UNIVERSIDAD DE CHILE
FACULTAD DE CIENCIAS FÍSICAS Y MATEMÁTICAS
DEPARTAMENTO DE INGENIERIA INDUSTRIAL

DETERMINANTES DE SPREADS DE BONOS CORPORATIVOS EN EPISODIOS DE ILIQUIDEZ GLOBAL DE MERCADO

MEMORIA PARA OPTAR AL TÍTULO DE INGENIERO CIVIL INDUSTRIAL

ALFONSO IGNACIO SILVA RUIZ

PROFESOR GUÍA:
PATRICIO ANDRÉS VALENZUELA AROS

MIEMBROS DE LA COMISIÓN:
PATRICIO ANDRÉS VALENZUELA AROS
MANUEL ANDRÉS DIAZ ROMERO
SERGIO DANIEL LEHMANN BERESI

SANTIAGO DE CHILE
2013

RESUMEN DE LA MEMORIA
PARA OPTAR AL TÍTULO DE
INGENIERO CIVIL INDUSTRIAL
POR: ALFONSO IGNACIO SILVA RUIZ
FECHA: 12/09/2013
PROF. GUÍA: SR. PATRICIO VALENZUELA

DETERMINANTES DE SPREADS DE BONOS CORPORATIVOS EN EPISODIOS DE ILIQUIDEZ GLOBAL DE MERCADO

Dado que la inversión en capital físico es un driver fundamental del crecimiento económico, es importante entender los determinantes del costo de capital para firmas privadas. Un gran número de investigaciones ha explorado los determinantes de *spreads* de bonos corporativos (Collin-Dufresne, Goldstein y Martin (2001), Huang y Kong (2003) y Chen, Lesmond y Wei (2007)). Estos estudios muestran que tanto el riesgo de no pago como la prima por liquidez son importantes *drivers* de *spreads* de bonos corporativos. Sin embargo, no caracterizan qué tipo de bonos son más vulnerables a episodios de iliquidez en los mercados de deuda ni tampoco analizan si la importancia de la probabilidad de no pago y la prima por riesgo difiere durante periodos de estabilidad financiera versus periodos de iliquidez de mercado.

Usando índices de *option-adjusted spreads* (OAS) del *Bank of America Merrill Lynch* para el período 1999-2003, este *paper* examina exhaustivamente los determinantes de *spreads* de bonos corporativos en tiempos de iliquidez en mercados de deuda. El principal objetivo de este trabajo tiene tres puntos. Primero, siguiendo la literatura mencionada, se desea testear si las variables relacionadas al riesgo de no pago y prima por liquidez son determinantes significativos de los *spreads* de bonos corporativos. Segundo, el *paper* examina las características particulares tales como madurez, calificación crediticia y sector industrial que hacen que ciertos bonos sean más vulnerables a shocks de iliquidez de mercado. Tercero, el trabajo explora si la proporción de la varianza de los *spreads* de bonos corporativos que puede ser explicada por riesgo de no pago y prima por liquidez cambia sustancialmente en tiempos de iliquidez de mercado en comparación con períodos de estabilidad financiera.

Los principales resultados de este trabajo caracterizan los bonos menos afectados durante episodios de iliquidez de mercado en tres formas. Primero, bonos con más mayor madurez son menos afectados. Segundo, bonos con mejor clasificación crediticia son menos afectados. Tercero, bonos de los sectores como el industrial y servicios son menos afectados y bonos del sector financiero o bancario son más afectados por episodios de iliquidez de mercado. Adicionalmente, este *paper* encuentra que la probabilidad de no pago puede explicar una alta proporción de la varianza de OAS durante tiempos de estabilidad, mientras que las variables de iliquidez de mercado se vuelven más relevantes en períodos de estrés financiero.

Los resultados de este *paper* mejoran el entendimiento de los determinantes de *spreads* de bonos corporativos. Además, tienen importantes implicancias para inversionistas que invierten en instrumentos de renta fija, directivos de empresas que necesitan levantar capital en mercados de deuda internacionales y responsables de las políticas que necesitan entender las principales vulnerabilidades durante episodios de inestabilidad financiera.

RESUMEN DE LA MEMORIA
PARA OPTAR AL TÍTULO DE
INGENIERO CIVIL INDUSTRIAL
POR: ALFONSO IGNACIO SILVA RUIZ
FECHA: 12/09/2013
PROF. GUÍA: SR. PATRICIO VALENZUELA

DETERMINANTS OF CORPORATE BOND SPREADS DURING MARKET ILLIQUIDITY EPISODES

Given that investment in physical capital is the key driver of economic growth, it is very important to understand the determinants of the cost of capital for private firms. A large body of research has explored the determinants of corporate bond spreads (see, e.g., Collin-Dufresne, Goldstein and Martin (2001), Huang and Kong (2003) and Chen, Lesmond and Wei (2007)). These studies show that both default risk and liquidity premium are important drivers of corporate bond spreads. However, they do not characterize the bonds that are more vulnerable to episodes of debt market illiquidity and whether the importance of default risk and liquidity premium differs during periods of financial stability versus periods of debt market illiquidity.

Using option-adjusted spread (OAS) indices from Bank of America Merrill Lynch for the period from 1999 to 2013, this paper comprehensively examines the determinants of corporate bond spread indices in times of debt market illiquidity. The main goal of this paper is threefold. First, following the mentioned literature, this paper tests whether variables related to default risk and liquidity premium are indeed significant determinants of corporate bond spreads. Second, the paper examines the particular characteristics such as time to maturity, credit rating and industrial sector that make particular bonds more vulnerable to shocks of market illiquidity. Third, the paper explores whether the proportion of the variance of corporate bond spreads that can be explained by default risk and liquidity premium substantially change in times of market illiquidity in comparison to periods of financial stability.

The major findings in this paper characterize the less affected bonds during market illiquidity episodes in three ways. First, bonds with more time to maturity are less affected. Second, bonds with better credit rating are less affected. Third, bonds from utilities and industrial sector are among the less affected and bonds from financial or banking sector are more affected by episodes of market illiquidity. Additionally, this paper finds that default risk can explain a higher proportion of OAS variance during market stability, while that market illiquidity variables become more relevant in periods of financial distress.

The results in this paper improve the understanding of the determinants of corporate bond spreads. Moreover, they have important implications for investors that invest in fixed income instruments, firm managers that need to raise capital in international debt markets and policy makers that need to understand the main vulnerabilities during episodes of financial instability.

DEDICATORIA

Para mi padre, mi madre y mi hermano

AGRADECIMIENTOS

Agradezco a mi familia y amigos por el apoyo incondicional durante este proceso

A mi profesor guía Patricio, que sin su ayuda y apoyo este trabajo no hubiese resultado.

Por todo, gracias.

CONTENTS

1. INTRODUCTION

Corporate bond spreads have been object of several studies through modern times. Their importance relies on the benefits to two major agents in the economy: investors and enterprises. On one hand, investors need to make their investment decisions based on a solid mathematical foundation. This allows them to know how their investments could be affected by market illiquidity episodes, since the spread represents their return.

Additionally, debt issuing is a powerful channel for corporations to finance their growth decisions and the spread represents the cost of this financing method. Evidence shows that the amount related to debt issuing is significatively more than the equity issued amount for the same period (see Gozzi et al. (2010)). This reaffirms the importance of bond spreads for issuing corporations.

Furthermore, markets have been struck by several illiquidity episodes through history. Different agents play *the* important role during the onset of these episodes since each crisis differs from one another. Examples of this are the dot.com crisis and internet startups, sub-prime crisis and the major breakdown of financial and banking institutions like Lehman Brothers, euro crisis and Greece's default. There is a well-documented literature that explores corporate bond spreads and their major drivers. However, since each crisis is different, those drivers may change over time. Empirical evidence shows that corporate bond spreads behavior differs in market stability periods from global illiquidity episodes.

The historical behavior of corporate bond spreads throughout time can help to build some intuition for the purposes of this paper. In a general way, a bond spread can be affected by three dimensions: time-to-maturity, credit rating quality and economic sector. Figure 1 shows how corporate bond spreads are affected by the aforementioned dimensions. For credit rating, one can see that spreads have a stable behavior in times of financial and economic stability. However, in times of crisis (e.g. the sub-prime crisis of 2008-2009) spreads change dramatically. Analyzing the rating dimension, one can see that *spreads for bonds with better credit rating quality are not as affected by crisis as bonds with worse credit rating quality*. This can be presented as the first intuition.

Doing a similar analysis, Figure 1 also shows how spreads vary across sectors. One can notice that in times of economic and financial stability, spreads follow a stable pattern. But again, in episodes of market illiquidity, spreads rise significatively. Although it is a generalized rise, *this effect is stronger on financial or banking institutions*. Higher leverage levels and a higher market correlation can cause a higher spread increase than on less correlated sectors such as the industrial or utilities. This can be presented as the second intuition.

Finally, Figure 1 presents evidence on the behavior of bond spreads by different maturity levels. Repeating a similar analysis, Figure 1 shows that *bonds with longer maturities are less affected than bonds with shorter maturities*. One possible explanation is that longer maturity bonds (e.g. 10 year bonds) have their major payouts outside the crisis, thus the spread associated does not vary that much. On the contrary, shorter maturity bonds (e.g. 1 year bonds) have their major

payouts during the onset of the crisis. Since episodes of financial distress impact on the short side of the interest rate curve, the effect is stronger in bonds with shorter maturity. This would be the third intuition.

Using an option adjusted spread (OAS) heterogeneous daily novel dataset for the period 10/18/1999 to 1/16/2013, this paper comprehensively examines the determinants of corporate bond spread indices in times of debt market illiquidity. The main goal of this paper is threefold. First, following the mentioned literature, this paper tests whether variables related to default risk and liquidity premium are indeed significant determinants of corporate bond spreads. Second, the paper examines the particular characteristics such as time to maturity, credit rating and industrial sector that make particular bonds more vulnerable to shocks of market illiquidity. Third, the paper explores whether the proportion of the variance of corporate bond spreads that can be explained by default risk and liquidity premium substantially change in times of market illiquidity in comparison to periods of financial stability.

To do so, this study analyzes the behavior of corporate OAS indices throughout the last three major crisis that have struck the market: part of the dot.com crisis (1999-2001), the sub-prime crisis (2007-2009) and the European crisis (2010-2012). Finally a sensibility analysis is intended using different liquidity proxies and a variance decomposition is performed to discuss the evolution of corporate bond spreads drivers over time. A market stability period is used to contrast the obtained results.

Specifically, the main goal of this paper is to *"evaluate the impact of illiquidity market episodes on corporate bond spreads (USD denominated). Also, identify and analyze which bonds and sectors are more vulnerable to the periods mentioned above"*. This will be the major work guideline. Among the secondary goals, obtaining a dataset that represents the bond market for the period under study will set the empirical foundations to run further analysis. Then, one would be able to characterize and model the corporate bond spread behavior for the specified period. Finally, one could conclude which sector is more affected by market illiquidity episodes and bond spreads drivers change over time

As the primary goal states, this paper focuses on analyzing the behavior of USD denominated corporate bond spreads in developed markets. The study of emerging markets is out of the scope. It is necessary to distinguish between these two cases, since bond spreads on emerging markets have different approaches than bond spreads on developed markets. Measuring the market liquidity for the early cases is the interesting challenge presented in related papers (see e.g. Cavallo and Valenzuela (2010)).

2. LITERATURE REVIEW

This section explains the body of research about corporate bond spreads. The literature on the determinants of corporate bond spreads has its origin on Merton (1974), who sets the foundations of basic credit risk structural models allowing the study of bond spreads in different contexts. From this point, the literature for corporate bond spreads has suffered a significant growth.

Collin-Dufresne, Goldstein and Martin (2001) study the determinants of corporate bond spreads using bond data for the industrial sector from 1988 to 1997. They conclude that structural models cannot explain by themselves alone the corporate bond spread changes, using the U.S. Treasury bonds as proxy.

Campbell and Taskler (2003) analyze bond spread changes using idiosyncratic volatility by firm starting from the model proposed by Merton (1974), for a dataset from 1990's (1990-2000). Along with Collin-Dufresne, Goldstein and Martin (2001), they point out that the portion of no-explicability from the structural models must be associated to liquidity.

Chen, Lesmond and Wei (2007) analyze the corporate bond spreads behavior using a new liquidity proxy (LOT proxy, after the initials for Lesmond, Ogden and Trzcinka (1999)) for a dataset from 1994 to 2003, controlling by credit rating. They find that more illiquid bonds tend to have higher spreads, and an increase in their liquidity reduces the spreads significatively.

Huang and Kong (2003) face the same problem utilizing Option Adjusted Spread indices (OAS). Using an OAS dataset from 1997 to 2002, the find that Rusell 2000 Index historical volatility, along with High-Low and Small-Big factors from Fama and French (1992) and some macroeconomic variables, they can explain the 67.68% and 60.82% of spread changes for B and BB- rated bonds respectively (high yield bonds). This shows that spread changes are highly correlated with equity market factors, justifying the inclusion of macroeconomic factors in the credit risk models.

Covitz and Downing (2007) study very short term corporate bond spreads with firm data from 1998 to 2003, analyzing the liquidity effect and controlling by credit rating and maturity. They find that liquidity plays an important role determining bond spreads. However, credit rating plays a much more important role, even in very short term bonds (1 month maturity or less).

Dick-Nielsen, Feldhütter and Lando (2010) analyze the behavior of corporate OAS specifically for the sub-prime crisis. They find that during the onset of subprime crisis, illiquidity increases its explanatory power significatively. Among the results, the slope used is consistently negative throughout the different robustness checks.

Valenzuela (2011) explores the corporate bond spreads behavior using a novel OAS indices dataset from 2004 to 2009. He finds that, besides liquidity premium, market illiquidity has an economically significant effect through rollover risk. This effect exacerbates during crisis episodes and lower rated bonds are among the most affected. Despite the fact that banking and financial institutions have a high exposure to rollover losses, banks are less exposed since they have the support of a lender of last resort.

The presented studies focus the corporate bond spreads problem from different views, taking a versatile set of variables and trying to complement the structural models presented by Merton. Nevertheless, there are some common paths on the solution, such as liquidity proxies. Also controlling the spreads behavior by credit rating, maturity and/or sector is a common practice among academics. Despite the several analysis done by researchers, one must notice that crisis are different from one another. A study that explores the determinants and characterizes the most

vulnerable bonds during different episodes of market illiquidity does not exist. So here is where the gap is found.

3. THEORETICAL FRAMEWORK

This section presents a theoretical framework on corporate bond spreads in order to sustain the hypothesis of this paper. As stated before, this paper explores the effects of illiquidity over corporate bond spreads. The empirical argument presented by Dick-Nielsen, Feldhütter and Lando (2010) sustains the hypothesis of differences between bonds issued by different sectors. Specifically, they find that liquidity premium and bond spreads are higher for financials than industrials. The factors that could explain the difference between sectors are threefold. First, sectors such as financials or banks present high leverage ratios than utilities or industrials. During market illiquidity episodes, leverage ratios and market exposure rise significatively. Therefore, the probability of default of a bond also has an important rise, thus the spread associated increases in response to higher liquidity premiums. Second, market illiquidity episodes may differ from one another. This might cause a higher illiquidity impact over some sectors. Examples of this are sub-prime crisis and financials, or dot.com crisis and internet startups. Third, some sectors such as banking have a strong support through a lender of last resort. This could have an attenuation effect over bond spreads, generating differences across sectors.

During times of market stability, corporate bond spreads follow the classic intuition for time to maturity: longer maturity levels imply more uncertainty and higher risk, therefore, long maturity bonds have higher spreads than bonds with shorter maturities. However, during episodes of financial and economic distress, the interest rate structure inverts, and the intuition goes in the opposite direction, where the illiquidity impact is higher over bonds with short maturity levels. Spread differences due time to maturity can be explained by the following mechanism: under the assumption that two bonds have credit rating quality and issuing sector, shorter maturity bonds have their major payouts during the onset of market illiquidity episodes. This is where de effect of market illiquidity is higher. On the contrary, payouts of bonds with longer maturity levels occur outside the crisis, thus, the illiquidity effect is lower.

