On the Determinants of Underpricing in Corporate Bond Offerings

June, 2016

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Abstract

Money is often left on the table when corporations issue new securities. Explanations for the underpricing phenomenon are often related to information asymmetry between the investor and the issuer. In this study we investigate factors affecting underpricing on corporate bonds in the Swedish market. To some extent contrary to what was expected, the results indicate that bonds are on average overpriced. The study finds support for the riskiness of the bond and bookbuilding as determinants of underpricing. We find little support for the market level credit risk affecting underpricing, which leads us to believe that the market level credit risk might affect the type and frequency of issues rather than underpricing directly.

Keywords: Bond Underpricing, Underpricing, Initial Bond Offering, Swedish Bond Market, Credit Default Swap, CDS, Market Credit Risk

We would like to thank Hossein Asgharian, professor at the Department of Economics at Lund University, for his valuable guidance and ideas. Naturally, all errors are our own.

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I. Introduction

Mispricing of financial securities is the subject of attention for a large bulk of the finance literature. Previous research on corporate bond underpricing suggests that as with equity, there is an underpricing of bonds that result in initial positive abnormal returns. The hypothesised explanations for such underpricing are to a large extent related to information asymmetry. Factors affecting underpricing include the riskiness of the bond, whether or not the firm has issued debt before and whether the firm is listed or not (Datta, Iskandhar-Datta and Patel, 1997; Cai, Helwege and Warga, 2007). These explanations do however not explain why evidence on underpricing differs over time (e.g. Brimmer, 1960; Fung and Rudd, 1986; Cai et al., 2007). This study examines the underpricing of corporate bond issues in the Swedish market by looking at initial abnormal returns. We first examine if previously established factors and theories play a role in explaining bond underpricing on the smaller and less mature Swedish bond market. Further we extend the research by hypothesising that underpricing is not only a function of issue specific characteristics, but also a function of the market level credit risk, which could potentially explain the inconsistency over time.

Worldwide, the fixed income market is the world's largest financial market with an estimated value of $157 trillion in 2010 as compared to the estimated $54 trillion equity market (Roxburgh, Lund and Piotrowski, 2011). Consequently, the fixed income market has been subject to extensive research. However, one area in which research is predominately focused on equity is underpricing; the study of initial abnormal returns at the issue of a security. If bond underpricing amounts to 0.08% on average for all bonds, as indicated by Cai et al. (2007), this would mean that $120 billion would have been left on the table for all bonds outstanding in 2010, an amount approximately equal to Ukraine's total GDP (IMF, 2015). Therefore, identifying market conditions in which it is favourable or unfavourable to issue bonds would be of great use for market participants.

During the last decade, the debt financing of Swedish corporations has started shifting in its fundamentals. Swedish corporations have historically relied heavily on bank lending as opposed to using public debt in the form of corporate bonds (Gunnarsdottir and Lindh, 2011). Due to stricter regulations on banks and an increase in investor appetite, the market for corporate bonds is growing rapidly in Sweden. Despite the recent growth in the corporate bond market, investors, financial intermediaries, and issuers state that the bond market for

Swedish corporations is underdeveloped with modest liquidity and a lack of transparency (Gunnarsdottir and Lindh, 2011). The underdevelopment of the Swedish bond market becomes evident when compared to the well-developed market in the US where a majority of previous bond research has been undertaken. The US market is characterised by higher transparency and regulatory oversight in contrast to the Swedish market (Gunnarsdottir and Lindh, 2011). A plausible consequence of the underdevelopment in the Swedish market is that several larger Swedish corporations issue bonds on markets outside Sweden such as the Luxemburg market. This could of course also be explained by the number of international investors in, and the size of, the Swedish bond market. During the financial crisis, banks became severely reluctant to lend to companies (Chui, Domanski, Kugler and Shek, 2010). Bank loans to large borrowers fell by 79% in the fourth quarter in 2008 relative to the peak of the credit boom in the US (second quarter of 2007) (Ivashina and Scharfstein, 2010). As a consequence, corporations had to look for substitutes to bank lending, causing them to turn to the bond market (Fitch, 2010). In combination with the implementation of Basel III, which is expected to decrease supply and increase the cost of traditional bank loans (Slovik and Cournède, 2011), it seems clear why there is an underlying expectation for a larger supply of Swedish corporate bond issues.

