and pricing characteristics differ significantly between AS bonds issued in the U.S. versus W.E.

After the analysis of table 3.3.1. is possible for us to conclude that using the same pricing characteristics for AS bonds issued in the U.S. and W.E. we end up having different credit spreads as well as different pricing determinants impacts between the analysed regions.

In fact, the average and the median credit spread is noticeable different between the two regions if we look at all the AS bonds issuances of the sample, being the U.S. and W.E. samples significantly different at 5%. Additionally, if we split our sample in securities as it was done in table 3.3.2 we continue to conclude that for ABS, MBS and CDOs the mean and median of the credit spreads differs between the U.S. and W.E. In fact, the difference of means between the U.S. and W.E. samples are significant at 1% level for MBS and CDOs and at 5% level for ABS

In relation to the pricing characteristics, regarding the previous literature findings it was assumed that the credit spreads of the U.S. and W.E. are impacted by the same pricing characteristics.

Therefore, the pricing determinants used were the same for the U.S. and W.E. sample, however the impacts on credit spreads were different, as verified by the difference of means between the two samples that is statistically significant at 1% level.

If we split the analysis of the pricing factors by security type, as it was done in table 3.3.2, we continue to conclude that the samples are differently affected by the same pricing determinants, due to the 1% level of significance difference

between the samples, except for CDOs Credit Rating in which the difference of means between the samples is not statistically significant.

Indeed, we corroborate, the hypothesis that credit spreads and pricing characteristics differ between AS bonds issued in the U.S. versus W.E.

2. AS bonds credit spread is higher in the U.S. than in W.E.

Again, reviewing table 3.3.1, and the answer to the first hypothesis we corroborated it. Thus, the credit spreads for AS bonds issued in the U.S. and in W.E. are different, and by analysing in different way table 3.3.1 is possible to highlight that not just the mean but also the median for credit spreads is higher for AS bonds issued in the U.S. In reality this was an à-priori expectation since at least after the crisis ECB launched three programmes to buy these kinds of securities, which made the credit spread to decrease. Moreover, the financial crisis was triggered in the U.S. and investors lost more confidence in this market, penalizing more the issuers in the spreads required.

Detailing this evidence presented in table 3.3.1, we can analyse once again table 3.3.2, in which we can divide the average and median credit spread by securities. As a matter of fact, the average and median credit spread for MBS are much higher in the U.S. rather than in W.E. Likewise, the mean and the median credit spreads for CDOs are higher in the U.S. vis-à-vis with W.E. By contrast, the average credit spread of ABS in W.E. is higher than the average credit spread in the U.S., which does not happen with the median that is lower in W.E.

Until now we have strong evidences that the credit spreads in the U.S. are higher than in W.E.

To confirm our hypothesis some linear regression models were conducted, and the results helped to take more prosperous conclusions.

Firstly, in table 4.1.1, model [1] we can see that we have positive coefficients for the variables W.E. before crisis and W.E. crisis (with a significance level of 1%), which means that an AS bond issued in W.E. has on average a higher credit spread than one issued in the U.S. However, if we control for UK borrowers, like in table 4.1.1 model [2] we understand that the coefficient for the variable W.E. before crisis is now negative (with a significance level of 1%) and W.E. crisis is still positive (with a significance level of 1%) but decreases significantly. Finally, the coefficient for the variable U.K. borrowers is extremely high (with a significance level of 1%), yielding 130.61. Therefore, we can conclude that in the U.K. the credit spreads are higher than in the U.S. and in Continental Europe.

Splitting the overall analysis of the credit spreads differences by region into security types, we have to analyse table 4.1.2. models [3], [4], and [5].

Starting with model [3] the variable W.E. before crisis takes a negative value (-22.32), although it is not significant. As opposite variable W.E. crisis and U.K. borrowers take positive values, 21.49 (significant at a 5% level) and 92.83 (significant at 1% level) which means that an issuance of ABS in Continental Europe during crisis period and an issuance in the U.K. have both higher credit spreads than an ABS issuance in the U.S.

In model [4], despite the fact that variables W.E. before crisis and W.E. crisis have positive values, 13.31 and 18.84, the values are not significant. By contrast the variable U.K. Borrowers in this model is positive, 86.90 (significant at 1% level) which leads to the conclusion that, once again the issuances of MBS in the U.K. have higher credit spreads than in the U.S. and Continental Europe.

In the last model of table 4.1.2, model [5], the variable W.E. before crisis takes a negative value of -126.41 (significant at 1% level) and W.E. crisis takes also a negative value of -23.89, but this time it is not significant. The variable U.K. borrowers is one more time positive, 176.30 (significant at 1%level). As for the models [2], [3] and [4], model [5] verifies the evidence that also for CDOs an

issuance in the U.K. represents an increase in the credit spreads if we compare to the U.S. and Continental Europe.