Finally, important differences between the effects of illiquidity over investment grade and junk bonds in market illiquidity episodes may appear. The differences are almost non-existent during normal times. Since credit rating represents the probability of default of a bond, bonds with worse credit rating quality should be more exposed to the effects of financial distress, showing higher spreads for being less liquid. On the other hand, a flight to quality effect should be expected towards investment grade bonds, where the impact of market illiquidity is lower.

4. DATA

This section describes the data used for the proposed analysis. The dataset was obtained from BofA Merril Lynch Index Database. It includes 28 OAS indices with different maturities, credit ratings and sectors. The period under study runs from 10/18/1999 to 1/16/2013, capturing the mid-end of dot.com crisis (10/18/1999 – 10/31/2003), a market stability period (10/31/2003 –

2/1/2007), the sub-prime crisis (2/1/2007 – 1/4/2010) and the euro crisis (1/4/2010 – 1/16/2013). All these sub sets consider a post crisis-period and all data is on daily basis.

As for credit rating quality, the dataset counts with AA-AAA and BBB-A rated OAS indices. This will allow to test the first intuition describe in the above section. As for economic sector, the dataset takes into account the following sectors: banks, finance, industrial and utilities. With this information, it is possible to test the second intuition regarding sectors and credit spread changes. Maturity information for each OAS index is grouped as follows: 1-10 years, 10-15 years and 15+ years. This gives the chance to test the intuition for time-to-maturity and its impact over corporate bond spreads. All the information described so far is consolidated in a panel data. For a summary, see Table 4.

Originally, the dataset included 50 OAS indices with the information described above. However, due to massive missing values, some indices were excluded from the analysis. This could have caused biased results. Another cause for data exclusion was the overlapping maturities presented in the available data. Some indices have maturity levels of 5 – 10 years. As one can see, this period is included in the indices with maturities of 1 – 10 years, so including these type of indices does not give any extra information for the proposed analysis. The original dataset also contained information about gas and electric along with utilities and phones issued bonds. The preliminary results using the original dataset showed that the gas and electric sectors were highly correlated with utilities and phones. To correct this bias, these two sector categories where merged in only one, called utilities. In a similar way, there was a major category grouping for credit rating quality. Originally, there were several ratings within indices. These categories were merged into the final two described above: AA – AAA and BBB – A rating.

4.1. OAS indices

The spreads defined so far are associated with a particular instrument, such as a bond. These fixed income instruments might be structured in several ways: can have coupon payments or buying/selling options embedded. These features can affect their value, affecting the instrument's spread. Using such instruments might lead to biased estimations and results (Huang and Kong (2003)).

That's why the use of option adjusted spreads (OAS) is the best alternative to correct the mentioned bias. This type of spread is free of embedded options.[1] The indices utilized in the econometric models are built grouping bonds with similar characteristics according to the three dimensions discussed in previous sections. These instruments are weighted by outstanding amounts, capturing the non-survivability effect, that is, companies that were considered on the index but that no longer exist and must be taken out.

4.2. Variable set

The variable set will change according to the effects evaluated by the regression. In this point, a similar methodology presented in Huang and Kong (2003) is used. They use different

[1] Duffe (1998) finds that bonds with embedded call options and coupon effects do affect the bond spread changes

regressions for each dimension tested (maturity and credit rating). Overall, Table 2 shows descriptive statistics for all variables and Table 3 reports a variable summary.

As stated before, fixed effects are used to control for credit rating, maturity and sector. Each one of these dimensions has a dummy variable associated to each subcategory (e.g. credit rating has 2 subcategories: AA-AAA and BBB-A ratings, each with a dummy variable associated). This approach is similar to Chen, Lesmond and Wei (2007) and suits perfect to panel data. In order to capture the effects of the general economic environment on credit risk firms, the level and slope of the U.S. Treasury yield curve are included, defined as the 10 year on-the-run bond yield and the difference between the 10 year and 2 year U.S. Treasury bond yields respectively.

4.3. Market liquidity measures

This section explains the market liquidity proxies used in the analysis. The first market liquidity proxy used is the on/off-the-run U.S. treasury spread. It corresponds to the difference between the yield of the off-the-run and on-the-run U.S. Treasury bonds. The proxy is constructed based upon on-the-run and off-the-run bond data obtained through the websites of the U.S. Department of Treasury[2] and the U.S. Federal Reserve.[3] Although the issuer of both types of bonds is the same, the major difference between these two instruments relies on their liquidity. Since on-the-run bonds are more liquid than off-the-run bonds, they are traded at higher prices than off-the-run bonds with similar characteristics. Another major difference is the specialness of the on-the-run bonds in the repo markets. This characteristic refers to the fact that on-the-run bonds are frequently able to pledge them as collateral and borrow in the repo market at lower interest rates than those of similar loans with off-the-run bonds as collateral (Sundaresan and Wang, 2009).

The noise measure presented by Xing Hu, Pan and Wang (2012) also performs as a liquidity proxy. It is defined as the difference between bonds with maturities from 1 month to 10 years and their model-implied yield, and it is obtained through the authors' website. The major result of this analysis is that during times of market liquidity, abundant arbitrage capital smoothes out the yield curve. But in illiquidity episodes, the yield curve can move freely due to a shortage of arbitrage capital. This produces a general noise in prices. Thus, the noise can be used to capture the effects of market illiquidity episodes.

The Chicago Board Options Exchange Market Volatility Index (VIX) measures the 30 day future implied volatility of the S&P 500 Index. Commonly known as the "fear gauge", it was included as an independent volatility measure in a first approach and was obtained from Bloomberg. However, Bao, Pan and Wang (2011) explore the relation between changes in market-wide illiquidity and other market variables. They find that changes in illiquidity are positively related to changes in VIX. Moreover, they explain that this relation is not driven solely by the events in 2008 (Sub-prime crisis and Lehmann bankruptcy). Given these findings, preliminary regressions where overestimating for illiquidity effects.

Additionally, empirical evidence shows that stability periods have lower volatility levels, and market expectations remain similar. But in market illiquidity episodes, volatility rises

[2] http://www.treasury.gov/Pages/default.aspx
[3] http://www.federalreserve.gov/

significatively and market expectations go in this direction. This evidence sustains the use of VIX index as proxy for illiquidity. The use of three different liquidity proxies is considered for robustness check. Table 5 shows the correlation matrix containing all the variables used in the analysis.

4.4. Expected results

The next section describes the expected results for this paper. Given the empirical evidence presented so far, there are three major results for each of the intuitions described in the introduction. First, the estimates associated to longer maturity bonds should be statistically significant and higher than shorter maturity bonds. However, the liquidity effect over maturity should be stronger in bonds with shorter time-to-maturity levels. This result should apply for market illiquidity episodes since the interest rate curve inverts during crisis. On the contrary, the estimates for maturity should follow the classical intuition in times of market stability, i.e., longer maturity bonds present higher risk, thus the estimates should be higher and the illiquidity effect should also be stronger.

Second, coefficients on leveraged and highly market-correlated sectors such as banks or financials should be statistically significant and higher than less market-exposed sectors such as industrial or utilities. Although this effect shows during market stability periods, one should expect that this effect differ from one crisis to another, since market illiquidity episodes are different. Moreover, the illiquidity effect should be stronger on banks and financials.

Third, since credit rating measures the probability of default of a certain bond, in market stability periods one should expect that bonds with worse credit rating quality should have higher estimates than high rated bonds. This effect should be exacerbated during market illiquidity episodes as seen on Figure 1. Furthermore, illiquidity effects over bonds with worse credit rating quality should be stronger. Fourth, liquidity measures should have positive and statistically significant estimates, regardless the period taken for the analysis, since liquidity plays an important role during crisis.

Finally, the variance decomposition analysis should show the major drivers for corporate OAS. Along with the results presented in the literature, credit rating and liquidity premium should be the major drivers for corporate bond spreads. Despite this, one should expect that drivers may change over time, since every market illiquidity episode is different.

5. METHODOLOGY

This section explains the methodology used in order to answer the principal questions stated in sections above. In order to construct the dataset, one has to review external databases, such as BofA Merril Lynch Index, DataStream or Bloomberg, and look up for the required indices. Finally establish a consolidated novel panel data. Then, a study of the different approaches to the main problem exposed in the literature is necessary, in order to specify the models for the purposes of this paper. The implementation of the specified models comes afterwards, analyzing if the obtained results are consistent with the intuition. Finally, a robustness check is performed

using different liquidity proxies and sub-set regressions (e.g. a regression for a specific sector or time period). Finally analyze the new results and their significance.

5.1. Panel data

This section explains the benefits and limitations of panel data. Panel data has several advantages when analyzing a heterogeneous dataset. However, it also has its limitations. The discussion centers on the points presented in Baltagi (2008).

Among the benefits, panel data can efficiently control by heterogeneity across individuals, since assumes that individuals behave in a different way. Times series and cross-section approaches do not include this effect, thus, there is a risk of obtaining biases results. Also, panel data shows more information, more variability, less collinearity among variables, more degrees of freedom and more efficiency. Time series studies usually have multicollinearity issues, obtaining biased estimations and results. Finally, panel data suits better for studying adjusting dynamics. Time series and cross section analysis cannot identify adjusting dynamics over time. Examples of this are monetary policies, or unemployed population over time.

The use of panel data also has its limitations. Data collecting issues and error measurement distortions are common in panel dataset. Selection issues are also possible. Examples of this are individuals who do not work by unemployment but by own choice (e.g. salary preferences not fulfilled), affecting unemployment indices. In this case, one has to assume that the data delivered by Merril Lynch and Bloomberg is well computed and the indices used can be a representative sample of the bond market.

Despite this, there is in fact some lack of data, hence the initial treatment. There is also a short temporal dimension issue for panel data, meaning that asymptotic arguments showed in the literature are not valid for short periods of time. The period under study in this paper runs for over 13 years, thus, this issue should not be a concern. Given all this evidence, panel data should be a viable choice for exploring the determinants of corporate bond spreads.

5.2. Empirical models

This section describes the empirical approach in order to explore the main determinants of corporate bond spreads. In a general way, the econometric approach is as follows:

$$OAS_{it} = \alpha + \beta_1 D_i^{rating} + \beta_2 D_i^{sector} + \beta_3 D_i^{maturity} + \beta_4 Crisis_t + \beta_5 slope_t + \beta_6 yield_t + u_{it} \qquad (1)$$

Where the subscript it represents the value of the OAS index i at a time t. The $Crisis$ factor measures the market liquidity. The term u_{it} represents the regression error and α stands for the constant. The dummy variables capture the fixed effect by rating, sector and maturity (the use of fixed effects will be discussed in detail in further sections).

In order to capture the effects of the general economic environment on the credit risk of firms, the level and the slope of the U.S. Treasury yield curve are included, defined as the 10 year bond yield, and the difference between the 10 year and 2 year U.S. Treasury bond yields. To amplify the baseline regressions, interaction effects with illiquidity proxies are included:

$$OAS_{it} = \alpha + \beta_1 D_i^{rating} + \beta_2 D_i^{sector} + \beta_3 D_i^{maturity} + \beta_4 Crisis_t + \beta_5 slope_t + \beta_6 yield_t + \beta_7 Crisis\ x\ D_i^{sector} + \beta_8 Crisis\ x\ D_i^{sector} + \beta_9 Crisis\ x\ D_i^{maturity} + u_{it} \quad (2)$$

With this approach it is easier to isolate the individual effect of each dimension and to analyze its impact on corporate bond spreads, thus it is easier to check the intuition.

5.3. Variance decomposition analysis

A variance decomposition analysis is also performed,[4] to identify the explanatory power of each factor included in the regression. This analysis is performed for each period described above. The equation is as follows:

$$1 = \frac{Cov(OAS_{it}, \beta_1 D_i^{rating})}{Var(OAS_{it})} + \frac{Cov(OAS_{it}, \beta_2 D_i^{sector})}{Var(OAS_{it})} + \frac{Cov(OAS_{it}, \beta_3 D_i^{maturity})}{Var(OAS_{it})} + \frac{Cov(OAS_{it}, \beta_4 Crisis)}{Var(OAS_{it})} + \frac{Cov(OAS_{it}, \beta_5 slope_t)}{Var(OAS_{it})} + \frac{Cov(OAS_{it}, \beta_6 yield_t)}{Var(OAS_{it})} + \frac{Cov(OAS_{it}, u_{it})}{Var(OAS_{it})} \quad (3)$$

6. MAIN RESULTS

6.1. Baseline results

This section reports the major findings in this paper. Table 6 presents the results of the specified regressions for the whole period of study. Columns (1) and (2) show the results using only fixed effects by credit rating, industrial sector and time-to-maturity. As expected, this approach does not give enough information to conclude significatively since there are no variables capturing the market effects over corporate bond spreads.

Columns (3) – (5) show the results from estimating equation (1). The coefficients associated with credit rating are high and statistically significant. Overall, the table shows that indices with worse credit rating quality have higher spreads than indices with better credit rating quality. This effect is consistent with the literature.

Fixed effects by sector have the expected sign. This indicates that bond spreads of sectors such as the financial or banking are higher than the utilities or industrial sectors. High leverage ratios and a higher market correlation can explain these results. The banking sector might be less risky than financial, since banking institutions count with a lender of last resort. The coefficients associated with the U.S. Treasury 10 year bond yield and the slope are negative and statistically significant. This suggests that the long end of the Treasury curve drive changes. These results are consistent with Duffee (1998) and Dick-Nielsen, Feldhütter and Lando (2012).

Maturity levels also show significant estimations. The results suggest that bonds with longer time-to-maturity have higher corporate bond spreads. This is consistent with the classical intuition since longer maturities imply more uncertainty, therefore, higher risk. Finally,

[4] In order to perform this analysis, the noise measure (Hung, Pan and Wang, 2012) is used as liquidity proxy except for the euro crisis.

coefficients associated with liquidity premium are positive and statistically significant as expected, showing consistency with the literature.

6.2. Interaction effects

Table 7 augments the baseline regressions with interaction terms, in which one interacts the market illiquidity variables with credit rating, time-to-maturity and economic sector respectively. It reports the results from estimating equation (2) for the whole sample by OLS. I use three measures for market illiquidity: the on/off the run U.S. Treasury 10 year bond spread, the noise measure (see Hung, Pan and Wang (2012)) and the VIX index.

Columns (1) – (3) show the estimates for credit rating interactions. The results indicate that market illiquidity is positively related to corporate bond spreads and that this effect is stronger in bonds with lower credit rating. This finding goes in the same direction as the intuition presented in the introduction section, as lower credit rating quality implies higher risk of default.

Columns (4) – (6) report the coefficients on maturity interactions. The results suggest that the impact of market illiquidity over bonds with shorter time-to-maturity is higher, as their major payouts occur during the onset of these episodes. On the contrary, bonds with longer time-to-maturity are less affected since interest rate curve changes affect the short side and the major payouts occur outside these episodes of market illiquidity.

Columns (7) – (9) show the estimates for economic sector interactions. The results indicate that indices from utilities and industrials are among the most affected by episodes of financial distress, even over banking or financial sector.

6.3. Variance decomposition analysis

I perform a variance decomposition analysis in order to quantify each factor's relative contribution on explaining the variance of corporate spreads. Noise measure is used as liquidity proxy. Results show that credit rating, U.S. treasury yield and the noise measure can explain 63% of corporate bond spreads' variance. The noise measure can explain the 41.73% by itself. This result is consistent with the intuition, since liquidity plays an important role in market illiquidity episodes according to structural credit risk models. This also proves that bonds with worse credit rating quality are more affected in times of financial distress. The major results can be found in Table 8.v

7. ADDITIONAL RESULTS

There exists the possibility that corporate bond spreads are driven by different factors over time and the use of the whole sample would not allow to foresee this effect. This section explores whether the main determinants of corporate bond spreads differ across different time periods and sectors. I use four sub-samples by period (dot.com crisis, period of market stability, sub-prime crisis and euro crisis) and four sub-samples by sector (financials, banks, industrials and utilities). Liquidity proxies remain the same.

7.1. Sub-samples by period

7.1.1. Dot.com crisis

7.1.1.1. Baseline results

Table 9 reports the results for the dot.com crisis sub-sample. Columns (1) and (2) show the results only using fixed effects by credit rating, time-to-maturity and economic sector. As stated before, this approach is simplistic, due to its incapability to capture the market environment.