A majority of previous research on bond underpricing is characterised by two features. First, the research is mainly focused on firm and issue specific characteristics. Second, most of the research takes place in the United States during the 20th century. This paper contributes to the existing literature first by focusing on issues only on the Swedish market in modern time, a bond market less developed and smaller than the US bond market. A consequence of a young bond market could be enhanced information asymmetry or simple inexperience compared to a more mature bond market, which in turn could cause increased underpricing. Agency problems and information asymmetry in the debt market can be reduced over time as firms in the market acquire reputation (Diamond, 1989). As such, it is interesting to examine how previous results relate to another market with different characteristics. Instead of focusing solely on firm and issue characteristics, this paper also contributes by examining the impact of the market level credit risk on bond underpricing. It has previously been shown that firm specific risk is a contributing factor to underpricing (Datta et al., 1997), which is why we want to investigate if the market level credit risk could have a similar effect. One way to measure the market level credit risk is to consider a Credit Default Swap (CDS) index. The CDS is a financial instrument which allows investors to protect themselves against the credit risk of an underlying asset (Ericsson, Jacobs and Oviedo, 2009). The purchase of a CDS is analogous to that of a normal insurance, the buyer pays a premium for holding the insurance and if the underlying asset fails, the seller of the CDS (the insurer) will have to compensate the buyer for the loss[1]. Because of its properties, as well as the fact that the CDS is a traded security, the price of a CDS reflects the default risk of the underlying entity in question and is therefore highly correlated to the price of the entities debt. By aggregating CDS prices, we argue that a measure of the overall credit risk in the market can be achieved.

The study results in a number of interesting observations. First, corporate bonds on the Swedish market are on average overpriced by 10 basis points (bps) as measured by negative initial abnormal returns. Second, high yield bonds are on average underpriced by 22 bps while investment grade bonds are on average overpriced by 17 bps. Third, we find support for the bookbuilding process, in which underpricing is less severe if a firm has recently issued debt. Fourth, we find no support for the nominal level of the CDS index having a direct impact on bond underpricing. However, when dividing the sample period into periods of relatively high and relatively low market credit risk environments, respectively, we find that bonds are priced higher in the low market credit risk environment. Unfortunately, these results are not robust when altering the market credit risk measure causing us to believe that the market level credit risk might affect the type and frequency of issues rather than underpricing directly.

The rest of this paper will be structured as follows. Section II presents previous research and theories together with the hypotheses driven in this paper. Section III presents the methodology of the study. Section IV displays key features of the data collection process and descriptive statistics on the final sample. Section V presents the empirical findings of the study and analysis of those findings. Finally, section VI concludes the study.

II. Theory and Hypotheses

In this section the five hypotheses driven in the paper are presented. Each hypothesis is derived and discussed in relation to relevant previous research and empirical results.

[1] Failure of an asset may include, but is not limited to, failure to pay, bankruptcy of the entity or entering restructuring (Blanco, Brennan and Marsh, 2005).

A. Bond Underpricing

Despite the smaller volume of academic research conducted on bond underpricing compared to equity underpricing, the first studies on security underpricing are carried out on the bond market. Early evidence from the period 1900-1944 indicates that outstanding bonds are sold at a premium in the market compared to new issues when looking at the yield to maturity (Hickman, 1958). The results lead Hickman (1958) to draw the conclusion that investors could profit from the observed underpricing through short-term trading of new issues.

Several papers look at the method of issuing bonds and how this affects the level of underpricing. Maese (1985) presents evidence showing that initial yield differentials between methods of issuing bonds is not related to underpricing but is rather explained by previously unaccounted differences in the bonds. Fung and Rudd (1986) reach a similar conclusion, that the method of issue does not affect underpricing to the same extent as previously shown. In the first study outside the US, Wasserfallen and Wydler (1988) using a sample of Swiss bonds finds evidence of slight underpricing. The underpricing is approximately equal to the difference in transaction costs between new and seasoned bond, closely related to the method of issuing the bond. Tests of several hypotheses also reveal that the underpricing partly seems to be explained by unexpected changes in interest rates over the offering period.

In a study on a related area, US Treasury Bills, Spindt and Stolz (1992) find evidence of underpricing by showing that bills in the primary market are underpriced compared to equal bills in the secondary market. The small difference is explained as a mean to compensate for uncertainty to as whether primary purchasers will be successful in their bidding. Vinson (1970) and Alexander and Stover (1977) examines convertible debt issues and finds evidence of underpricing. This is also supported by more recent research from Kang and Lee (1996) who finds that US convertibles are subject to underpricing amounting to 1.11%.