Adding up the findings achieved in tables 4.2.1 and 4.2.2 as the robustness checks for models [1] to [5] we can corroborate some findings.

In model [6] presented in table 4.2.1 we do not corroborate the findings of model [1], for the variable W.E. before crisis. Although, in model [7] we corroborate that credit spreads in Continental Europe before crisis are lower than in the U.K. and in the U.S. For variable W.E. crisis we do not corroborate with models [6] and [7] the findings of models [1] and [2], although from the variable UK Borrowers we do corroborate the findings of model [2] with the ones in model [7].

In table 4.2.2, regarding variables W.E. before crisis and W.E. crisis we just corroborate the findings in model [5] with the ones in model [10] that state that CDOs issued in Continental Europe before crisis had a lower credit spread than the ones issued in the U.K. and in the U.S. Regarding the variable UK Borrowers, we can corroborate that issuances of ABS and CDOs in the U.K. have a higher credit spread than the ones in the U.S. and Continental Europe.

Concluding the robustness checks analysis with table 4.2.3, we cannot corroborate that issuances in the UK have a higher credit neither that CDOs issued in Continental Europe before crisis have a lower credit spread

Finally, we can partially corroborate the hypothesis that credit spreads are higher in the U.S. rather than in W.E. Firstly, we can corroborate that for all types of securities the credit spread is higher in the U.K. vis-à-vis with the U.S. and Continental Europe. Secondly, we cannot conclude if the credit spreads are higher in the U.S. comparing to Continental Europe.

Regarding deal type, we can corroborate the following hypothesis: (*i*) AS bond credit spreads in the U.K. are higher than those of bonds issued in the U.S. or Continental Europe for all AS bond types; (*ii*) CDOs issued in Continental

Europe have lower credit spreads than those issued by U.S. banks in the pre-crisis period; (*iii*) ABS issued by Continental European banks have higher credit spreads than ABS issued by U.S. banks.; and (*iv*) for the remaining periods and AS bond types, spreads do not differ significantly between securities issued in the U.S. and Continental Europe.

3. The 2007-2008 financial crisis and the subsequent European sovereign debt crisis affected significantly AS bonds credit spread and pricing determinants.

To get insights in order to perceive on how the financial crisis affected the credit spreads of AS bonds we have now to observe table 3.3.3 in which the sample of AS bonds issued by banks between 2000 and 2016 was split in two periods: (i) pre-crisis period that goes from January, 1st of 2000 to September 2008 and; (ii) crisis period that covers the period from September 2008 until the end of our period of analysis, December 31st, 2016. Moreover, in that table is also possible to analyse the split by security type.

If we focus ourselves, firstly in the U.S., we can perceive that the average credit spread in the pre-crisis period is higher for MBS than the one in the crisis period, 27.96 against -3.71 (with 1% level significance of difference between sample means). By contrast, for ABS and CDOs issued in the U.S. the mean credit spreads increases on both, from -1.57 to 40.35 and from 80.93 to 132.44, respectively (with 1% level significance of difference between sample means). Analysing now the issuances made by W.E. banks we can see a decrease in the mean credit spreads or MBS and ABS if we compare the pre-crisis with the crisis period. MBS average reduces from 12.26 to -43.85, and ABS from 19.14 to 1.47 (having both samples 1% level of significance of difference between sample means). By opposite CDOs reveal an increase from 33.49 to 180.41 (with 1% level significance of difference between sample means).

From the analysis of the multivariate analysis section we can state looking at models [1] and [2] that issuances during crisis in W.E. have a higher credit spread than the ones issued before crisis, although the other models do not allow us to corroborate that idea.

Summing up, we can state that: (i) for both pre-crisis and crisis period the average credit spreads of MBS are lower in W.E.; (ii) in the pre-crisis period the average credit spread for ABS was higher in W.E. and the average credit spread for CDOs was higher in the U.S.; (iii) during the crisis period the average credit spread for ABS was higher in the U.S. and the average credit spread for CDOs was higher in the W.E.

Regarding the other pricing factors, we can highlight the following evidences: (i) the average credit rating for CDOs increase not just in the U.S. but also in W.E., if we compare the pre-crisis with the crisis period (with 1% level of significance of difference between sample means); (ii) the average number of tranches reduces from the pre-crisis period to the crisis period in all securities and regions, but for CDOs issued in W.E.; (iii) the average country risk increases in W.E. during the crisis period; (iv) fixed rate issuances increase during the crisis period except for CDOs issued in the U.S. (with 1% level of significance of difference between sample means, except for CDOs issued in W.E. that was insignificant).