Columns (3) – (5) show the results from estimating equation (1). Similarly, the coefficients associated with credit rating are high and statistically significant. Altogether, the table reports that indices with worse credit rating quality have higher spreads than indices with better credit rating quality. This effect is consistent with the literature since credit rating measures the probability of default.

Contrary to the results presented in the above section, fixed effects present a different behavior during the dot.com crisis. The coefficients across sectors are similarly high and statistically significant. Furthermore, financials and utilities indices present the highest corporate bond spreads since these sectors were among the most affected by the dot.com crisis, due to their high involvement in internet startups.

Coefficients on time-to-maturity are also statistically significant. The results indicate that bonds with longer maturities have higher corporate bond spreads. Additionally, bonds with shorter maturities have lower spreads. These results are consistent with the main results discussed in above sections.

The coefficients associated with the US. Treasury interest rate curve and slope are significatively negative and also statistically significant, showing the effect of the crisis on the interest rate structure. These results are consistent with Dick-Nielsen, Feldhütter and Lando (2010). Finally, estimates on liquidity premium have the expected sign.

7.1.1.2. Interaction effects

Table 10 amplifies the baseline regressions with interaction terms. It reports the results from estimating equation (2) for the dot.com crisis sub-sample by OLS. The same proxies for market illiquidity are used.

Columns (1) – (3) show the coefficients associated with credit rating interactions. The results suggest that market illiquidity, again, has a positive impact over corporate bond spreads and this effect is stronger on bonds with lower credit rating quality. During periods of market illiquidity, the probability of default of corporate bonds rises, hence, there is a higher impact over corporate bond spreads.

Columns (4) – (6) report the coefficients on time-to-maturity interactions. These results suggest that shorter maturity bonds are more affected by episodes of financial distress since their major payouts occur during the onset of the dot.com crisis. On the other hand, longer maturity bonds are less affected by these episodes, due to the fact that interest rate curve is affected on the short side and the major payouts of these bonds occur outside de crisis.

Finally, columns (7) – (9) present the coefficients associated with sector interactions. Results indicate that, among the economic sectors used in the analysis, utilities and financials are more affected by the dot.com crisis. This crisis was produced by the burst of internet company bubbles, as they were not as profitable as the investors thought. The index used as "utilities" has several telecom companies, which invested important sums of money on internet companies. As a result, utilities and financials issued bonds are among the most affected during dot.com crisis

7.1.1.3. Variance decomposition analysis

Similar to the above section, we perform a variance decomposition analysis in order to quantify each factor's relative contribution on explaining the variance of corporate spreads. Noise measure is used as liquidity proxy. The results suggest that credit rating can explain the 37.8% of corporate bond spreads variance by itself. As a result, one can conclude that credit rating quality is **the** determinant of corporate bond spreads during the dot.com crisis. This result is consistent with the literature (Covitz and Downing, 2007). Again, results are summarized in Table 8.

7.1.2. Period of market stability

7.1.2.1. Baseline results

Table 11 describes the results for the period of market stability. Columns (1) and (2) show the results only using fixed effects by credit rating, time-to-maturity and economic sector. Similar to the section above, this approach does not capture the market environment.

Columns (3) – (5) report the results from estimating equation (1) for this sub-sample. The results suggest that coefficients on credit rating quality differ on level from the ones on the dot.com crisis. Despite this, the table shows that lower credit rating quality bonds have higher corporate bond spreads and vice versa. This effect is consistent with the intuition, however, is not as strong as it is during times of financial distress

Coefficients associated with economic sector also differ. The estimates associated with fixed effects have the expected sign and are statistically significant. However, during periods of market stability, indices for financial or industrial companies present higher corporate bond spreads. On the other hand, bonds from banks or utilities have lower spreads. These results are consistent with the intuition, since financial or banking institutions present higher market correlations and higher leverage levels. These two effects should rise liquidity premium for bonds from these sectors.

Maturity also shows significant estimates. Coefficients on longer maturity bonds are high and statistically significant. These results indicate that, during periods of market stability, longer maturity bonds have higher spreads than bonds with shorter maturities. This finding is consistent with the classical intuition since longer maturities imply more uncertainty, therefore, have a higher liquidity premium.

Finally, the coefficients associated with the US. Treasury interest rate curve and slope are have the expected sign and are statistically significant. Also, liquidity premium has the expected sign.

Given this points, one can imply that the major risk factors for corporate bond spreads during periods of market stability are twofold. First, credit rating as it reflects the probability of default. Second, the maturity as longer maturities present higher uncertainty, hence more risk. Although these effects are present during this period, they are not as strong as they are during episodes of market illiquidity

7.1.2.2. Interaction effects

Table 12 augments the baseline regressions with interaction terms, using the same liquidity proxies as before. It reports the results from estimating the equation (2) for the market stability sub-sample by OLS.

Columns (1) – (3) report credit rating interactions. The results suggest that market illiquidity has a positive impact over corporate bond spreads. This effect is stronger on bonds with lower rating quality, however, the difference is not as strong as it is during market stability periods. This effect is consistent with the intuition, since bonds have a similar behavior on this period.

Columns (4) – (6) describe maturity interactions. The coefficients on time to maturity are statistically significant. The results suggest that market illiquidity has a higher impact over short maturity bonds.

Finally, Columns (7) – (9) show the results for the sector interactions. The results suggest that market illiquidity has a similar impact over bonds across sectors. However, the effect is stronger on bonds from utilities and industrials.

7.1.2.3. Variance decomposition analysis

Similar to the above section, I perform a variance decomposition analysis in order to analyze the importance of each factor for corporate bond spreads. Noise measure is used as a liquidity proxy. The results suggest that spread changes are driven by maturity and credit rating, with special importance on the latter. Furthermore, these two factors can explain together the 59.36% of OAS variance and credit rating quality can explain the 44.43%. This is consistent with the literature. Table 8 describes the analysis in detail.

7.1.3. Sub-prime crisis

7.1.3.1. Baseline results

Table 13 describes the results for the sub-prime crisis sub-sample. Columns (1) and (2) show the results only using fixed effects by credit rating, time-to-maturity and economic sector. Similar to the section above, this approach does not capture the market environment.

Columns (3) – (5) show the estimations from equation (1) the sub-prime crisis. The coefficients on credit rating are high and statistically significant. Moreover, the table shows that bonds with worse credit rating quality have higher spreads than bonds with better rating quality. This result is consistent with the literature and similar to the results obtained in the above sections. However, the difference is significatively stronger than it is on other sub-samples.

Maturity estimations have the expected sign and are statistically significant. The coefficients on time-to-maturity indicate that bonds with shorter maturities have lower spreads and vice versa. Although these results are consistent with the literature, again, the effect is significatively stronger for this sub-sample.

Coefficients associated with sector also differ. The coefficients associated with fixed effects by sector are statistically significant. These results indicate that bonds from financial or banking institutions have spreads seven to ten times higher than bonds from utilities or industrial companies. This is consistent with the empirical evidence, since hedge funds and several banking institutions played a primary role during the onset of the sub-prime crisis. Furthermore, the difference between financials and banks relies on the fact that banking institutions count with a lender of last resort.

7.1.3.2. Interaction effects

Table 14 amplifies the baseline regressions with interaction terms. It describes the results from estimating equation (2) for the sub-prime crisis by OLS. Market illiquidity proxies are the same as the ones used in the above sections.

Columns (1) – (3) show rating interactions. Similarly, market illiquidity has a positive impact over corporate bonds spread, where lower credit rating quality bonds are, again, more affected. As one can remember, there were several financial instruments that were highly traded and strongly dependent on credit rating. Examples of this are CDO's (and all its variants), which could deliver AAA rated instruments using junk bonds.

Columns (4) – (6) describe the results for maturity interactions. The coefficients on time-to-maturity have the expected sign and are statistically significant. These results indicate that shorter maturity bonds have higher spreads than bonds with longer maturities. The effect is similar to the previous sub-samples, but even so, the effect is stronger during the sub-prime crisis.

Finally, columns (7) – (9) show the results for sector interactions. Consistent with the risk analysis made for Table 13, financial and banking institutions are more affected by market illiquidity. Besides the correlation and leverage analysis presented above, these institutions were the principal and most affected players during the sub-prime crisis. In one hand, banks were delivering house loans with almost no background check (the so called NINJA loans or "no income, no job, no assets"). Furthermore, banking institutions were investing on CDO's, CDS's and other similar instruments during this crisis, selling these loan portfolios to hedge funds and other investors. Moreover, hedge funds were selling these instruments and buying risky debt, and everyone was buying securitizations against their investments.

Once the bubble busted, the quality of their debt was not as good as investors thought, incurring in several losses during this crisis. The leverage ratios doubled or tripled almost instantly, and the crisis was unleashed. The lender of last resort had to act to stabilize markets, and "too big to fail" companies such as Morgan Stanley or Goldman Sachs were bailed out. Others like Lehman Brothers just could not be saved and filed for bankruptcy. This examples show and confirm that

banking sector is backed up by its lender of last resort, and financial institutions might be more exposed to illiquidity episodes (as regressions show).

7.1.3.3. Variance decomposition analysis

Table 8 reports the detailed results from the variance decomposition analysis. One major finding of this paper is that liquidity premium is **the** principal driver of corporate bond spreads changes during the sub-prime crisis. This result is consistent with Dick-Nielsen, Feldhütter and Lando (2010). Overall, Table 8 indicates that liquidity by itself can explain the 37.12% of corporate bond spreads variance. Lower credit rating quality and long maturity levels have 9.42% and less than 1% of explanatory power respectively.

In conclusion, if one contrasts these results with the ones obtained for the market stability period, one can notice that there is a radical change among the explicability of corporate bond spread changes, since lower credit rating quality and long maturity levels explain 44.43% and 14.92% respectively. On one hand, credit rating and longer maturities appear to be the principal drivers during market stability periods since these two variables capture the high risk factors that impact over bonds in a traditional way. On the other hand, sub-prime crisis indicates that during illiquidity episodes, the major risk is associated to liquidity premiums and the classical drivers lose their explanatory power over corporate OAS.

7.1.4. Euro crisis

7.1.4.1. Baseline results

Table 15 shows the results for the euro crisis sub-sample. Columns (1) and (2) show the results only using fixed effects by credit rating, time-to-maturity and economic sector. Once again, this approach does not capture the market environment.

Columns (3) – (5) show the results from estimating equation (1) for euro crisis by OLS. Similar to the sections above, coefficients on lower credit rating quality are high and statistically significant. These results suggest that bonds worse credit rating quality have higher spreads than bonds with a better credit rating quality. This finding is consistent with the literature and similar to the ones obtained for the other sub-samples.

Maturity estimations are statistically significant as well and have shown a similar behavior for the three previous sub-samples. However, coefficients on time-to-maturity are twice as high during the euro crisis. Although this effect is expected, is stronger than it is for other sub-samples. These results suggest spreads associated with longer maturities are higher by forty basis points over bonds with shorter maturities.

In contrast to other sub-sets, estimates associated with economic sector present different results. Although all estimates are statistically significant, coefficients on financials and banking institutions are considerably higher than the coefficients associated to utilities or industrials. These results indicate that spreads of bonds from the first two sectors are up to nine or ten times higher than the spreads of bonds from the latter sectors. This effect was expected, as banks were among the most affected institutions during the onset of the euro crisis.

7.1.4.2. Interaction effects

Table 16 augments the baseline regressions with interaction terms. It describes the results from estimating equation (2) for the euro crisis by OLS. Market illiquidity proxies are the same as the ones used in the above sections.

Columns (1) – (3) describe the results for credit rating interactions. Similar to above sections, market illiquidity has a positive impact over credit rating. This effect is stronger on bonds with worse rating quality. This result is consistent with the literature and with the prior findings.

Columns (4) – (6) show the results for maturity interactions. Coefficients associated to time-to-maturity are also statistically significant, following a similar pattern during the other sub-samples. Overall, the table confirms the fact that short maturity bonds are more affected by market illiquidity. This result is consistent with the literature and with the results obtained so far.

Finally, columns (7) – (9) show the results for sector interactions. Coefficients on economic sectors are all statistically significant. Market illiquidity has a similar impact across sectors. However, the effect over banking and financial institutions is stronger than it is over utilities or financials. Euro crisis involved banks and governments who could not fulfill their role as lenders of last resort (e.g. Greece and their defaulted bonds). This might explain the low difference between the financial and banking sector, as they were both highly exposed to the effects of market illiquidity.

7.1.4.3. Variance decomposition analysis

In addition, I perform a variance decomposition analysis in order to quantify each factor's relative contribution on explaining the variance of corporate spreads. The results suggest that credit rating quality and fixed effects by sectors such as industrials and utilities are the principal factors that explain the behavior of corporate bond spreads during the euro crisis, with a 66.16% total. Lower credit rating quality explains a 30.39% by itself. For this analysis, VIX is used as liquidity proxy, since noise measure does not have enough data to explain this period.

7.2. Sub-samples by sector

7.2.1. Baseline results

Tables 17 to 24 show the results from estimating equations (1) and (2) for sector sub-samples by OLS. I use the same liquidity proxies presented in above sections. Common patterns can be found among the results. The coefficients on credit rating are high and statistically significant across sectors. This confirms the importance of the probability of default in a bond's value. Surprisingly, this effect does not apply to banking sector.

Estimates on maturity are statistically significant as well. Results suggest that longer maturity bonds have higher spreads than bonds with shorter maturity levels. These result is consistent across sectors, however, the effect is not as strong for utilities issued bonds. In addition, coefficients associated with liquidity premium are statistically significant and have the expected positive sign.

7.2.2. Interaction effects

Coefficients on credit rating are statistically significant and show similar behavior across sectors. The results indicate market illiquidity episodes have, again, a positive impact over corporate bond spreads. This effect is stronger on bonds with worse credit rating quality. Coefficients associated with time-to-maturity are statistically significant and follow a similar behavior as the findings from the above section. The results suggest that shorter maturity bonds are more affected by episodes of financial distress. This effect is consistent across sectors.

8. POLICY DISCUSSION

This section sets a policy discussion regarding corporate bond spreads. Given the results and discussion reported above, one can mention a series of suggestions for policy makers in attempt to prevent market illiquidity episodes and establishing a better and healthier economic environment. The discussion is separated in three major points, regarding the three important market illiquidity episodes analyzed in this paper.

8.1. Dot.com crisis

Internet companies played an important role in the dot.com crisis. Investors threw money at these entities, assuring that they were the next moneymakers of the next century, generating an internet bubble that busted and caused the crisis. The major problem was that companies were not as solvent as investors thought. With this in mind, policy makers should pay special attention to market bubbles, since correlation s increase significatively during episodes of financial distress and diversification theories do not apply normally. Also, empirical evidence has demonstrate that normal distributions on market issues present fat tails. As a result, the probability of an episode of market illiquidity is not as low as theoretical models show.

As a consequence of this crisis, the regulatory framework involving companies was reinforced. Despite this, internet companies should be regulated more strictly, analyzing performance ratios, and study carefully the real capacity of companies for generating revenues. Nowadays, internet giants play important roles in the economy. Companies such as Google or Facebook have important investments and new companies can rise in the future. As an example, few weeks after when Facebook went public on 2012, its price went down considerably, as investors thought it would generate more revenues than it actually could. The important task for policy makers is to establish a strict regulatory framework to prevent episodes such as the dot.com crisis in the early 2000's, assuring the real solvency for this type of company.

8.2. Sub-prime crisis

Sub-prime crisis has been over analyzed due to its major impact over the economies worldwide. In the task of trying to find a "guilty", many pointed out the role played by hedge funds, banks and/or the U.S. government during the crisis. The sub-prime crisis left market giants such as Lehman Brothers in bankruptcy and the "lender of last resort" was not as powerful as investors thought. Analyzing the financial instruments used in this crisis, one can see that a major factor that could have caused this crisis is the investor's trust over credit ratings. Many of these

instruments were rated AAA or "investment grade", but actually they were built based on junk bonds or "non-investment grade" portfolios. Then a question appears: what is truly an investment grade?

Empirical evidence shows that in times of market stability, ratings can predict quite well the probability of default of a financial instrument, such as a bond. Table 25 shows the evolution of Standard & Poor's rating since 1990 to 2011. Here, one can appreciate that AAA bonds have almost 0% probability of default. Despite this, the quality of the information given by a rating decreases significatively during market illiquidity episodes.