Conard and Frankena (1969) investigate the yield differential with three hypotheses. The first is related to bond characteristics, the second is related to the underwriter's pricing strategy, while the third hypothesis is related to market imperfections and transaction costs. Their study focuses mainly on Aa rated bonds and reach the conclusion that the difference in the coupon rate and its implication for a call premium could explain almost half the yield differential. After controlling for the coupon difference, there is still a yield differential, which the authors attribute to both their second and third hypothesis; indicating that underwriters might use a different pricing strategy for new and seasoned offers and that market imperfections lead to new issues being more affected by changing macroeconomic factors such as the interest rate.

In attempts to explain the *seasoning effect*[2] there are arguments that new issues and outstanding bonds converge towards an unobservable mean (Weinstein, 1978) and that outstanding bonds are merely lags of new issues (Lindvall, 1977). Fung and Rudd (1986) argue that the discrepancy between these two interpretations is related to a third explanation of the seasoning process: the cost of issuing the bond. However, in their empirical investigation Fung and Rudd (1986) find no clear evidence of underpricing as opposed to previous research and are therefore unable to investigate their hypothesis. The authors argue that this could be a consequence of them using trader quotes.

Despite some contradictions, a majority of the previous research point to the same conclusion; corporate bonds are on average underpriced. Further, the Swedish bond market is a relatively new one, since corporations historically have relied heavily on bank lending rather than the financial markets (Gunnarsdottir and Lindh, 2011). A consequence of a young bond market could be enhanced information asymmetry or simple inexperience compared to a more mature bond market (Diamond, 1989), which in turn could increase underpricing. Hence, based on previous research regarding the bond market and the nature of the Swedish market, the first hypothesis is:

Corporate bonds on the Swedish market are on average underpriced.

B. Riskiness of the Bond

Closely related to debt underpricing is the well-documented phenomenon of abnormal returns in stocks on the first day of trading: IPO underpricing. In a sample of IPO's from the 1960s Ibbotson (1975) documents an initial average performance of 11.4% but the author is not able to provide any explanation. Research on IPO underpricing shows that the initial abnormal return on equity is higher than for bonds, indicating that the riskier of the two is underpriced to a greater extent (Ibbotson, 1975; Loughran and Ritter, 2004; Datta et al., 1997; Cai et al., 2007). Underpricing of equity is also present in Seasoned Equity Offerings (SEOs), although less severe. Looking at a sample of seasoned offerings in the period 1980-1988, Corwin (2003) finds underpricing amounting to 2.2%.

[2] Referring to the pricing difference between outstanding bonds and new issues.

The link between debt and equity is much related to the quality of the bond, the lower the rating of the bond, the more it behaves like equity (Cornell and Green, 1991). Weinstein (1981) similarly compares the amount of systematic risk in bonds of different ratings and concludes that speculative bonds contain a larger systematic risk factor than investment grade bonds.

The first empirical evidence on bond underpricing distinguishing between high yield and investment grade is presented by Datta et al. (1997). The authors study the US market and focus only on initial public offerings of debt by excluding seasoned offerings resulting in a final sample of merely 50 issues. Despite the small sample, the results show significant underpricing for high yield issues, which is related to equity underpricing because of the larger portion of systematic risk constituting a high yield bond compared to an investment grade bond. The authors also find that investment grade bonds rather are overpriced and give a negative holding period return. Much related to the quality of the bond, Datta et al. (1997) also find that investment banker status is an element of underpricing. The authors argue that these factors are highly related to information asymmetry. Similar results are found by Cai et al. (2007) in a study on underpricing in both initial bond offerings and seasoned offerings. The authors find significant underpricing in both initial and seasoned offerings for high yield bonds, but they were not able to establish such a relationship for investment grade issues.

Goldstein and Hotchkiss (2007) examine the relationship between bond underpricing and trading activity in the aftermarket and provide additional empirical evidence for the difference in underpricing between investment grade and high yield issues. The authors find underpricing of 45 bps for investment grade issues and 124 bps for high yield issues in the period 2002-2006. They argue that the underpricing is related to both an ex-ante decision to underprice and aftermarket price dispersion. Further they argue that an increase in trading transparency is related to smaller underpricing for investment grade bonds.

The difference in pricing between investment grade bonds and high yield bonds may be derived from the nature of the two bonds, as a riskier bond can be seen as built up by a larger part of equity which is more severely affected by information asymmetry. As the equity stake and risk increases issuers could be forced to underprice to a larger extent in order to compensate investors purchasing the bond at the offering. For a perfectly safe asset, the impact of any information asymmetry diminishes as the return to the investor is already known and thus the value of any additional information is virtually zero. To compensate for a larger risk, underpricing could be an alternative to a higher coupon rate, as the previous gives the buyer an immediate discount and compensation for the risk of the market reaction as compared to the latter. Further, there is no reason to believe that the bonds issued on the Swedish market would differentiate from previous findings regarding differences in underpricing in high yield and investment grade bonds (e.g. Datta et al., 1997; Cai et al., 2007). Hence the second hypothesis is:

The level of underpricing increases with the riskiness of the bond.