In order to supplement the previous analysis, from table 4.1.1, model [1] we can conclude that the coefficients between W.E. before crisis (26.60) and W.E. crisis (74.16) are different (with 1%level of significance), being the last one higher, yielding that during crisis the credit spread in W.E. was higher than the one in W.E. before crisis. If we turn our attention to model [2] of the same table the coefficient for W.E. crisis (20.88) is still higher than the one for W.E. pre-crisis (-45.98) (with 1%level of significance), which yields the same conclusion as before.

Additionally, the models presented in table 4.1.2 could have helped us to better detail the above-mentioned statements, although, in this table for model

[4] the coefficients for W.E. before crisis and W.E. crisis are insignificant, happening the same in mode [3] for the variable W.E. before crisis, and in model [5] for the variable W.E. crisis, which do not help to corroborate the previous findings.

6 Conclusion

The impact of the 2007/2008 financial crisis in the credit spread of Asset Securitization Bonds has been a matter of study by the researchers since those financial products played an important role in triggering the global financial crisis. However, literature investigating differences in credit spreads and pricing factors between bonds issued in the U.S. *versus* W.E., as well as in the pre-crisis *vis-à-vis* crisis periods is scant.

This study intends to fill that gap in the literature by performing analyses comparing pre- and crisis periods, bonds issued by banks in the U.S. and W.E. markets, and deal types (ABS *versus* MBS *versus* CDO).

Considering the hypotheses raised, we find that despite both in the U.S. and in W.E. the credit spread of AS bonds is affected by similar factors, we can point out some differences in these factors between the regions. AS bonds issued by the U.S. banks have a higher proportion of fixed rate issuances, lower average transaction size and tranche size, and less issuances exposed to currency risk. We also show that by far the U.K. is the analysed region in which the credit spreads are higher, for the three types of securities (ABS, MBS and CDOs), if we compare with the U.S. and Continental Europe. Furthermore we concluded that the credit spreads of AS bonds issued in Continental Europe in the before crisis period are lower than the ones issued in the U.S. and in the U.K. Additionally in a deep analysis of Continental Europe, we can evidence the effects brought by the Quantitative Easing programmes launched by ECB after the financial crisis, starting in 2011, showing that the credit spreads for AS bonds issued in Continental Europe during crisis were lower than the ones issued in this region before crisis.

Regarding CDOs we concluded that the credit spread of this type of securities is lower in Continental Europe before crisis rather than in the U.S. or the U.K.

Analysing the pricing factors of AS bonds, as expected we corroborate the previous literature that states that rating affects positively the credit spread (one-unit downgrade in the rating of a tranche impacts positively the credit spread). Moreover, we concluded that an increase in the number of banks involved in an AS bond transaction reduces the credit spread of that transaction.

It was also concluded that an increase in the slope of the yield curve (difference between the 10yrs government yield and the 3mth government yield) reflects a decrease in the credit spread. Furthermore, an increase in the country risk is associated to an increase in the credit spread, as well as an increase in volatility.

Regarding Creditor Rights we also concluded that countries with a higher creditor rights coefficient have issuances of AS bonds with lower credit spreads.

With respect to callability, we concluded that callable issuances have a higher credit spread, except for CDOs, in which we achieved the opposite conclusion.

The last conclusion, in line with the previous findings was that an increase in the maturity of an AS bond's tranche reflects a decrease in the credit spread.

As a topic for further studies, the U.K. seems to be a region of potential interest by the researchers since it was not explained in this study why the credit spreads of AS bonds issued in the U.K. are significantly higher than those issued by banks located in the U.S. and Continental Europe. Additionally, we found interesting news about the securitization markets of China and South America. Therefore, it is interesting to know that in China between 2014 and 2016 we accounted 329 deals, resulting in 1,118 tranches, in a total amount of $184 billion. Not so much but also a growing securitization market, is the South America one with 31 deals between 2014 and 2016, 50 tranches and with $3 billion issued. A research investigating these markets would be very valuable to understand better the functioning of AS market.

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Appendix

Rating	Scale	Category	
AAA	1	Prime	Investment grade
AA+	2	High Grade	
AA	3		
AA-	4		
A+	5	Upper medium Grade	
A	6		
A-	7		
BBB+	8	Lower Medium Grade	
BBB	9		
BBB-	10		
BB+	11	Non-investment grade speculative	Speculative grade
BB	12		
BB-	13		
B+	14	Highly speculative	
B	15		
B-	16		
CCC+	17	Substantial risks	
CCC	18	Extremely speculative	
CCC-	19	Default imminent with little prospect of recovery	
CC	20		
C	21		
DDD	22	In default	
DD	22		