Policy makers should evaluate the possibility of giving a more dynamic information criterion for probabilities of default. The sub-prime crisis put this issue on evidence. Better ratings can also be better indicators for illiquidity episodes. Along with this, the market of rating agencies has high entrance barriers, making it low competitive. The regulation regarding rating agencies should be in favor of competition, giving the opportunity to new agencies which can improve the existing methods, or even establish new ones, that are more dynamic and reflect a more real probability of default.

8.3. Euro crisis

The non-banking financial sector was the biggest loser during the euro crisis. Despite the fact that banks also suffered during this crisis and some lenders of last resort could not response to the needs of their banking institutions, non-banking financial institutions cannot rely on a backup during illiquidity episodes. The agency problem regarding banks has been studied by many authors, and the discussion of the incentives that some investors may or may not have can depend on the existence of this almighty lender.

Policy makers may analyze the possibility of creating an institution that can serve as a lender of last resort for the non-banking financial institutions. This entity could ensure the survivability of the economic system during crisis. Another suggestion is the proper creation of financial instruments that can inject liquidity into markets. Since one of the major results of this paper is the important role of liquidity during crisis, these type of instruments can control crisis, diminishing the effects of illiquidity onto the economies, and also could be able to prevent them, using these instruments ex-ante.

9. CONCLUSIONS

This paper explores the principal determinants of corporate bond spreads during global market illiquidity episodes. Using fixed effects by credit rating, maturity and sector; the results confirm that liquidity and credit rating are the principal drivers corporate bond spreads during episodes of market illiquidity (see e.g. Covitz and Downing (2007)). However, the proportion of the variance explained by these two factors actually changes over time. The variance decomposition analysis confirms this hypothesis, as credit rating quality goes from explaining 44.43% during the period of market stability to 9.42% during the sub-prime crisis. Moreover, for the same period, liquidity premium goes from explaining almost 1% of corporate bond spread changes during the market stability period to 37.12% during the sub-prime crisis.

Regression analysis by time-to maturity suggest that bonds with shorter maturities are more affected by shocks of market illiquidity. This confirms the intuition presented based on the empirical evidence. Moreover, bonds with worse credit rating quality are indeed more vulnerable by episodes of market illiquidity than bonds with better credit rating quality. These results suggest that probabilities of default rise during market illiquidity episodes as expected.

Although market illiquidity shocks have a significant impact across sectors, the results suggest that there are two main clusters that can be affected by crisis: the financial sector, including banking and non-banking institutions; and the industrial sector along with utilities companies. Analysis suggests that bonds from the financial or banking sector are more exposed to episodes of financial distress, confirming the last hypothesis. Despite the similarity presented in between the first group, banks count with a lender of last resort, amortizing the effects of illiquidity over these institutions. The results are robust using three different liquidity proxies and controlling for the economic environment using the level and slope of the interest rate curve. In addition, this paper concludes with a policy suggestion series, indicating policy makers the importance of regulation regarding credit rating for investment purposes.

10.REFERENCES

R. C. Merton, «On the Pricing of Corporate Debt: The Risk Structure of Interest Rates,» *The Journal of Finance,* vol. XXIX, nº 2, pp. 449-470, May, 1974.

F. A. Longstaff y E. S. Schwartz, «A Simple Approach to Valuing Risky Fixed and Floating Rate Debt,» *The Journal of Finance,* vol. L, nº 3, pp. 789-819, Jul, 1995.

R. Litterman y J. A. Scheinkman, «Common Factors Affecting Bond Returns,» *Journal of Fixed Income,* Jun, 1991.

D. A. Lesmond, J. Ogden y C. Trzcinka, «A New Estimate of Transaction Costs,» *Review of Financial Studies,* vol. XII, nº 5, 1999.

D. Lando, Credit Risk Modeling: Theory and Applications, Princeton Series in Finance, 2004.

E. F. Fama y K. R. French, «The Cross-Section of Expected Stock Returns,» *The Journal of Finance,* vol. XLVII, nº 2, pp. 427-465, Jun, 1992.

D. Duffie y K. J. Singleton, Credit Risk: Pricing, Measurement & Management, Princeton Series in Finance, 2003.

G. R. Duffee, «The Relation Between Treasury Yields and Corporate Bond Yield Spreads,» *The Journal of Finance,* vol. LIII, nº 6, Dec, 1998.

D. Covitz y C. Downing, «Liquidity or Credit Risk? The Determinants of Very Short-Term Corporate Yield Spreads,» *The Journal of Finance,* vol. LXII, nº 5, Oct, 2007.

P. Collin-Dufresne, R. S. Goldstein y J. S. Martin, «The Determinants of Credit Spread Changes,» *The Journal of Finance,* vol. LVI, nº 6, pp. 2177-2207, Dec, 2001.

L. Chen, D. A. Lesmond y J. Wei, «Corporate Yield Spreads and Bond Liquidity,» *The Journal of Finance,* vol. LXII, nº 62, p. 119–149, Feb, 2007.

E. A. Cavallo y P. Valenzuela, «The Determinants of Corporate Risk in Emerging Markets: An Option-Adjusted Spread Analysis,» *International Journal of Finance and Economics,* vol. XV, nº 1, pp. 59-74, 2010.

J. Y. Campbell y G. B. Taskler, «Equity Volatility and Corporate Yield Bonds,» *The Journal of Finance,* vol. LVIII, nº 6, Dec, 2003.

B. H. Baltagi, Econometric Analysis of Panel Data, Wiley; 3rd edition, 2008.

S. Sundaresan and Z. Wang, "Y2K Options and the Liquidity Premium in Treasury Markets," *Review of Financial Studies,* vol. XXII, no. 3, pp. 1021-1056, 2009.

G. Xing Hu, J. Pan y J. Wang, «Noise as Information for Illiquidity,» 2012.

J. Dick-Nielsen, P. Feldhütter y D. Lando, «Corporate bond liquidity before and after the onset of the subprime crisis,» *Journal of Financial Economics*, vol. CIII, nº 3, pp. 471-492, 2012.

M. R. Roberts y T. M. Whited, «Endogeneity in Empirical Corporate Finance,» *Simon School Working Paper No. FR 11-29.* , Oct, 2012.

P. Valenzuela, «Rollover Risk and Corporate Bond Spreads,» *Wharton Financial Institution Center*, 2012.

J.-Z. Huang y W. Kong, «Explaining Credit Spread Changes: Some New Evidence from Option-Adjusted Spreads of Bond Indices,» *New York University, Stern School of Business Finance Paper No. 03-013.*, Jun, 2003.

J. Bao, J. Pan y J. Wang, «The Illiquidity of Corporate Bonds,» *Journal of Finance*, vol. LXVI, nº 3, pp. 911-946, Jun, 2011.

11.APPENDIX

11.1. APPENDIX A: BOND SPREADS AND THEIR THEORETICAL DETERMINANTS

The works done by Baltagi (2008), Duffie and Singleton (2003) and Lando (2004) are used as reference. Bond returns can be represented as follows:

$$Bond\ Return = r_f + Risk\ Premium$$

Where the $Risk\ Premium$ represents the market incentives to invest in this type of instruments and r_f corresponds to the risk free rate (e.g. U.S. T-Bills). With this information, the bond spread can be represented as follows:

$$Bond\ Spread = Risk\ Premium = Bond\ Return - r_f$$

The bond spread value issued by a firm depends of the following variables (as shown by Collin-Dufresne, Goldstein and Martin (2001)):

$$Bond\ Spread(t) = BS(V_t, r_t, \{X_t\})$$

where V_t represents the firm value at a time t. r_t corresponds to the spot rate at a time t and $\{X_t\}$ represents a set of "state variables" that would be included in the models.

As mentioned above, structural models focused on the study of bond spreads have their origin in Merton (1974). Taking this as a starting point, many authors have tried to establish new models and give a more complete approach. In their paper, Collin-Dufresne, Goldstein and Martin (2001) present some theoretical determinants for bond spreads:

- *Changes in the spot rate:* Higher drifts on the neutral risk firm valuation impact directly on the probability of default, thus the default risk decreases and so does the bond spread (Longstaff and Schwartz (1995))
- *Changes in the slope of the yield curve:* A low slope is synonym of a weak economy, therefore spreads will rise and vice versa (Litterman and Scheinkman (1991))
- *Changes in leverage:* It is known that the probability of default increases when a firm has a high leverage ratio, therefore, spreads rise.
- *Changes in volatility:* An increase in the volatility levels implies a higher default risk, therefore, spreads increase.
- *Changes in the probability or magnitude of a downward jump in firm value:* Implied volatility smiles in observed option prices suggest that market account for the probability of large negative jumps in firm value. Therefore, increases in either the probability or magnitude of a negative jump should increase credit spreads.
- *Changes in the business climate:* In instability market episodes, the recovery rates decreases, raising bond spreads and vice versa.

11.2. APPENDIX B: MODELS AND THEIR MAJOR ISSUES

As described in previous sections, the panel data models used in this paper are represented as follows:

$$y_{it} = \alpha_i + \vec{\beta}^T \vec{X} + \varepsilon_{it}$$

Where y_{it} represents the dependent variable, α_i corresponds to the regression's intercept, $\vec{\beta}$ is the coefficient vector, $\vec{X}$ represents the explaining variable set and ε_{it} corresponds to the regression's error.

Dealing with this type of econometric models, there is always the endogeneity risk. Endogeneity is when independent variables are correlated with the dependent (variable through the error term. This leads to obtain biased ordinary least squares estimators (OLS). Also, the model must be well specified. Causes of endogeneity are (Baltagi (2008) and Roberts and Whited (2012)):

- *Omitted variable bias:* It occurs when the dependent variable is correlated with an exogenous variable through error. This endogenizes the omitted variable, causing biased estimations.
- *Simultaneity:* Also known as reverse causality. It appears when one includes a dependent variable as independent. In other words, the dependent variable causes the dependent variable and vice versa.
- *Measurement error on independent variables:* It is usually due to bad data typing or wrong data measurement.
- *Selection bias:* Produced by using no representative samples in the study, leaving out important population segments.

In empirical financial economy (as this paper), the most common cause for endogeneity is the omitted variable bias, given the significant existing heterogeneity on datasets (Baltagi (2008) and Roberts and Whited (2012)). Panel data offers a partial solution to this problem. Assume that one has a model of the following structure:

$$y_{it} = \beta_0 + \beta_1 x_{it} + u_{it} \quad (i = 1, \dots, N; t = 1, \dots, T)$$

Where the error term can be decompose as follows:

$$u_{it} = c_i + e_{it}$$

To be able to focus on specific panel data issues, one assumes that e_{it} has zero mean conditional to x_{it} and c_i for all t. The c_i term can be interpreted as the aggregate effect of non-observable variables, time independent. The omitted variable endogeneity appears when c_i and x_{it} are correlated. If that is the case, it is called fixed effect, otherwise, one is in presence of random effect.

The fixed effect is desirable in this type of regression because it captures the non-observability described above. However, OLS estimators are biased and results are not significant. The major

problem is that fixed effect increases as the regression's explanatory power decreases, which is a common fact in financial economy research.

There are two ways of solving the fixed effect endogeneity. One way is to run a l*east squares dummy variable regression (LSDVR).* This means that one has to include intercepts for each firm i on the regression. The major drawback of this approach is the amount of data, since its implementation is unfeasible. An alternative approach is to run the following regression:

$$\left(y_{it} - \frac{1}{T}\sum_{t=1}^{T} y_{it}\right) = \beta_1\left(x_{it} - \frac{1}{T}\sum_{t=1}^{T} x_{it}\right) + \left(e_{it} - \frac{1}{T}\sum_{t=1}^{T} e_{it}\right)$$

As seen in the previous regression, the fixed effect c_i is gone, basically because

$$\left(c_i - \frac{1}{T}\sum_{t=1}^{T} c_i\right) = 0$$

With this, the OLS method is applicable to the following regression:

$$\Delta y_{it} = \beta_1 \Delta x_{it} + \Delta e_{it}$$

To choose one regression over the other, one should run both regressions and evaluate the statistical significance of each one with the standard Hausman test, where the null hypothesis is the existence of random effect and the alternative hypothesis is the presence of fixed effect. Additionally, one must check if the inclusion of fixed effect alters the coefficients associated to the explanatory variables in a significant way (in an economic sense).

Taking this into account, if the Hausman test null hypothesis is rejected, and the economic significance suffers insignificant alterations, then a nested OLS estimation can be done, where qualitative results remain valid.

12.TABLES

Table 1: Debt Issued v/s Equity Issued in 2005. Source: Gozzi et al (2010)

	Equity issues		Debt issues		Total	
	Total	% abroad	Total	% abroad	Total	% abroad
Amount raised (million U.S. dollars at 2005 prices)						
Developed economies	4,372,328	8	19,146,822	35	23,519,150	30
Developing economies	583,375	28	629,122	47	1,212,497	38
Number of Firms						
Developed economies	24,313	5	11,504	36	32,989	16
Developing economies	10,497	6	3,165	27	12,980	11

Table 2: Description of variables used in the analysis. Some dummy variables were encoded for treatment purposes.

	Definition	Unit of Measurement	Data Source
OAS	Option adjusted spread	Basis points	BoFA Merrill Lynch
Sector	Economic Sector	(1 = Banks, 2 = Finance, 4 = Industrial, 3 and 5 = Utilities)	BoFA Merrill Lynch
Maturity	Bond Maturity	(1 = 1-10yr, 2 = 10-15yr, 3 = 15+yr)	BoFA Merrill Lynch
Rating	Bond Credit Rating	(1 = AA-AAA, 2 = BBB-A)	BoFA Merrill Lynch
Us Treasury 10yr yield	10 year on-the-run US Treasury bond yield	Percentage	The US Federal Reserve and the Department of Treasury.
Slope 10yr - 2 yr yield	Difference between the 10 and 2 year on-the-run US Treasury bond yields	Percentage	The US Federal Reserve and the Department of Treasury.
VIX	CBOE Volatility Index	Basis points	Bloomberg
On/off 10 year spread	Difference between the 10 year off-the-run US treasury bonds and 10 year on-the-run US treasury bonds.	Basis points	The US Federal Reserve and the Department of Treasury.
Noise measure	Difference between the market yield and the implicit yield for US treasury bonds.	Basis points	Xing Hu, Pan and Wang (2012)

Table 3: Descriptive statistics for regression variables.

	Obs	Mean	Std. Dev.
OAS spread	93401	163.73	0.39
Sector	96908	-	-
Maturity	96908	-	-
Rating	96908	-	-
Us Treasury 10yr yield	92708	4.06	1.14
Slope 10yr - 2 yr yield	92708	1.38	0.99
VIX	93324	21.96	0.03
On/off 10 year spread	92708	23.55	0.05
Noise measure	85288	3.52	0.01

Table 4: Summary of descriptive statistics for rating, sector and maturity.

	Freq	Percent (%)	Cum. (%)
Descriptive statistics for rating			
AA – AAA	48454	50	50
BBB – A	48454	50	100
Total	96908	100	
Descriptive statistics for sector			
Banks	20776	21.43	21.43
Finance	20776	21.43	42.86
Industrial	20776	21.43	64.29
Utilities	34610	35.71	100
Total	96908		
Descriptive statistics for maturity			
1 – 10 years	36610	35.71	35.71
10 – 15 years	36610	35.71	71.43
15+ years	27688	28.57	100
Total	96908		

Table 5: Correlation matrix.