C. Information Asymmetry

As researchers have tried to explain the phenomena of underpricing, several different theories have arisen and many relate to asymmetric information between the parties involved. Since the underpricing literature is dominated by equity studies, not all of these theories are applicable to a bond study because of differences between the two asset classes. Rock (1986), when attempting to explain IPO underpricing, introduces a theory known as the winner's curse. The theory builds upon the existence of two groups, one with informed investors who enjoy privileged information and another group of uninformed investor with no privileged information. If the IPOs are priced at their expected value, privileged investors will swarm good issues and abandon bad issues, leaving uninformed investors with an over allocation of bad issues, causing them to abandon the IPO market. As a result all IPOs need to be underpriced in order to compensate the uninformed investors and maintain a market.

A secondary explanation for equity underpricing is the signalling model which takes the view that firms themselves know their prospects best and as a consequence there is an information asymmetry problem for the investors[3]. To mitigate this problem the best firms choose to underprice in order to signal their quality, and investors know that only the best firms are able to recover the costly signal (Allen and Faulhaber, 1989). Jegadeesh, Weinstein and Welch (1993) provide mixed evidence for the signalling theory by showing that, on the one hand, underpricing increase the likelihood and size of a subsequent equity issue. On the other hand, the authors argue that the economic significance of their results are weak. Meanwhile, Garfinkel (1993) does not find any statistical significant relationship between underpricing and the likelihood of a subsequent equity offering, thus contradicting the signalling theory. Cai et al., (2007) attempts to investigate the signalling model in a bond context by using

[3] Nearly all information models builds upon the assumption that inside actors are better informed than investors (e.g. Brealey, Leland and Pyle, 1977).

future credit rating downgrades as proxy for asymmetric information. The authors find some supportive evidence by showing that firms that underprice less have a higher probability of being downgraded in the subsequent year. However, these results are not statistically robust. To some extent similar to the signalling argument is that of grandstanding; to underprice in order to raise attention from investors and media. Gompers (1996) argues that young venture capital firms have incentives to use IPOs to raise attention in order to increase the size of future funds.

The theoretical motives for the abovementioned theories when applied to bond underpricing are however questioned. Regarding the winner’s curse theory, it is argued that since a majority of the actors in the bond market are informed institutional investors the categorisation of informed and uninformed investors is not valid (Cai et al., 2007), a situation also applicable to the Swedish market. As the theoretical motives are highly questionable and no previous research is able to provide evidence that the winner’s curse affects underpricing in the bond market, this theory is disregarded. Previous studies on the signalling theory give the theory little or no validity (Jegadeesh et al., 1993; Garfinkel, 1993; Cai et al., 2007). Further, the utilized methodology by Cai et al. (2007) is inapplicable on our data set, as detailed and extensive credit rating data is unavailable on the Swedish market as compared to the US market. Thus, this study will not look at the signalling aspect of information asymmetry. The theoretical motives for grandstanding are also questionable, as very little media attention is directed to debt issues as opposed to equity issues. This is also supported by the fact that little attention is given to grandstanding in the debt underpricing literature, causing us to disregard this as an explanation for bond underpricing.

The most recent bond underpricing study, carried out by Cai et al. (2007), studies underpricing on both initial bond offerings (IPOs) and seasoned bond offerings (SBOs) of corporate bonds on the US market. In the study, the authors focus on information asymmetry and liquidity as explanatory factors for underpricing as they deem these to be most relevant on the bond market. The study concludes that the underpricing found in speculative grade bonds are related to information asymmetry and not to liquidity. The issuing companies needs to compensate investors for lack of information and this is done through underpricing. Hence, the larger asymmetric information between the investors and the companies, the larger the compensation in terms of underpricing of the issue.

There are several measurable factors that could affect the information asymmetry problem. First, first-time issuers are believed to have larger information asymmetry due to the market's unfamiliarity with the company (Cai et al., 2007). These companies generally have limited historical coverage from analysts and investors; thus a larger compensation will be required to successfully issue their bonds. Second, private companies do not have the same exposure to the market as public companies have and might therefor not attract the same attention. Furthermore, private companies are also likely to have less information published and historical information may also be more limited (Cai et al., 2007). Hence, private companies are also expected to underprice to a larger extent. Third, the size of the company may affect the magnitude of information asymmetry. There are arguments that a larger firm could complicate an analysis of the company and hence increase information asymmetry (e.g. Cai et al., 2007). Although, there are also arguments for an opposing view, that a larger size will incur greater scrutiny from analysts and the market in general leading to a decrease in information asymmetry (e.g. Datta et al., 1997; Aboody and Lev, 2000). Due to the lack of theoretical and empirical consistency on the impact of size on underpricing, we choose not to hypothesise about the size variable but include it as a control variable in our regression analysis. The third hypothesis in this paper is consequently:

Issues subject to greater information asymmetry experience larger underpricing.