Table 7.1.: Rating Scale

Country	Laporta's Creditor Rights until 2005	Laporta's Creditor Rights after 2005
Austria	2	2
Belgium	0	2
Denmark	2	3
Finland	3	3
France	3	3
Germany	1	2
Greece	2	2
Ireland	4	3
Italy	1	2
Netherlands	2	2
Norway	4	3
Portugal	3	2
Spain	4	4
Sweden	3	3
Switzerland	2	2
UK	5	4
USA	5	2

Table 7.2.: Laporta's Creditor Rights

Table 7.3.: Regression analysis on the impact of the independent variables on the credit spread

Dependent variable: Credit Spread (bps)	[1b] ABS, MBS and CDO in US and UK	[1c] ABS, MBS and CDO before crisis
Independent variables:		
Intercept	255.30 **	-280.03 ***
	(2.17)	(-8.95)
WE before crisis	88.77 ***	41.71 ***
	(6.23)	(6.05)
WE after crisis	67.18 **	-
	(2.25)	-
Rated	-61.92 ***	-77.23 ***
	(-6.79)	(-5.10)
Rated rating	21.49 ***	19.95 ***
	(72.18)	(70.78)
Transaction size	0.00 ***	0.00 **
	(2.58)	(2.28)
Tranche to transaction	-0.04	0.15 ***
	(-1.30)	(5.41)
Callable	6.59 ***	-5.22 *
	(2.95)	(-1.93)
ABS	-63.07 ***	-39.27 ***
	(-20.40)	(-11.63)
MBS	-55.33 ***	-37.65 ***
	(-13.38)	(-8.65)
Number of banks	-4.75 ***	-2.38 ***
	(-8.45)	(-4.13)
Currency Risk	-75.66 ***	-56.99 ***
	(-10.98)	(-8.76)
Maturity	-1.76 ***	-0.72 ***
	(-19.68)	(-7.76)
Subordinated Debt	31.78 ***	24.85 ***
	(12.90)	(9.26)
Fixed Rate	151.79 ***	150.68 ***
	(54.05)	(47.66)
Country Risk	66.07 ***	-8.08 ***
	(4.04)	(-2.64)
Risk Free	60.74 ***	49.49 ***
	(26.79)	(22.68)
Volatility	2.116 ***	2.74 ***
	(8.53)	(10.29)
Government yield	-38.83 ***	13.38 ***
	(-13.76)	(4.55)
GDP per capita	0.00	0.00 ***
	(-1.53)	(9.83)
Creditor Rights	-31.66 ***	-6.49 ***
	(-5.58)	(-4.37)
UK	-	-
	-	-
Year fixed effects	Yes	Yes
Number of observations	59,728	51,499
Adjusted R^2	0.62	0.61

Table 7.4.: Regression analysis on the impact of the independent variables on the adjusted spread

Dependent variable: Adjusted Spread (bps)	[6a] ABS, MBS and CDO in US and UK	[6b] ABS, MBS and CDO before crisis
Independent variables:		
Intercept	613.98 ***	148.80 ***
	(8.27)	(4.87)
WE before crisis	-92.19 ***	-39.15 ***
	(-5.56)	(-7.05)
WE after crisis	-124.44 ***	
	(-3.49)	
Rated	-66.42 ***	-62.51 ***
	(-7.29)	(-3.36)
Rated rating	22.18 ***	20.88 ***
	(75.60)	(75.38)
Transaction size	0.00 **	0.00 ***
	(-2.21)	(-3.64)
Tranche to transaction	-0.19 ***	-0.03
	(-7.49)	(-1.26)
Callable	10.91 ***	-1.25
	(6.04)	(-0.62)
ABS	-54.67 ***	-36.30 ***
	(-20.47)	(-13.47)
MBS	-43.33 ***	-29.29 ***
	(-13.00)	(-9.31)
Number of banks	-3.55 ***	-1.72 ***
	(-7.95)	(-4.08)
Currency Risk	-12.80 *	-2.54
	(-1.92)	(-0.43)
Maturity	-0.53 ***	0.35 ***
	(-7.40)	(5.22)
Subordinated Debt	15.86 ***	-9.86 ***
	(7.35)	(-4.25)
Fixed Rate	-61.12 ***	-52.35 ***
	(-31.87)	(-25.18)
Country Risk	-15.61	-4.57 *
	(-1.23)	(-1.72)
Risk Free	-1.09	-1.80
	(-0.64)	(-1.16)
Volatility	1.690 ***	1.42 ***
	(7.23)	(7.08)
Government yield	-0.40	5.87 ***
	(-0.17)	(2.75)
GDP per capita	-0.01 ***	0.00 ***
	(-4.55)	(6.02)
Creditor Rights	9.86	-6.67 ***
	(1.61)	(-4.77)
UK	-	-
	-	-
Year fixed effects	Yes	Yes
Number of observations	56,714	47,457
Adjusted R^2	0.54	0.50