	OAS	Us Treasury 10yr yield	Slope 10yr - 2 yr yield	VIX	On/off 10 year spread	Noise measure
OAS	1					
Us Treasury 10yr yield	-0.38	1				
Slope 10yr - 2 yr yield	0.27	-0.65	1			
VIX	0.63	-0.32	0.34	1		
On/off 10 year spread	0.52	-0.32	0.68	0.7	1	
Noise measure	0.67	-0.22	0.21	0.75	0.695	1

Number of observations used: 81912

Table 6. Determinants of corporate bond spreads

This table reports the results from estimating equation (1) for the whole sample under study by OLS. Moreover, it presents the major risk factors for corporate OAS across different dimensions. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)	(4)	(5)
Rating: BBB – A	81.515**	82.359**	81.802**	79.994**	82.562**
	(-0.729)	(-0.730)	(-0.531)	(-0.514)	(-0.532)
Maturity: 10 – 15 years	1.662	0.481	1.257	-2.895**	0.180
	(-0.908)	(-0.905)	(-0.663)	(-0.656)	(-0.671)
Maturity: 15+ years	22.400**	19.786**	19.951**	17.491**	19.786**
	(-0.922)	(-0.929)	(-0.665)	(-0.640)	(-0.663)
Sector: Finance		13.508**	13.569**	14.865**	13.644**
		(-1.313)	(-0.958)	(-0.916)	(-0.94)
Sector: Utilities		-26.187**	-25.412**	-18.672**	-26.307**
		(-1.084)	(-0.798)	(-0.754)	(-0.785)
Sector: Industrial		-39.804**	-39.707**	-34.646**	-39.650**
		(-1.024)	(-0.775)	(-0.729)	(-0.752)
Us Treasury 10yr yield			-66.217**	-34.542**	-30.262**
			(-0.443)	(-0.383)	(-0.269)
Slope 10yr - 2 yr yield			-71.601**	-5.585**	-10.957**
			(-0.665)	(-0.323)	(-0.303)
On/off 10 year bond spread			6.087**		
			(-0.045)		
Noise measure				27.157**	
				(-0.205)	
VIX					7.659**
					(-0.055)
Constant	114.255**	129.568**	353.463**	185.194**	99.204**
	(-0.675)	(-1.052)	(-2.088)	(-2.057)	(-1.506)
Adjusted R2	0.12	0.15	0.57	0.64	0.58
N	93,401	93,401	89,360	81,940	89,276

Table 7. Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the whole sample under study by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by credit rating quality. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)
Rating: BBB – A	-3.156	37.655**	40.407**
	(-1.910)	(-0.951)	(-1.169)
Maturity: 10 – 15 years	0.143	0.613	-3.097**
	(-0.647)	(-0.650)	(-0.636)
Maturity: 15+ years	19.781**	19.861**	17.466**
	(-0.650)	(-0.656)	(-0.628)
Sector: Finance	13.646**	13.584**	14.894**
	(-0.905)	(-0.937)	(-0.872)
Sector: Utilities	-26.339**	-26.001**	-18.817**
	(-0.770)	(-0.794)	(-0.741)
Sector: Industrial	-39.647**	-39.692**	-34.617**
	(-0.718)	(-0.754)	(-0.683)
Us Treasury 10yr yield	-30.138**	-66.012**	-34.361**
	(-0.265)	(-0.429)	(-0.375)
Slope 10yr - 2 yr yield	-10.768**	-71.410**	-5.361**
	(-0.293)	(-0.637)	(-0.311)
VIX	5.619**		
	(-0.064)		
On/off 10 year bond spread		5.096**	
		(-0.045)	
Noise measure			21.188**
			(-0.251)
Rating Interactions			
Rating: BBB – A x VIX	3.908**		
	(-0.100)		
Rating: BBB – A x On/off 10 year bond spread		1.894**	
		(-0.047)	
Rating: BBB – A x Noise measure			11.284**
			(-0.387)
Constant	143.202**	375.695**	205.109**
	(-1.775)	(-2.174)	(-2.111)
Adjusted R2	0.60	0.59	0.66
N	89,276	89,360	81,940

Table 7 (cont.). Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the whole sample under study by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by time-to-maturity. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(4)	(5)	(6)
Rating: BBB – A	82.581**	82.136**	80.126**
	(-0.522)	(-0.525)	(-0.501)
Maturity: 10 – 15 years	70.977**	43.145**	40.243**
	(-2.340)	(-1.146)	(-1.415)
Maturity: 15+ years	71.071**	58.424**	51.155**
	(-2.421)	(-1.217)	(-1.442)
Sector: Finance	13.645**	13.580**	14.892**
	(-0.921)	(-0.940)	(-0.883)
Sector: Utilities	-26.330**	-25.840**	-18.805**
	(-0.771)	(-0.788)	(-0.731)
Sector: Industrial	-39.648**	-39.696**	-34.619**
	(-0.743)	(-0.766)	(-0.711)
Us Treasury 10yr yield	-30.173**	-66.068**	-34.376**
	(-0.263)	(-0.423)	(-0.372)
Slope 10yr - 2 yr yield	-10.821**	-71.462**	-5.379**
	(-0.297)	(-0.634)	(-0.313)
VIX	9.418**		
	(-0.104)		
On/off 10 year bond spread		7.165**	
		(-0.064)	
Noise measure			33.985**
			(-0.378)
Maturity Interactions			
Maturity: 10 – 15 years x VIX	-3.228**		
	(-0.123)		
Maturity: 15+ years x VIX	-2.338**		
	(-0.127)		
Maturity: 10 – 15 years x On/off 10 year bond spread		-1.798**	
		(-0.059)	
Maturity: 15+ years x On/off 10 year bond spread		-1.636**	
		(-0.06)	
Maturity: 10 – 15 years x Noise measure			-12.305**
			(-0.467)
Maturity: 15+ years x Noise measure			-9.568**
			(-0.483)
Constant	60.066**	327.273**	160.142**
	(-2.090)	(-1.883)	(-2.124)
Adjusted R2	0.59	0.59	0.66
N	89,276	89,360	81,940

Table 7 (cont.). Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the whole sample under study by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by economic sector. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(7)	(8)	(9)
Rating: BBB – A	82.564**	81.641**	80.006**
	(-0.524)	(-0.530)	(-0.503)
Maturity: 10 – 15 years	0.178	1.482*	-2.912**
	(-0.662)	(-0.661)	(-0.644)
Maturity: 15+ years	19.785**	19.983**	17.486**
	(-0.646)	(-0.657)	(-0.616)
Sector: Finance	-14.228**	-10.362**	2.301
	(-3.619)	(-1.775)	(-2.305)
Sector: Utilities	-8.206**	-38.157**	-4.481*
	(-2.710)	(-1.411)	(-1.753)
Sector: Industrial	27.616**	-17.445**	7.010**
	(-2.697)	(-1.469)	(-1.797)
Us Treasury 10yr yield	-30.252**	-66.292**	-34.506**
	(-0.267)	(-0.432)	(-0.382)
Slope 10yr - 2 yr yield	-10.943**	-71.666**	-5.552**
	(-0.298)	(-0.646)	(-0.316)
VIX	8.332**		
	(-0.121)		
On/off 10 year bond spread		5.890**	
		(-0.074)	
Noise measure			30.327**
			(-0.521)
Sector Interactions			
Sector: Finance x VIX	1.270**		
	(-0.189)		
Sector: Utilities x VIX	-0.825**		
	(-0.141)		
Sector: Industrial x VIX	-3.066**		
	(-0.140)		
Sector: Finance x On/off 10 year bond spread		1.016**	
		(-0.091)	
Sector: Utilities x On/off 10 year bond spread		0.550**	
		(-0.069)	
Sector: Industrial x On/off 10 year bond spread		-0.945**	
		(-0.070)	
Sector: Finance x Noise measure			3.564**
			(-0.775)
Sector: Utilities x Noise measure			-4.042**
			(-0.566)
Sector: Industrial x Noise measure			-11.835**
			(-0.591)
Constant	84.380**	358.476**	173.848**
	(-2.535)	(-2.168)	(-2.350)
Adjusted R2	0.59	0.58	0.66
N	89,276	89,360	81,940

Table 8: Variance decomposition analysis

This table summarizes the results of the variance decomposition analysis by different periods. It reports each factor's relative contribution to explain corporate OAS variance. The analysis shown is made using the noise measure as liquidity proxy. For euro crisis, VIX is used as liquidity proxy since noise measure does not have enough data for the last period.

	All data (%)	Dot.com crisis (%)	Market stability (%)	Sub – prime crisis (%)	Euro crisis (%)
Rating: BBB-A	10.68	37.80	44.43	9.42	30.39
Maturity: 10-15yr	0.03	0.07	0.32	1.00	3.63
Maturity: 15+yr	0.46	3.35	14.92	-0.07	2.80
Sector: Industrials	1.28	-0.43	0.72	4.07	16.77
Sector: Finance	0.55	0.98	1.61	0.68	-1.47
Sector: Utilities	0.29	2.80	-0.17	2.01	19.00
Liquidity	41.73	0.07	-0.49	37.12	4.74*
Us Treasury 10yr yield	10.59	-0.40	1.58	10.25	3.03
Slope 10yr - 2 yr yield	-1.27	2.84	2.58	6.42	0.57
Residuals	35.66	52.91	34.49	29.10	20.53

Table 9. Determinants of corporate bond spreads

This table reports the results from estimating equation (1) for the dot.com crisis sub-sample by OLS. Moreover, it presents the major risk factors for corporate OAS across different dimensions. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)	(4)	(5)
Rating: BBB – A	92.462**	91.644**	92.056**	91.839**	92.114**
	(-0.652)	(-0.636)	(-0.608)	(-0.635)	(-0.606)
Maturity: 10 – 15 years	-2.516**	-1.371	-1.932*	-1.643	-2.018*
	(-0.852)	(-0.849)	(-0.822)	(-0.862)	(-0.816)
Maturity: 15+ years	29.144**	32.126**	32.078**	32.051**	32.081**
	(-0.708)	(-0.680)	(-0.624)	(-0.665)	(-0.620)
Sector: Finance		29.370**	29.228**	29.424**	29.427**
		(-0.857)	(-0.792)	(-0.834)	(-0.800)
Sector: Utilities		33.759**	32.990**	33.537**	33.226**
		(-0.958)	(-0.920)	(-0.958)	(-0.929)
Sector: Industrial		12.259**	12.118**	12.322**	12.316**
		(-0.732)	(-0.681)	(-0.696)	(-0.690)
Us Treasury 10yr yield			-18.415**	-25.046**	-6.673**
			(-0.693)	(-0.908)	(-0.708)
Slope 10yr - 2 yr yield			-43.086**	-22.459**	-13.109**
			(-0.697)	(-0.594)	(-0.547)
On/off 10 year bond spread			2.583**		
			(-0.051)		
Noise measure				5.330**	
				(-0.453)	
VIX					3.435**
					(-0.069)
Constant	82.472**	61.052**	130.026**	196.119**	26.829**
	(-0.472)	(-0.753)	(-4.176)	(-4.632)	(-4.886)
Adjusted R2	0.41	0.44	0.52	0.47	0.53
N	29,649	29,649	28,354	28,214	28,326

Table 10. Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the dot.com crisis sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by credit rating quality. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)
Rating: BBB – A	-11.674**	45.612**	114.525**
	(-3.047)	(-1.669)	(-2.663)
Maturity: 10 – 15 years	-1.728*	-1.961*	-1.675
	(-0.793)	(-0.808)	(-0.861)
Maturity: 15+ years	32.117**	32.073**	32.039**
	(-0.606)	(-0.610)	(-0.663)
Sector: Finance	29.388**	29.222**	29.371**
	(-0.799)	(-0.805)	(-0.836)
Sector: Utilities	33.439**	32.953**	33.422**
	(-0.922)	(-0.925)	(-0.958)
Sector: Industrial	12.277**	12.112**	12.269**
	(-0.695)	(-0.700)	(-0.698)
Us Treasury 10yr yield	-6.662**	-18.425**	-25.036**
	(-0.694)	(-0.678)	(-0.915)
Slope 10yr - 2 yr yield	-13.033**	-43.140**	-22.472**
	(-0.541)	(-0.683)	(-0.597)
VIX	1.238**		
	(-0.069)		
On/off 10 year bond spread		1.784**	
		(-0.051)	
Noise measure			8.811**
			(-0.589)
Rating Interactions			
Rating: BBB – A x VIX	4.235**		
	(-0.129)		
Rating: BBB – A x On/off 10 year bond spread		1.549**	
		(-0.055)	
Rating: BBB – A x Noise measure			-6.697**
			(-0.741)
Constant	80.441**	154.104**	184.362**
	(-4.919)	(-4.257)	(-4.546)
Adjusted R2	0.55	0.53	0.47
N	28,326	28,354	28,214

Table 10 (cont.). Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the dot.com crisis sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by time-to-maturity. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(4)	(5)	(6)
Rating: BBB – A	92.131**	92.051**	91.823**
	(-0.606)	(-0.604)	(-0.634)
Maturity: 10 – 15 years	2.368	6.025**	0.995
	(-4.358)	(-2.134)	(-3.433)
Maturity: 15+ years	57.314**	70.666**	11.486**
	(-3.145)	(-1.769)	(-2.872)
Sector: Finance	29.430**	29.230**	29.459**
	(-0.801)	(-0.7910)	(-0.836)
Sector: Utilities	33.208**	32.999**	33.614**
	(-0.927)	(-0.919)	(-0.958)
Sector: Industrial	12.319**	12.119**	12.357**
	(-0.689)	(-0.687)	(-0.700)
Us Treasury 10yr yield	-6.674**	-18.412**	-25.053**
	(-0.708)	(-0.689)	(-0.906)
Slope 10yr - 2 yr yield	-13.115**	-43.072**	-22.451**
	(-0.547)	(-0.693)	(-0.593)
VIX	3.801**		
	(-0.099)		
On/off 10 year bond spread		3.051**	
		(-0.058)	
Noise measure			3.781**
			(-0.585)
Maturity Interactions			
Maturity: 10 – 15 years x VIX	-0.18		
	(-0.187)		
Maturity: 15+ years x VIX	-1.032**		
	(-0.129)		
Maturity: 10 – 15 years x On/off 10 year bond spread		-0.265**	
		(-0.074)	
Maturity: 15+ years x On/off 10 year bond spread		-1.286**	
		(-0.056)	
Maturity: 10 – 15 years x Noise measure			-0.773
			(-0.941)
Maturity: 15+ years x Noise measure			6.080**
			(-0.805)
Constant	17.889**	115.947**	201.346**
	(-5.148)	(-4.214)	(-4.816)
Adjusted R2	0.53	0.53	0.47
N	28,326	28,354	28,214

Table 10 (cont.). Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the dot.com crisis sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by economic sector. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(7)	(8)	(9)
Rating: BBB – A	92.232**	92.022**	91.746**
	(-0.602)	(-0.601)	(-0.634)
Maturity: 10 – 15 years	-2.185**	-1.885*	-1.513
	(-0.805)	(-0.803)	(-0.859)
Maturity: 15+ years	32.052**	32.084**	32.058**
	(-0.612)	(-0.623)	(-0.667)
Sector: Finance	-33.866**	-5.511*	56.573**
	(-3.678)	(-2.353)	(-3.617)
Sector: Utilities	-52.154**	-28.249**	65.149**
	(-4.662)	(-2.594)	(-3.999)
Sector: Industrial	-8.295**	4.726*	20.443**
	(-3.111)	(-2.038)	(-3.124)
Us Treasury 10yr yield	-6.659**	-18.397**	-25.077**
	(-0.702)	(-0.675)	(-0.911)
Slope 10yr - 2 yr yield	-13.161**	-43.006**	-22.462**
	(-0.545)	(-0.680)	(-0.595)
VIX	1.512**		
	(-0.104)		
On/off 10 year bond spread		1.582**	
		(-0.065)	
Noise measure			10.849**
			(-0.813)
Sector Interactions			
Sector: Finance x VIX	2.586**		
	(-0.148)		
Sector: Utilities x VIX	3.482**		
	(-0.194)		
Sector: Industrial x VIX	0.841**		
	(-0.125)		
Sector: Finance x On/off 10 year bond spread		1.158**	
		(-0.072)	
Sector: Utilities x On/off 10 year bond spread		2.043**	
		(-0.084)	
Sector: Industrial x On/off 10 year bond spread		0.246**	
		(-0.061)	
Sector: Finance x Noise measure			-8.048**
			(-1.005)
Sector: Utilities x Noise measure			-9.346**
			(-1.115)
Sector: Industrial x Noise measure			-2.425**
			(-0.896)
Constant	73.888**	159.850**	177.688**
	(-5.392)	(-4.433)	(-5.006)
Adjusted R2	0.54	0.54	0.47
N	28,326	28,354	28,214