D. Bookbuilding

The previous hypothesis suggests that underpricing is a direct function of information asymmetry, or put differently, underpricing is compensation for investors' lack of information. One way to decrease the information asymmetry is for large institutions to thoroughly analyse the firm at hand. Such an analysis however could be costly to execute and as such underpricing acts as compensation for the analysis (Leite, 2006). Should a given company issue several securities within a short time period, the analysis from the first issue should at least partially be applicable for the following issues. Hence the compensation, i.e. underpricing, should be smaller in the subsequent issues. This process is what Cai et al. (2007) denote the bookbuilding process, and it stems from previous research on IPO underpricing (Benveniste and Spindt, 1989; Benveniste, Busaba and Wilhelm, 2002; Sherman and Titman, 2002). Cai et al. (2007) find evidence that the bookbuilding process significantly affects the level of underpricing by showing that if a firm has made another recent public debt offering prior to the observed issue, this results in less underpricing. The authors, however, also finds evidence that a recent equity issue increases underpricing. This difference in effect can be derived from the pecking order theory developed by Myers and Majluf (1984) where a firm prefers to finance investments with debt over equity, hence issuing equity signals that the firm is unable to obtain debt financing. Masulis (1988) present empirical evidence showing that there are negative announcement effects of issuing equity whereas no such effect exists for debt. This rationale concerning the bookbuilding process and its relation to underpricing should also hold for the Swedish market, which is why the fourth hypothesis is:

The bookbuilding process affects underpricing.

E. Market Level Credit Risk

As the possibility for systematic short-term trade profits in bonds goes against the efficient market hypothesis, Brimmer (1960) discusses potential reasons for the yield differential between new bond issues and outstanding bonds. The study leads the author to two conclusions as to why the pricing paradox exists; first, new issuers are more sensitive to the supply of commercial bank credit available in the market, and secondly, outstanding issues are often traded at a discount in periods of rising interest rates causing a reluctance for the holders to sell them in order to change to new issues.

Another explanation for the pricing paradox is brought forward by Lindvall (1977) who develops Conard and Frankena's (1969) hypothesis of macro-economic factors by arguing that the yield on seasoned issues lags the yield on new issues as a result of new issues being more exposed. The author explains this by claiming that the nature of the bond market with large institutions causes infrequent trading of seasoned issues and hence a slower adoption to market conditions. Fung and Rudd (1986) concludes that the market environment affects the impact of the issue method on underpricing, and highlights that additional research is needed in the area.

A phenomenon indicating that the macroeconomic environment could affect underpricing of securities is the existence of hot and cold IPO markets, where hot markets refer to periods of large underpricing and cold markets periods of less underpricing (Ritter, 1984). Ritter hypothesises that the observed periods of substantial underpricing could be explained by an increased fraction of high-risk IPOs compared to periods with less underpricing. The author does, however, fail to support his hypothesis with the available data at the time. Corwin (2003) also finds that the level of underpricing in seasoned equity offerings change during the period 1980-1998 and argues that firm or offer specific characteristics are not able to explain this completely; hence hypothesizing that one plausible explanation could be changes in macroeconomic factors. Loughran and Ritter (2004) examine IPO underpricing over time and also find sharp fluctuations in the period 1980-2000. Their result show that the average one-day holding period return in the 1980s is 7% while the corresponding figure in the 1990s is 15% increasing even further in the late 1990s before the tech bubble. The authors argue that the level of underpricing is affected by the market environment, where information acquisition[4] and the winner's curse theory are the main explanatory factors during the 1980s while other factors were more important during the onset of the tech bubble. Despite the clear evidence of fluctuations, the relationship between IPO underpricing and the macroeconomic environment is to a far less extent covered in research than the relationship between IPO underpricing and firm characteristics. However, the scarce research undertaken in the area does suggest that a relationship exist. Ljungqvist (1997) finds a positive relation between IPO underpricing and the macroeconomic climate, where the value of a Business Climate Index is used as proxy. More recent research by Tran and Jeon (2011) who examine IPO activity in the US 1970-2005 indicate that the interest rate and the 10 year US Treasury bond yield partly determine the amount of proceeds raised through IPOs. Ameer (2012) reach a similar conclusion by showing that there is a significant relationship between the number of IPOs and macroeconomic variables such as the interest rate and industrial production in Malaysia.

As previous research indicates that risker (i.e. high yield) bonds tend to be more severely underpriced it seems reasonable that an overall increase in the market risk should increase underpricing on average. Hence, a macroeconomic variable accounting for the overall risk of the market could be the explanatory factor to the discrepancies in previous empirical findings regarding whether underpricing exists consistently or not. There is no single macroeconomic factor that is widely recognized as a sole predictor for hot and cold IPO markets. Because of this, there is no single factor that can be applied from the IPO literature to this study. Several papers do, however, investigate the relationship between bonds and CDSs on an individual level (e.g. Hull, Predescu and White, 2004; Blanco et al., 2005). Moreover Byström (2005) investigate the relationship between CDS indices and the stock market. Because of the established link between the CDS and bonds, and the nature of the CDS, we argue that by

[4] Information acquisition theory refers to the compensation in the form of underpricing to investors for their production of information about the issue/company. Information acquisition is related to the bookbuilding process, which refers to a decrease in underpricing in future issues as a consequence of the information already acquired.

taking an aggregated measure (a CDS index); one can create a macroeconomic factor that captures the overall credit risk level on the bond market.

The market for CDSs has been growing rapidly over the last years and its value was estimated at $57 trillion in 2008 (IOSCO, 2012; Arora, Gandhi and Longstaff, 2012). In a study investigating the relationship between investment-grade bonds and CDSs, Blanco et al. (2005) finds that for their sample the bond market and CDS market price default risk equally, implying an inverse relationship between bond prices and the CDS spread. The authors argue that CDSs are useful indicators of credit risk since they are cleaner indicators compared to bond spreads and since they lead the price discovery process. Longstaff, Mithal and Neis (2005) study the composition of corporate bond spreads, i.e. to what extent they consist of a default and a liquidity component. The authors find that a majority of the spread, for all rating categories, is related to the default component. Furthermore, Byström (2005) studies the relationship between European CDS indices (more specifically, iTraxx indices) and the underlying entities' stock price characteristics. The author concludes that there is a strong link between the two markets and that stock volatility is significantly correlated with the iTraxx index spread, further establishing the link between default risk and the CDS spread. Byström also point out the existence of capital structure arbitrage, a line of business in which arbitrageurs take advantage of the discrepancies between CDS spreads and the pricing of the underlying entity.

Norden and Weber (2009) study the relationship between CDS movements and movements in bond prices and finds that CDS spread changes granger-cause[5] bond spread changes to a large extent, implying that the CDS spread is a good predictor of bond market behaviour. The authors also find significant cointegration of CDS and bond spreads and that the CDS market leads the price discovery process. Empirical evidence from the post-crisis era also show support for the same conclusion as the abovementioned studies and further that the CDS lead is particularly strong in bearish times (Coudert and Gex, 2010).

Due to the nature of CDSs, there is also a strong link between CDSs and credit ratings. Both the stock market and the CDS market do to some extent foresee changes in the credit ratings from the three big rating agencies[6] (Norden and Weber, 2004). The empirical evidence presented by Norden and Weber (2004) shows that announcements for credit rating reviews

[5] Granger-cause is a statistical term which refers to one time series leading another.
[6] Standard & Poor's, Moody's and Fitch.

do exhibit abnormal returns while actual downgrades do not, suggesting that new information is provided only in the former. The results for the CDS market is also coherent with those of Hull et al. (2004), who show that the level of the CDS has predictive power for negative rating changes and find the same relationship regarding rating reviews and abnormal return. Hull et al. (2004) also finds that both the level of the CDS and credit-spread changes contains helpful information in estimating the likelihood of a credit downgrade. 51% of negative outlooks, 40% of reviews, and 43% of the downgrades in their sample occur during the top quartile level of the CDS.

Since the magnitude of underpricing is not constant over time, it seems reasonable to believe that the market conditions play a role in the pricing and trading behaviour of newly issued bonds. Because CDSs directly reflect the default probability of a given entity, or market for that matter, its relationship with bond market behaviour has become a subject of attention. It has not however been studied if, and how, the CDS market might affect bond underpricing. Since it has been shown that underpricing increases with bond specific risk, it can be hypothesised that the same relation could hold on a market level, where bonds would be more underpriced in periods of relatively higher market credit risk. Taking these aspects together, this study attempts to offer an alternative explanation to which factors that explain the level of underpricing in a given market. Hence, the fifth hypothesis is:

The level of underpricing is dependent on the market level credit risk.