Table 11. Determinants of corporate bond spreads

This table reports the results from estimating equation (1) for the period of market stability sub-sample by OLS. Moreover, it presents the major risk factors for corporate OAS across different dimensions. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)	(4)	(5)
Rating: BBB – A	38.832**	39.123**	39.533**	39.524**	39.536**
	(-0.249)	(-0.254)	(-0.249)	(-0.249)	(-0.249)
Maturity: 10 – 15 years	10.876**	10.469**	9.914**	9.928**	9.902**
	(-0.241)	(-0.245)	(-0.235)	(-0.235)	(-0.235)
Maturity: 15+ years	28.412**	27.787**	27.735**	27.737**	27.716**
	(-0.337)	(-0.343)	(-0.336)	(-0.336)	(-0.336)
Sector: Finance		10.621**	10.645**	10.645**	10.651**
		(-0.349)	(-0.324)	(-0.323)	(-0.323)
Sector: Utilities		2.108**	1.517**	1.530**	1.514**
		(-0.363)	(-0.357)	(-0.357)	(-0.358)
Sector: Industrial		8.211**	8.216**	8.216**	8.220**
		(-0.351)	(-0.338)	(-0.338)	(-0.338)
Us Treasury 10yr yield			8.782**	9.667**	7.752**
			(-0.404)	(-0.440)	(-0.437)
Slope 10yr - 2 yr yield			-4.370**	-5.084**	-5.364**
			(-0.753)	(-0.237)	(-0.216)
On/off 10 year bond spread			0.006		
			(-0.067)		
Noise measure				2.042**	
				(-0.423)	
VIX					0.512**
					(-0.069)
Constant	49.354**	44.599**	9.019**	1.957	7.452**
	(-0.161)	(-0.264)	(-1.956)	(-2.374)	(-1.841)
Adjusted R2	0.59	0.61	0.65	0.65	0.66
N	22,694	22,694	21,682	21,682	21,654

Table 12. Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the period of market stability sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by credit rating quality. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)
Rating: BBB – A	28.439**	37.399**	33.937**
	(-1.403)	(-0.348)	(-0.810)
Maturity: 10 – 15 years	9.859**	9.841**	9.849**
	(-0.235)	(-0.237)	(-0.237)
Maturity: 15+ years	27.709**	27.724**	27.726**
	(-0.335)	(-0.335)	(-0.335)
Sector: Finance	10.651**	10.645**	10.645**
	(-0.324)	(-0.324)	(-0.324)
Sector: Utilities	1.473**	1.447**	1.455**
	(-0.359)	(-0.361)	(-0.361)
Sector: Industrial	8.220**	8.216**	8.216**
	(-0.338)	(-0.337)	(-0.337)
Us Treasury 10yr yield	7.735**	8.741**	9.639**
	(-0.436)	(-0.404)	(-0.440)
Slope 10yr - 2 yr yield	-5.384**	-4.388**	-5.081**
	(-0.217)	(-0.753)	(-0.237)
VIX	0.094		
	(-0.091)		
On/off 10 year bond spread		-0.078	
		(-0.068)	
Noise measure			0.431
			(-0.514)
Rating Interactions			
Rating: BBB – A x VIX	0.806**		
	(-0.105)		
Rating: BBB – A x On/off 10 year bond spread		0.161**	
		(-0.025)	
Rating: BBB – A x Noise measure			3.035**
			(-0.464)
Constant	13.312**	10.358**	5.077*
	(-2.024)	(-1.977)	(-2.460)
Adjusted R2	0.66	0.66	0.66
N	21,654	21,682	21,682

Table 12 (cont.). Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the period of market stability sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by time-to-maturity. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(4)	(5)	(6)
Rating: BBB – A	39.620**	39.783**	39.732**
	(-0.246)	(-0.242)	(-0.244)
Maturity: 10 – 15 years	46.443**	22.271**	36.863**
	(-1.383)	(-0.324)	(-0.766)
Maturity: 15+ years	57.586**	38.117**	52.253**
	(-1.861)	(-0.464)	(-1.039)
Sector: Finance	10.651**	10.645**	10.645**
	(-0.321)	(-0.319)	(-0.322)
Sector: Utilities	1.402**	1.185**	1.252**
	(-0.356)	(-0.355)	(-0.354)
Sector: Industrial	8.220**	8.216**	8.216**
	(-0.337)	(-0.337)	(-0.336)
Us Treasury 10yr yield	7.705**	8.590**	9.562**
	(-0.430)	(-0.394)	(-0.432)
Slope 10yr - 2 yr yield	-5.418**	-4.453**	-5.071**
	(-0.219)	(-0.730)	(-0.236)
VIX	2.040**		
	(-0.085)		
On/off 10 year bond spread		0.544**	
		(-0.066)	
Noise measure			10.697**
			(-0.448)
Maturity Interactions			
Maturity: 10 – 15 years x VIX	-2.656**		
	(-0.104)		
Maturity: 15+ years x VIX	-2.166**		
	(-0.137)		
Maturity: 10 – 15 years x On/off 10 year bond spread		-0.938**	
		(-0.024)	
Maturity: 15+ years x On/off 10 year bond spread		-0.770**	
		(-0.031)	
Maturity: 10 – 15 years x Noise measure			-14.643**
			(-0.436)
Maturity: 15+ years x Noise measure			-13.207**
			(-0.585)
Constant	-13.380**	2.664	-13.676**
	(-1.964)	(-1.917)	(-2.357)
Adjusted R2	0.66	0.68	0.67
N	21,654	21,682	21,682

Table 12 (cont.). Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the period of market stability sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by economic sector. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(7)	(8)	(9)
Rating: BBB – A	39.463**	39.326**	39.397**
	(-0.249)	(-0.250)	(-0.252)
Maturity: 10 – 15 years	10.005**	10.205**	10.105**
	(-0.232)	(-0.226)	(-0.231)
Maturity: 15+ years	27.730**	27.776**	27.762**
	(-0.337)	(-0.340)	(-0.338)
Sector: Finance	19.341**	15.512**	15.454**
	(-1.928)	(-0.519)	(-1.131)
Sector: Utilities	-17.093**	-3.626**	-8.439**
	(-2.033)	(-0.513)	(-1.180)
Sector: Industrial	4.758*	7.230**	2.742*
	(-2.022)	(-0.515)	(-1.182)
Us Treasury 10yr yield	7.792**	8.941**	9.730**
	(-0.433)	(-0.396)	(-0.437)
Slope 10yr - 2 yr yield	-5.317**	-4.302**	-5.093**
	(-0.217)	(-0.742)	(-0.237)
VIX	0.143		
	(-0.122)		
On/off 10 year bond spread		-0.061	
		(-0.070)	
Noise measure			0.230
			(-0.583)
Sector Interactions			
Sector: Finance x VIX	-0.630**		
	(-0.140)		
Sector: Utilities x VIX	1.355**		
	(-0.150)		
Sector: Industrial x VIX	0.251		
	(-0.150)		
Sector: Finance x On/off 10 year bond spread		-0.359**	
		(-0.032)	
Sector: Utilities x On/off 10 year bond spread		0.400**	
		(-0.035)	
Sector: Industrial x On/off 10 year bond spread		0.073*	
		(-0.035)	
Sector: Finance x Noise measure			-2.587**
			(-0.593)
Sector: Utilities x Noise measure			5.452**
			(-0.661)
Sector: Industrial x Noise measure			2.944**
			(-0.653)
Constant	12.312**	9.156**	5.046*
	(-2.228)	(-1.917)	(-2.438)
Adjusted R2	0.66	0.66	0.66
N	21,654	21,682	21,682

Table 13. Determinants of corporate bond spreads

This table reports the results from estimating equation (1) for the sub-prime crisis sub-sample by OLS. Moreover, it presents the major risk factors for corporate OAS across different dimensions. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)	(4)	(5)
Rating: BBB – A	112.617**	114.493**	107.048**	107.607**	107.459**
	(-2.321)	(-2.257)	(-1.416)	(-1.381)	(-1.396)
Maturity: 10 – 15 years	-47.014**	-49.641**	-39.286**	-40.069**	-39.862**
	(-2.873)	(-2.779)	(-1.765)	(-1.729)	(-1.750)
Maturity: 15+ years	-15.114**	-22.411**	-20.758**	-20.870**	-20.840**
	(-3.052)	(-2.997)	(-1.888)	(-1.835)	(-1.845)
Sector: Finance		16.575**	16.536**	16.536**	16.536**
		(-4.015)	(-2.625)	(-2.586)	(-2.560)
Sector: Utilities		-76.588**	-67.015**	-67.761**	-67.564**
		(-3.160)	(-1.958)	(-1.868)	(-1.915)
Sector: Industrial		-100.394**	-100.319**	-100.319**	-100.319**
		(-3.050)	(-2.006)	(-1.929)	(-1.946)
Us Treasury 10yr yield			-55.809**	-41.146**	-91.129**
			(-2.886)	(-2.915)	(-2.488)
Slope 10yr - 2 yr yield			-56.913**	25.607**	-0.674
			(-1.628)	(-1.467)	(-1.395)
On/off 10 year bond spread			6.613**		
			(-0.106)		
Noise measure				20.603**	
				(-0.307)	
VIX					6.175**
					(-0.095)
Constant	222.147**	268.607**	345.740**	262.133**	446.908**
	(-2.248)	(-3.198)	(-14.275)	(-14.472)	(-12.826)
Adjusted R2	0.11	0.18	0.69	0.71	0.70
N	20,752	20,752	19,886	19,886	19,886

Table 14. Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the sub-prime crisis sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by credit rating quality. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)
Rating: BBB – A	-3.873	17.547**	36.936**
	(-3.337)	(-2.017)	(-2.001)
Maturity: 10 – 15 years	-41.321**	-41.686**	-41.532**
	(-1.678)	(-1.697)	(-1.653)
Maturity: 15+ years	-21.049**	-21.101**	-21.079**
	(-1.792)	(-1.830)	(-1.785)
Sector: Finance	16.536**	16.536**	16.536**
	(-2.403)	(-2.446)	(-2.419)
Sector: Utilities	-68.953**	-69.301**	-69.154**
	(-1.871)	(-1.902)	(-1.824)
Sector: Industrial	-100.319**	-100.319**	-100.319**
	(-1.776)	(-1.814)	(-1.737)
Us Treasury 10yr yield	-90.188**	-55.521**	-40.571**
	(-2.379)	(-2.766)	(-2.815)
Slope 10yr - 2 yr yield	0.143	-56.186**	26.523**
	(-1.333)	(-1.555)	(-1.406)
VIX	4.065**		
	(-0.107)		
On/off 10 year bond spread		5.162**	
		(-0.109)	
Noise measure			14.397**
			(-0.366)
Rating Interactions			
Rating: BBB – A x VIX	4.068**		
	(-0.143)		
Rating: BBB – A x On/off 10 year bond spread		2.762**	
		(-0.080)	
Rating: BBB – A x Noise measure			11.747**
			(-0.415)
Constant	500.457**	391.555**	296.521**
	(-12.286)	(-13.753)	(-14.007)
Adjusted R2	0.73	0.72	0.73
N	19,886	19,886	19,886

Table 14 (cont.). Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the sub-prime crisis sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by time-to-maturity. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(4)	(5)	(6)
Rating: BBB – A	108.486**	108.184**	108.652**
	(-1.348)	(-1.396)	(-1.328)
Maturity: 10 – 15 years	84.344**	37.040**	40.327**
	(-4.032)	(-2.508)	(-2.433)
Maturity: 15+ years	67.912**	48.491**	37.603**
	(-4.167)	(-2.604)	(-2.504)
Sector: Finance	16.536**	16.536**	16.536**
	(-2.423)	(-2.526)	(-2.437)
Sector: Utilities	-68.933**	-68.531**	-69.154**
	(-1.811)	(-1.881)	(-1.750)
Sector: Industrial	-100.319**	-100.319**	-100.319**
	(-1.879)	(-1.955)	(-1.846)
Us Treasury 10yr yield	-90.202**	-55.618**	-40.571**
	(-2.337)	(-2.722)	(-2.720)
Slope 10yr - 2 yr yield	0.130	-56.431**	26.523**
	(-1.328)	(-1.572)	(-1.377)
VIX	8.644**		
	(-0.158)		
On/off 10 year bond spread		8.010**	
		(-0.125)	
Noise measure			27.806**
			(-0.451)
Maturity Interactions			
Maturity: 10 – 15 years x VIX	-4.548**		
	(-0.173)		
Maturity: 15+ years x VIX	-3.220**		
	(-0.176)		
Maturity: 10 – 15 years x On/off 10 year bond spread		-2.359**	
		(-0.100)	
Maturity: 15+ years x On/off 10 year bond spread		-2.104**	
		(-0.099)	
Maturity: 10 – 15 years x Noise measure			-13.408**
			(-0.503)
Maturity: 15+ years x Noise measure			-9.612**
			(-0.504)
Constant	374.020**	298.199**	214.661**
	(-12.504)	(-13.635)	(-13.590)
Adjusted R2	0.72	0.71	0.73
N	19,886	19,886	19,886

Table 14 (cont.). Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the sub-prime crisis sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by economic sector. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(7)	(8)	(9)
Rating: BBB – A	107.655**	107.479**	107.597**
	(-1.369)	(-1.376)	(-1.355)
Maturity: 10 – 15 years	-40.136**	-39.889**	-40.055**
	(-1.714)	(-1.714)	(-1.700)
Maturity: 15+ years	-20.879**	-20.844**	-20.868**
	(-1.771)	(-1.795)	(-1.772)
Sector: Finance	-36.369**	-31.531**	-13.207**
	(-6.424)	(-3.640)	(-3.767)
Sector: Utilities	-40.521**	-39.358**	-61.214**
	(-4.695)	(-2.927)	(-2.920)
Sector: Industrial	-14.850**	-21.055**	-49.414**
	(-4.749)	(-3.017)	(-3.013)
Us Treasury 10yr yield	-90.952**	-55.737**	-41.151**
	(-2.470)	(-2.862)	(-2.883)
Slope 10yr - 2 yr yield	-0.520	-56.731**	25.599**
	(-1.377)	(-1.597)	(-1.451)
VIX	6.767**		
	(-0.179)		
On/off 10 year bond spread		7.103**	
		(-0.140)	
Noise measure			21.731**
			(-0.570)
Sector Interactions			
Sector: Finance x VIX	1.915**		
	(-0.280)		
Sector: Utilities x VIX	-0.988**		
	(-0.198)		
Sector: Industrial x VIX	-3.094**		
	(-0.199)		
Sector: Finance x On/off 10 year bond spread		1.455**	
		(-0.149)	
Sector: Utilities x On/off 10 year bond spread		-0.855**	
		(-0.113)	
Sector: Industrial x On/off 10 year bond spread		-2.400**	
		(-0.115)	
Sector: Finance x Noise measure			4.872**
			(-0.809)
Sector: Utilities x Noise measure			-1.070
			(-0.602)
Sector: Industrial x Noise measure			-8.338**
			(-0.617)
Constant	429.682**	329.024**	255.279**
	(-12.847)	(-14.083)	(-14.235)
Adjusted R2	0.72	0.72	0.72
N	19,886	19,886	19,886

Table 15. Determinants of corporate bond spreads

This table reports the results from estimating equation (1) for the euro crisis sub-sample by OLS. Moreover, it presents the major risk factors for corporate OAS across different dimensions. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)	(4)	(5)
Rating: BBB – A	84.609**	87.058**	88.003**	82.200**	88.226**
	(-0.893)	(-0.613)	(-0.551)	(-0.624)	(-0.528)
Maturity: 10 – 15 years	42.780**	39.351**	37.960**	26.752**	37.615**
	(-1.054)	(-0.718)	(-0.658)	(-0.730)	(-0.631)
Maturity: 15+ years	45.296**	36.861**	36.607**	29.165**	36.537**
	(-1.105)	(-0.792)	(-0.711)	(-0.794)	(-0.674)
Sector: Finance		-8.789**	-8.777**	-12.957**	-8.800**
		(-1.124)	(-0.965)	(-1.041)	(-0.910)
Sector: Utilities		-93.112**	-94.355**	-91.740**	-94.680**
		(-1.005)	(-0.913)	(-1.018)	(-0.861)
Sector: Industrial		-101.859**	-101.729**	-102.888**	-101.761**
		(-0.946)	(-0.825)	(-0.906)	(-0.780)
Us Treasury 10yr yield			-51.110**	20.911**	-19.243**
			(-1.942)	(-1.985)	(-1.851)
Slope 10yr - 2 yr yield			-31.177**	-113.283**	-5.153*
			(-2.712)	(-3.269)	(-2.522)
On/off 10 year bond spread			4.374**		
			(-0.082)		
Noise measure				3.383**	
				(-0.461)	
VIX					2.581**
					(-0.046)
Constant	116.753**	174.903**	299.574**	380.229**	177.869**
	(-0.718)	(-1.000)	(-2.066)	(-3.748)	(-1.785)
Adjusted R2	0.37	0.70	0.78	0.81	0.79
N	19,788	19,788	18,946	11,666	18,918

Table 16. Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the euro crisis sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by credit rating quality. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)
Rating: BBB – A	78.461**	104.251**	75.849**
	(-1.925)	(-1.142)	(-2.503)
Maturity: 10 – 15 years	37.622**	38.464**	26.704**
	(-0.630)	(-0.650)	(-0.729)
Maturity: 15+ years	36.538**	36.679**	29.158**
	(-0.674)	(-0.708)	(-0.794)
Sector: Finance	-8.800**	-8.777**	-12.957**
	(-0.906)	(-0.965)	(-1.041)
Sector: Utilities	-94.673**	-93.875**	-91.786**
	(-0.858)	(-0.903)	(-1.015)
Sector: Industrial	-101.761**	-101.729**	-102.888**
	(-0.774)	(-0.826)	(-0.906)
Us Treasury 10yr yield	-19.380**	-50.516**	20.883**
	(-1.849)	(-1.918)	(-1.985)
Slope 10yr - 2 yr yield	-4.948*	-31.971**	-113.199**
	(-2.519)	(-2.688)	(-3.275)
VIX	2.349**		
	(-0.058)		
On/off 10 year bond spread		4.940**	
		(-0.085)	
Noise measure			2.074**
			(-0.603)
Rating Interactions			
Rating: BBB – A x VIX	0.453**		
	(-0.091)		
Rating: BBB – A x On/off 10 year bond spread		-1.090**	
		(-0.057)	
Rating: BBB – A x Noise measure			2.462**
			(-0.888)
Constant	182.779**	291.091**	383.512**
	(-1.992)	(-2.136)	(-3.687)
Adjusted R2	0.79	0.78	0.81
N	18,918	18,946	11,666

Table 16 (cont.). Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the euro crisis sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by time-to-maturity. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(4)	(5)	(6)
Rating: BBB – A	88.206**	88.370**	82.148**
	(-0.523)	(-0.545)	(-0.622)
Maturity: 10 – 15 years	72.672**	58.909**	17.421**
	(-2.2470)	(-1.371)	(-2.988)
Maturity: 15+ years	47.953**	55.136**	24.654**
	(-2.498)	(-1.477)	(-3.224)
Sector: Finance	-8.800**	-8.777**	-12.957**
	(-0.896)	(-0.947)	(-1.042)
Sector: Utilities	-94.653**	-94.846**	-91.671**
	(-0.851)	(-0.898)	(-1.016)
Sector: Industrial	-101.761**	-101.729**	-102.888**
	(-0.775)	(-0.812)	(-0.905)
Us Treasury 10yr yield	-19.784**	-51.717**	20.954**
	(-1.854)	(-1.931)	(-1.983)
Slope 10yr - 2 yr yield	-4.342	-30.366**	-113.407**
	(-2.525)	(-2.679)	(-3.269)
VIX	3.293**		
	(-0.084)		
On/off 10 year bond spread		5.205**	
		(-0.094)	
Noise measure			1.707*
			(-0.836)
Maturity Interactions			
Maturity: 10 – 15 years x VIX	-1.628**		
	(-0.105)		
Maturity: 15+ years x VIX	-0.530**		
	(-0.120)		
Maturity: 10 – 15 years x On/off 10 year bond spread		-1.409**	
		(-0.069)	
Maturity: 15+ years x On/off 10 year bond spread		-1.221**	
		(-0.071)	
Maturity: 10 – 15 years x Noise measure			3.625**
			(-1.084)
Maturity: 15+ years x Noise measure			1.743
			(-1.133)
Constant	162.218**	286.776**	384.746**
	(-2.316)	(-2.197)	(-4.250)
Adjusted R2	0.80	0.78	0.81
N	18,918	18,946	11,666

Table 16 (cont.). Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the euro crisis sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by economic sector. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(7)	(8)	(9)
Rating: BBB – A	88.214**	87.591**	82.233**
	(-0.518)	(-0.543)	(-0.620)
Maturity: 10 – 15 years	37.631**	38.536**	26.707**
	(-0.620)	(-0.653)	(-0.728)
Maturity: 15+ years	36.539**	36.689**	29.159**
	(-0.655)	(-0.707)	(-0.792)
Sector: Finance	24.868**	-5.655*	-22.848**
	(-3.309)	(-2.236)	(-4.517)
Sector: Utilities	-45.174**	-111.502**	-97.768**
	(-3.055)	(-1.937)	(-4.197)
Sector: Industrial	-38.911**	-113.659**	-124.907**
	(-2.824)	(-1.903)	(-3.914)
Us Treasury 10yr yield	-19.556**	-50.432**	20.885**
	(-1.828)	(-1.907)	(-1.985)
Slope 10yr - 2 yr yield	-4.684	-32.084**	-113.205**
	(-2.490)	(-2.681)	(-3.258)
VIX	4.352**		
	(-0.125)		
On/off 10 year bond spread		3.859**	
		(-0.115)	
Noise measure			-0.15
			(-1.298)
Sector Interactions			
Sector: Finance x VIX	-1.564**		
	(-0.156)		
Sector: Utilities x VIX	-2.300**		
	(-0.146)		
Sector: Industrial x VIX	-2.920**		
	(-0.134)		
Sector: Finance x On/off 10 year bond spread		-0.205	
		(-0.107)	
Sector: Utilities x On/off 10 year bond spread		1.162**	
		(-0.094)	
Sector: Industrial x On/off 10 year bond spread		0.783**	
		(-0.091)	
Sector: Finance x Noise measure			3.813*
			(-1.619)
Sector: Utilities x Noise measure			2.307
			(-1.480)
Sector: Industrial x Noise measure			8.489**
			(-1.397)
Constant	139.581**	307.578**	389.288**
	(-2.983)	(-2.518)	(-5.210)
Adjusted R2	0.80	0.78	0.82
N	18,918	18,946	11,666

Table 17. Determinants of corporate bond spreads

This table reports the results from estimating equation (1) for the banking sector sub-sample by OLS. Moreover, it presents the major risk factors for corporate OAS across different dimensions. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)	(4)
Rating: BBB – A	74.876**	75.206**	71.939**	75.363**
	(-1.806)	(-1.314)	(-1.212)	(-1.259)
Maturity: 10 – 15 years	-2.652	-3.122	-11.071**	-3.360*
	(-2.297)	(-1.715)	(-1.583)	(-1.648)
Maturity: 15+ years	21.602**	21.652**	17.099**	21.615**
	(-2.329)	(-1.612)	(-1.413)	(-1.560)
Us Treasury 10yr yield		-87.873**	-60.195**	-53.587**
		(-1.069)	(-0.918)	(-0.588)
Slope 10yr - 2 yr yield		-72.912**	-12.822**	-16.505**
		(-1.609)	(-0.792)	(-0.692)
On/off 10 year bond spread		5.858**		
		(-0.110)		
Noise measure			28.876**	
			(-0.530)	
VIX				8.002**
				(-0.124)
Constant	133.751**	452.589**	304.790**	198.042**
	(-1.709)	(-4.722)	(-4.402)	(-3.356)
Adjusted R2	0.08	0.54	0.65	0.57
N	20,712	19,816	18,226	19,798

Table 18. Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the banking sector sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by credit rating quality. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)
Rating: BBB – A	-47.190**	23.632**	-5.731*
	(-4.050)	(-2.329)	(-2.830)
Maturity: 10 – 15 years	-3.368*	-3.169	-11.233**
	(-1.586)	(-1.686)	(-1.464)
Maturity: 15+ years	21.615**	21.652**	17.099**
	(-1.490)	(-1.580)	(-1.297)
Us Treasury 10yr yield	-53.592**	-87.886**	-60.321**
	(-0.562)	(-1.008)	(-0.878)
Slope 10yr - 2 yr yield	-16.503**	-72.885**	-12.828**
	(-0.648)	(-1.477)	(-0.725)
VIX	5.208**		
	(-0.117)		
On/off 10 year bond spread		4.761**	
		(-0.103)	
Noise measure			17.809**
			(-0.567)
Rating Interactions			
Rating: BBB – A x VIX	5.586**		
	(-0.212)		
Rating: BBB – A x On/off 10 year bond spread		2.191**	
		(-0.112)	
Rating: BBB – A x Noise measure			22.090**
			(-0.928)
Constant	259.346**	478.433**	344.245**
	(-3.569)	(-4.825)	(-4.430)
Adjusted R2	0.61	0.55	0.70
N	19,798	19,816	18,226

Table 18 (cont.). Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the banking sector sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by time-to-maturity. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(4)	(5)	(6)
Rating: BBB – A	75.369**	75.246**	72.046**
	(-1.224)	(-1.286)	(-1.147)
Maturity: 10 – 15 years	117.010**	66.829**	69.472**
	(-5.218)	(-2.960)	(-3.520)
Maturity: 15+ years	85.736**	61.415**	62.853**
	(-5.196)	(-2.843)	(-3.260)
Us Treasury 10yr yield	-53.592**	-87.890**	-60.320**
	(-0.551)	(-0.968)	(-0.853)
Slope 10yr - 2 yr yield	-16.503**	-72.877**	-12.828**
	(-0.663)	(-1.452)	(-0.736)
VIX	10.805**		
	(-0.225)		
On/off 10 year bond spread		7.410**	
		(-0.143)	
Noise measure			40.827**
			(-0.826)
Maturity Interactions			
Maturity: 10 – 15 years x VIX	-5.487**		
	(-0.272)		
Maturity: 15+ years x VIX	-2.923**		
	(-0.273)		
Maturity: 10 – 15 years x On/off 10 year bond spread		-2.972**	
		(-0.146)	
Maturity: 15+ years x On/off 10 year bond spread		-1.688**	
		(-0.137)	
Maturity: 10 – 15 years x Noise measure			-22.921**
			(-1.162)
Maturity: 15+ years x Noise measure			-12.995**
			(-1.075)
Constant	136.566**	416.051**	263.198**
	(-4.740)	(-4.371)	(-4.671)
Adjusted R2	0.60	0.55	0.69
N	19,798	19,816	18,226

Table 19. Determinants of corporate bond spreads

This table reports the results from estimating equation (1) for the financial sector sub-sample by OLS. Moreover, it presents the major risk factors for corporate OAS across different dimensions. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)	(4)
Rating: BBB – A	95.442**	95.324**	94.068**	95.349**
	(-1.900)	(-1.300)	(-1.278)	(-1.300)
Maturity: 10 – 15 years	3.134	3.184	-3.720*	3.143
	(-2.519)	(-1.748)	(-1.725)	(-1.777)
Maturity: 15+ years	26.654**	26.673**	22.939**	26.638**
	(-2.518)	(-1.718)	(-1.673)	(-1.730)
Us Treasury 10yr yield		-89.620**	-51.261**	-46.381**
		(-1.144)	(-0.893)	(-0.623)
Slope 10yr - 2 yr yield		-85.425**	-5.550**	-12.239**
		(-1.706)	(-0.785)	(-0.732)
On/off 10 year bond spread		7.366**		
		(-0.119)		
Noise measure			32.610**	
			(-0.560)	
VIX				9.286**
				(-0.148)
Constant	133.361**	441.292**	243.259**	134.650**
	(-1.813)	(-5.022)	(-4.399)	(-3.363)
Adjusted R2	0.11	0.60	0.66	0.60
N	20,766	19,866	18,276	19,848

Table 20. Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the financial sector sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by credit rating quality. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)
Rating: BBB – A	-45.957**	18.279**	13.010**
	(-4.747)	(-2.303)	(-2.772)
Maturity: 10 – 15 years	3.143	3.184	-3.720*
	(-1.685)	(-1.673)	(-1.592)
Maturity: 15+ years	26.638**	26.673**	22.939**
	(-1.614)	(-1.633)	(-1.513)
Us Treasury 10yr yield	-46.381**	-89.620**	-51.261**
	(-0.599)	(-1.051)	(-0.827)
Slope 10yr - 2 yr yield	-12.239**	-85.425**	-5.550**
	(-0.682)	(-1.524)	(-0.699)
VIX	6.066**		
	(-0.104)		
On/off 10 year bond spread		5.731**	
		(-0.084)	
Noise measure			21.099**
			(-0.418)
Rating Interactions			
Rating: BBB – A x VIX	6.441**		
	(-0.252)		
Rating: BBB – A x On/off 10 year bond spread		3.271**	
		(-0.116)	
Rating: BBB – A x Noise measure			23.022**
			(-0.946)
Constant	205.303**	479.814**	283.788**
	(-3.833)	(-5.453)	(-4.542)
Adjusted R2	0.64	0.63	0.71
N	19,848	19,866	18,276

Table 20 (cont.). Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the financial sector sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by time-to-maturity. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(4)	(5)	(6)
Rating: BBB – A	95.349**	95.324**	94.068**
	(-1.260)	(-1.260)	(-1.205)
Maturity: 10 – 15 years	130.932**	79.862**	79.176**
	(-6.537)	(-3.071)	(-3.919)
Maturity: 15+ years	124.082**	91.956**	90.942**
	(-6.627)	(-3.176)	(-4.031)
Us Treasury 10yr yield	-46.381**	-89.620**	-51.261**
	(-0.599)	(-1.054)	(-0.837)
Slope 10yr - 2 yr yield	-12.239**	-85.425**	-5.550**
	(-0.709)	(-1.560)	(-0.742)
VIX	12.708**		
	(-0.321)		
On/off 10 year bond spread		9.375**	
		(-0.191)	
Noise measure			46.896**
			(-1.222)
Maturity Interactions			
Maturity: 10 – 15 years x VIX	-5.825**		
	(-0.347)		
Maturity: 15+ years x VIX	-4.442**		
	(-0.353)		
Maturity: 10 – 15 years x On/off 10 year bond spread		-3.255**	
		(-0.162)	
Maturity: 15+ years x On/off 10 year bond spread		-2.771**	
		(-0.165)	
Maturity: 10 – 15 years x Noise measure			-23.544**
			(-1.340)
Maturity: 15+ years x Noise measure			-19.314**
			(-1.389)
Constant	59.573**	393.971**	192.959**
	(-5.6870)	(-3.957)	(-4.366)
Adjusted R2	0.63	0.63	0.70
N	19,848	19,866	18,276

Table 21. Determinants of corporate bond spreads

This table reports the results from estimating equation (1) for the industrial sector sub-sample by OLS. Moreover, it presents the major risk factors for corporate OAS across different dimensions. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)	(4)
Rating: BBB – A	95.810**	95.691**	96.458**	95.709**
	(-0.955)	(-0.621)	(-0.569)	(-0.619)
Maturity: 10 – 15 years	14.481**	14.479**	11.260**	14.477**
	(-1.253)	(-0.818)	(-0.753)	(-0.825)
Maturity: 15+ years	29.074**	29.098**	26.403**	29.086**
	(-1.126)	(-0.716)	(-0.653)	(-0.728)
Us Treasury 10yr yield		-42.486**	-17.331**	-16.192**
		(-0.585)	(-0.439)	(-0.348)
Slope 10yr - 2 yr yield		-57.721**	-8.183**	-13.251**
		(-0.884)	(-0.378)	(-0.376)
On/off 10 year bond spread		4.480**		
		(-0.060)		
Noise measure			20.001**	
			(-0.2610)	
VIX				5.661**
				(-0.073)
Constant	75.276**	221.757**	90.262**	35.037**
	(-0.806)	(-2.421)	(-2.148)	(-1.706)
Adjusted R2	0.34	0.73	0.80	0.73
N	20,766	19,866	18,276	19,848