III. Methodology

Early research use yield to maturity to compare the return on new and outstanding issues (Brimmer, 1960; Conard and Frankena, 1969; Lindvall, 1977). Meanwhile, more recent research turn to using holding period return (Weinstein, 1978; Datta et al., 1997; Cai et al., 2007). Weinstein (1978) argues that while none of the methods are clearly superior to the other, holding period return has two main advantages compared to yield to maturity. First, as no yield to maturity exists on securities such as equities, holding period return enables more comparability with studies on other areas. Second, the statistical properties of holding period returns are more suitable for aggregation and are more easily analysed compared to the yield to maturity. Furthermore, with the increased development in technology and financial globalisation, it is far more common that bonds are bought for a short term trading purpose.

Hence, this study will use holding period returns as it captures the return of a short-term trade in a bond issue.

For bond prices in sub-sequent trading, trader quotes retrieved from Thomson Reuters Datastream are used. While it might be optimal to use actual transaction prices, no such data on Swedish bond trading is, to our knowledge, available. Trader quotes can according to Bonthron (2014) be seen as indicative values and several studies on bond underpricing use trader quotes, for instance Fung and Rudd (1986) and Wasserfallen and Wydler (1988). In order to be able to make a better comparison to previous research, normal returns rather than logarithmic returns are used. One of the main advantages of the time additive property of logarithmic returns is forgone as the study does not intend to look at periods of returns (Brooks, 2014). There is also discrepancy in the methodology used in previous research on bond underpricing for benchmarking the initial return on the new corporate bond issues; this study makes use of several corporate bond indices to compute abnormal return. A further motivation for this decision follows later in the subsection Comparative Index.

The calculation of the holding period return for each bond is displayed in equation 1.

$$R_i = \frac{P_{i,t+n} - P_{i,t}}{P_{i,t}} \tag{1}$$

For $i = 1,2, \dots ,256$, which corresponds to each individual bond. n is the number of days from the offering date t to the first day of trading. P represents the price for the given bond for each t.

The calculation of the holding period return for each benchmark index period is displayed in equation 2.

$$R_i^* = \frac{P_{z,t+n} - P_{z,t}}{P_{z,t}} \tag{2}$$

For $i = 1,2, \dots ,256$, which corresponds to each individual benchmark index period return. z is the corresponding index, which is one of the seven benchmark indices used. n is the number of days from the offering date t to the first day of trading for the benchmarked bond.

The calculation of the abnormal return for each bond is displayed in equation 3.

$$AR_i = R_i - R_i^* \quad (3)$$

Where R_i represents the initial return of the bond and R_i^* represents the return on the corresponding index for the same holding period.

A. Hypothesis Testing

In order to investigate the first hypothesis, *corporate bonds on the Swedish market are on average underpriced,* a univariate analysis of abnormal return is carried out on the entire sample. The obtained mean abnormal return is used to measure underpricing and the value is subject to a t-test to establish its statistical significance. A univariate analysis is also used in order to test the second hypothesis, *the level of underpricing increases with the riskiness of the bond*. The sample is divided into two subsamples, high yield and investment grade respectively, and the average abnormal return for each subsample is tested for significance using a t-test. To further examine the difference between the two samples, a single factor ANOVA analysis is conducted.

To extend the analysis of the second hypothesis and to test the third and fourth hypothesis, *issues subject to greater information asymmetry experience larger underpricing* and *the bookbuilding process affects underpricing* respectively, a multivariate analysis is conducted. One variable indicating the *Credit rating* and two proxies for information asymmetry are included; *First issue* and *Public or private*. To test the bookbuilding process two variables are used; *Recent debt issue* and *Recent equity issue*. Further, several control variables are included in order to isolate the effect of the explanatory variables. The control variables and the explanatory variables are further described in appendix 3. In order to examine the explanatory power of each explanatory variable the regression analysis is set up first testing each variable individually in a specification. Then all explanatory variables are used in a regression specification together and finally in the last specification the explanatory variables are ran together with the control variables. The final specification in the first multivariate analysis is displayed in equation 4.

$$AR_i = \alpha + \beta_1 CR_i + \beta_2 FI_i + \beta_3 PP_i + \beta_4 RD_i + \beta_5 RE_i + \beta_6 TA_i + \beta_7 GO_i + \beta_8 OA_i + \beta_9 EX_i + \beta_{10} ML_i + \varepsilon_i \quad (4)$$