Table 22. Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the industrial sector sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by credit rating quality. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)
Rating: BBB – A	0.284	39.493**	44.268**
	(-2.009)	(-1.104)	(-0.9650)
Maturity: 10 – 15 years	14.477**	14.479**	11.260**
	(-0.724)	(-0.728)	(-0.608)
Maturity: 15+ years	29.086**	29.098**	26.403**
	(-0.651)	(-0.649)	(-0.546)
Us Treasury 10yr yield	-16.192**	-42.486**	-17.331**
	(-0.321)	(-0.472)	(-0.366)
Slope 10yr - 2 yr yield	-13.251**	-57.721**	-8.183**
	(-0.328)	(-0.679)	(-0.286)
VIX	3.486**		
	(-0.045)		
On/off 10 year bond spread		3.287**	
		(-0.038)	
Noise measure			12.590**
			(-0.137)
Rating Interactions			
Rating: BBB – A x VIX	4.350**		
	(-0.107)		
Rating: BBB – A x On/off 10 year bond spread		2.386**	
		(-0.049)	
Rating: BBB – A x Noise measure			14.823**
			(-0.301)
Constant	82.749**	249.856**	116.357**
	(-1.863)	(-2.307)	(-1.908)
Adjusted R2	0.79	0.78	0.86
N	19,848	19,866	18,276

Table 22 (cont.). Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the industrial sector sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by time-to-maturity. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(4)	(5)	(6)
Rating: BBB – A	95.709**	95.691**	96.458**
	(-0.615)	(-0.615)	(-0.562)
Maturity: 10 – 15 years	19.859**	25.287**	16.918**
	(-3.603)	(-1.771)	(-2.114)
Maturity: 15+ years	57.297**	51.586**	44.663**
	(-3.125)	(-1.549)	(-1.811)
Us Treasury 10yr yield	-16.192**	-42.486**	-17.331**
	(-0.346)	(-0.574)	(-0.431)
Slope 10yr - 2 yr yield	-13.251**	-57.721**	-8.183**
	(-0.372)	(-0.868)	(-0.371)
VIX	6.171**		
	(-0.142)		
On/off 10 year bond spread		4.951**	
		(-0.085)	
Noise measure			22.265**
			(-0.519)
Maturity Interactions			
Maturity: 10 – 15 years x VIX	-0.245		
	(-0.187)		
Maturity: 15+ years x VIX	-1.286**		
	(-0.163)		
Maturity: 10 – 15 years x On/off 10 year bond spread		-0.459**	
		(-0.086)	
Maturity: 15+ years x On/off 10 year bond spread		-0.955**	
		(-0.074)	
Maturity: 10 – 15 years x Noise measure			-1.607*
			(-0.700)
Maturity: 15+ years x Noise measure			-5.186**
			(-0.599)
Constant	23.839**	210.658**	82.289**
	(-2.678)	(-2.293)	(-2.334)
Adjusted R2	0.74	0.74	0.81
N	19,848	19,866	18,276

Table 23. Determinants of corporate bond spreads

This table reports the results from estimating equation (1) for the utilities sector sub-sample by OLS. Moreover, it presents the major risk factors for corporate OAS across different dimensions. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)	(4)
Rating: BBB – A	69.633**	67.184**	64.392**	69.626**
	(-1.092)	(-0.771)	(-0.753)	(-0.805)
Maturity: 10 – 15 years	-4.661**	-1.467	-2.832**	-4.562**
	(-1.261)	(-0.890)	(-0.945)	(-0.946)
Maturity: 15+ years	7.063**	7.161**	6.762**	7.140**
	(-1.381)	(-0.902)	(-0.886)	(-0.908)
Us Treasury 10yr yield		-52.572**	-17.955**	-14.034**
		(-0.540)	(-0.538)	(-0.416)
Slope 10yr - 2 yr yield		-70.182**	1.546**	-4.565**
		(-0.828)	(-0.477)	(-0.473)
On/off 10 year bond spread		6.425**		
		(-0.055)		
Noise measure			26.968**	
			(-0.214)	
VIX				7.624**
				(-0.078)
Constant	114.990**	274.850**	98.011**	10.804**
	(-1.070)	(-2.386)	(-2.770)	(-2.127)
Adjusted R2	0.11	0.63	0.66	0.59
N	31,157	29,812	27,162	29,782

Table 24. Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the utilities sector sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by credit rating quality. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(1)	(2)	(3)
Rating: BBB – A	50.990**	58.609**	88.817**
	(-3.132)	(-1.334)	(-1.245)
Maturity: 10 – 15 years	-4.575**	-1.886*	-2.457*
	(-0.935)	(-0.892)	(-0.958)
Maturity: 15+ years	7.140**	7.161**	6.762**
	(-0.921)	(-0.908)	(-0.846)
Us Treasury 10yr yield	-13.948**	-52.446**	-18.360**
	(-0.421)	(-0.559)	(-0.523)
Slope 10yr - 2 yr yield	-4.431**	-70.076**	1.085*
	(-0.479)	(-0.855)	(-0.463)
VIX	7.142**		
	(-0.148)		
On/off 10 year bond spread		6.210**	
		(-0.081)	
Noise measure			31.113**
			(-0.293)
Rating Interactions			
Rating: BBB – A x VIX	0.850**		
	(-0.162)		
Rating: BBB – A x On/off 10 year bond spread		0.378**	
		(-0.068)	
Rating: BBB – A x Noise measure			-7.022**
			(-0.358)
Constant	20.839**	279.108**	85.919**
	(-2.950)	(-2.308)	(-2.868)
Adjusted R2	0.59	0.63	0.67
N	29,782	29,812	27,162

Table 24 (cont.). Determinants of corporate bond spreads

This table reports the results from estimating equation (2) for the utilities sector sub-sample by OLS. Overall, the table presents the liquidity premium interaction effects over corporate bond spreads by time-to-maturity. Three different liquidity proxies are used for robustness check purposes. Robust standard errors are shown in parenthesis.* p<0.05; ** p<0.01.

OAS	(4)	(5)	(6)
Rating: BBB – A	69.654**	67.803**	64.629**
	(-0.785)	(-0.769)	(-0.744)
Maturity: 10 – 15 years	46.585**	21.348**	19.427**
	(-3.082)	(-1.309)	(-1.459)
Maturity: 15+ years	40.890**	36.797**	25.739**
	(-3.388)	(-1.743)	(-1.923)
Us Treasury 10yr yield	-13.812**	-52.340**	-17.635**
	(-0.408)	(-0.522)	(-0.532)
Slope 10yr - 2 yr yield	-4.220**	-69.987**	1.909**
	(-0.466)	(-0.802)	(-0.470)
VIX	8.718**		
	(-0.104)		
On/off 10 year bond spread		7.029**	
		(-0.063)	
Noise measure			30.110**
			(-0.279)
Maturity Interactions			
Maturity: 10 – 15 years x VIX	-2.333**		
	(-0.162)		
Maturity: 15+ years x VIX	-1.538**		
	(-0.176)		
Maturity: 10 – 15 years x On/off 10 year bond spread		-1.001**	
		(-0.070)	
Maturity: 15+ years x On/off 10 year bond spread		-1.258**	
		(-0.079)	
Maturity: 10 – 15 years x Noise measure			-6.406**
			(-0.391)
Maturity: 15+ years x Noise measure			-5.390**
			(-0.586)
Constant	-14.590**	259.124**	84.980**
	(-2.382)	(-2.340)	(-2.813)
Adjusted R2	0.60	0.64	0.67
N	29,782	29,812	27,162

Table 25. Standard & Poor's credit ratings

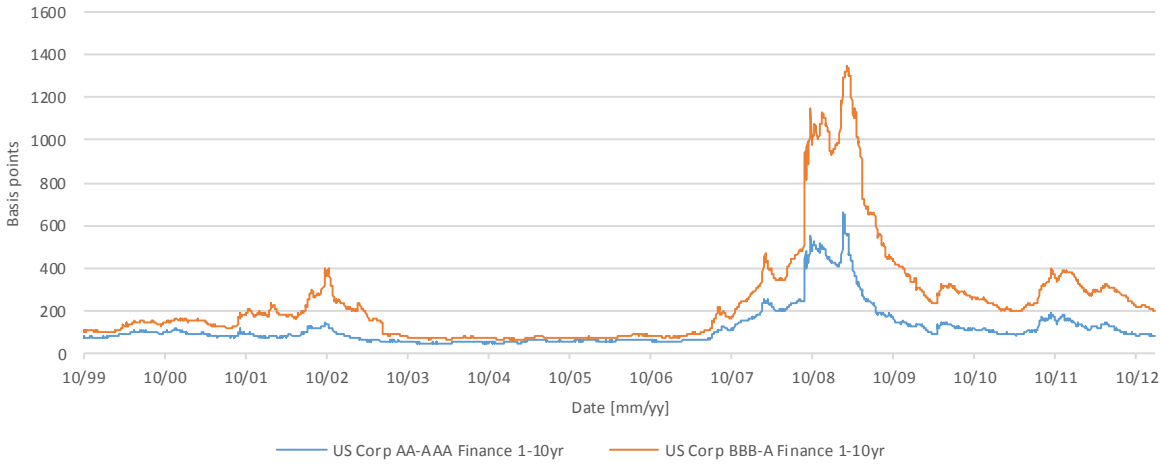
This table shows the evolution of credit ratings presented by Standard & Poor's since 1990 to 2001. It presents the probability of default associated with corporates for different credit rating quality levels, going from AAA to CCC/C. Al results are presented in percentages (%). Sources: Standard & Poor's Global Fixed Income Research and Standard & Poor's CreditPro®.

Year	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	CCC/C
1990	0	0	0	0	0	0	0	0.78	0	1.11	1.43	3.06	4.5	4.91	12.38	22.58	31.82
1991	0	0	0	0	0	0	0	0.85	0.75	0	3.77	1.12	1.05	8.72	16.88	30.56	32.76
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0.73	15.87	20.83	31.37
1993	0	0	0	0	0	0	0	0	0	0	0	1.94	0	1.32	4.26	4.35	14.29
1994	0	0	0	0	0	0	0	0	0	0	0	0.89	0	1.87	6.85	3.33	17.39
1995	0	0	0	0	0	0	0	0	0	0.72	0	1.67	1.23	2.88	7.29	8.11	30.43
1996	0	0	0	0	0	0	0	0	0	0	0.98	0	0.62	2.47	3.92	4.26	4.55
1997	0	0	0	0	0	0	0	0.48	0	0	0	0	0.47	0.8	5.69	15.91	8.33
1998	0	0	0	0	0	0	0	0	0.36	0	0	0.71	0.45	1.66	6.72	8.2	42.86
1999	0	0	0	0.64	0	0.37	0.43	0	0.38	0.45	0.85	1.3	0.81	4.02	9.14	15.19	37.5
2000	0	0	0	0	0	0.37	0.93	0	0.37	0.93	0	1.24	3.35	6.56	10.77	14.47	40.32
2001	0	0	0	0	0.92	0	0	0.41	0.71	0.44	0.8	1.29	4.64	5.57	16.3	28.72	50.62
2002	0	0	0	0	0	0	0	1.22	0.68	2.15	1.8	1.16	4	2.89	6.29	18.75	34.65
2003	0	0	0	0	0	0	0	0	0	0	0.89	1.59	0.4	1.03	5.26	13.7	37.14
2004	0	0	0	0	0	0.43	0	0	0	0	0	1.18	0.39	0	3.41	3.85	21.69
2005	0	0	0	0	0	0	0	0	0.3	0	0.8	0	0.4	1.08	3.33	4.95	11.11
2006	0	0	0	0	0	0	0	0	0	0	0.88	0	0.4	0.52	0.73	0.93	14.86
2007	0	0	0	0	0	0	0	0	0	0	0	0.54	0.39	0	0	0.68	16.44
2008	0	0	1.11	0.99	0.79	0.48	0.96	0.45	0.76	0.94	2.52	0.63	0.77	3.09	3.16	7.93	29.17
2009	0	0	0	0	0	0.48	0	0.49	0.37	0.85	0	1.43	0.88	5.07	9.57	19.9	48.97
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.96	3.21	22.64
2011	0	0	0	0	0	0	0	0	0	0.39	0	0	0	0.65	0.72	5.33	15.79
Average	0	0	0.04	0.05	0.06	0.08	0.1	0.18	0.27	0.3	0.66	0.87	1.38	2.34	6.84	10.39	24.2
Median	0	0	0	0	0	0	0	0	0	0	0	0.89	0.81	1.87	6.02	7.93	22.64
Standard deviation	0	0	0.2	0.21	0.21	0.17	0.28	0.34	0.37	0.53	0.97	0.87	1.69	2.13	4.73	8.09	12.9
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	0	0	1.11	0.99	0.92	0.48	0.96	1.22	1.41	2.15	3.77	3.06	7.14	8.72	16.88	30.56	50.62

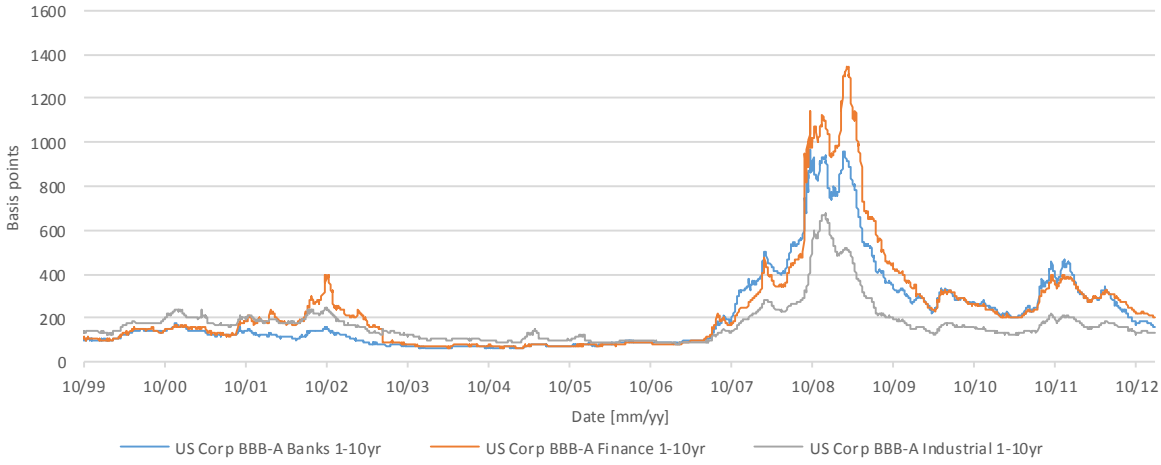
13.FIGURES

Figure 1: Historical evolution of corporate OAS by different dimensions.

Corporate OAS by rating. Source: Merril Lynch Index Database.



Corporate OAS by sector. Source: Merril Lynch Index Database.



Corporate OAS by maturity. Source: Merril Lynch Index Database.

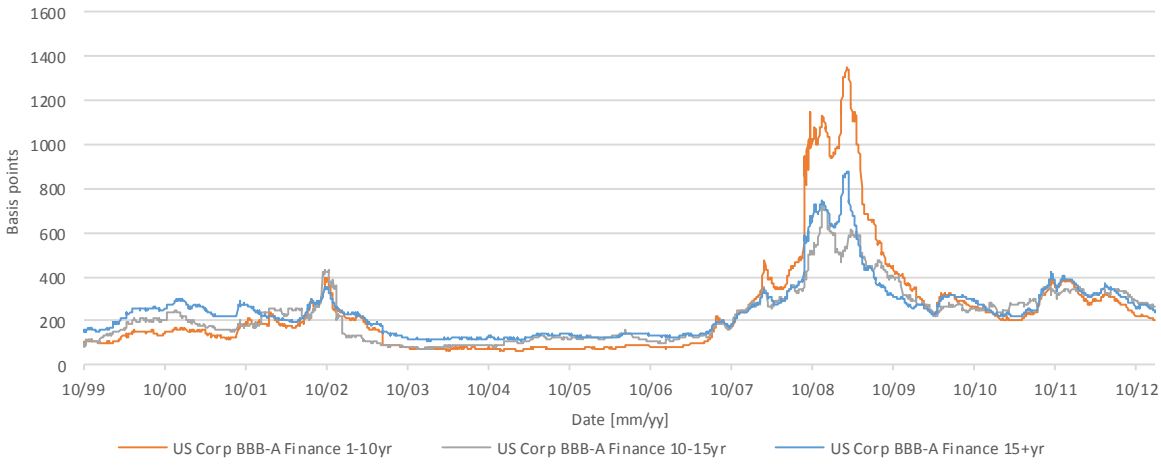


Figure 2: Variance decomposition, market stability versus sub-prime crisis. Source: Compiled by author based on data from BofA Merril Lynch Index Database