The fifth hypothesis, *the level of underpricing is dependent on the market level credit risk,* is investigated using both univariate and multivariate analysis. The univariate analysis is conducted by dividing the sample into two additional subsamples: *High CDS* and *Low CDS*. The *High CDS* subsample includes all bonds issued at a time where the CDS level exceeds the 80th percentile of the CDS index level for the entire period and the *Low CDS* subsample includes all bonds issued at a time where the CDS level is below the 20th percentile of the CDS index level for the entire period. By categorising the sample this way, we aim at identifying which bonds that are issued in a high market credit risk environment and low market credit risk environment, respectively, and enable an analysis of the abnormal returns in each environment[7]. T-tests are conducted to establish the statistical significance of the average abnormal returns in each subsample. To further examine the difference between the two samples, a single factor ANOVA analysis is conducted. Second, the daily level of the CDS index is used as an explanatory variable in a multivariate analysis. Since previous research has established that CDSs lead the price discovery process over bonds (Blanco et al., 2005) a lagged 20 trading day average of the CDS index level will be included in the multivariate analysis. In order to examine the explanatory power of each variable, first two different regressions each with one of the two explanatory variables for hypothesis five are conducted. Secondly, the statistically most relevant explanatory variable for the CDS level is run together with those from the first multivariate regression analysis described above. Finally, one regression including all control variables is carried out. The control variables and the explanatory variables are further described in appendix 3. The final specification in the second multivariate analysis is displayed in equation 5.

$$AR_i = \alpha + \beta_1 CDS_i + \beta_2 CR_i + \beta_3 FI_i + \beta_4 PP_i + \beta_5 RD_i + \beta_6 RE_i + \beta_7 TA_i + \beta_8 GO_i + \beta_9 OA_i + \beta_{10} EX_i + \beta_{11} ML_i + \varepsilon_i \quad (5)$$

The multivariate analyses are carried out using Ordinary Least Squares (OLS) regressions. White's (1980) test for heteroscedasticity reveals that several of the regressions are subject to

[7] While there is no predefined limit for a high and low period respectively, using the 90th and 10th percentile leads to too few observations in the high period and using the 70th and 30th percentile implies that we define a majority of the days (60%) as either high or low, rather than normal (40%).

heteroscedasticity. To account for this, White heteroscedasticity consistent standard errors are used in all OLS regressions.

IV. Data

This section describes the data gathering procedure and discusses relevant issues in the process. The section also includes descriptive statistics of the dataset.

A. Collection of the Bond Data

The data used is gathered from four separate main sources: S&P Capital IQ, Thomson Reuters Eikon, Thomson Reuters Datastream and Bloomberg Terminal. This is done in order to obtain the most complete dataset possible, as unique data can be found in all four databases. The list over all bonds issued on the Swedish market is gathered from the S&P Capital IQ database, which contains information on all bond issues. The bond issuances collected are issues conducted in the period 2009-01-01 to 2016-01-20 on the Swedish market. The study includes companies in all sectors except for the financial services sector, which is in accordance to the most recent research on bond underpricing (Cai et al., 2007)[8]. The study also excludes Corporate Convertibles and Corporate Pay-In-Kinds and does not define a bond issue through a new corporate structure as an initial offering if the company has previously issued debt through another entity; this is controlled by the related companies' data obtained from S&P Capital IQ[9]. The S&P Capital IQ database is also used to collect issuer, ISIN number, offering date, maturity date, issue rating, issuer rating, and ultimate parent. In order to determine if a company was listed at the time of issuance, historical IPO dates for all companies that are public are examined. In the sample, there is no company that issued bonds both before and after going public. The sample is also examined for any companies that possibly could have been delisted during the observation period; however, no such company exists.

Additional data is then added manually; initial offerings and recent debt offerings are identified by manually searching the corporations' bond history in Thomson Reuters Datastream. Recent equity offerings are identified through the Nasdaq Corporate Actions list. Data on offering size is complemented through Thomson Reuters Eikon as the S&P Capital IQ size data is distorted by historical currency conversion. A number of observations had

[8] Real Estate firms are included in our study even though they in some categorisations can be placed as a sub-division of financial firms.
[9] Both these assumptions are in line with previous research by Cai et al. (2007).

missing ISIN numbers, these issues were successfully matched manually on issuer, offering date, maturity date and coupon rate to Thomson Reuters Datastream in order to receive the ISIN number and return data. Despite utilizing several data sources to complete the data set, more than half of the observations are excluded from the final sample due to insufficient data. Incompleteness of data in the sample is a problem experienced by many researchers investigating the bond market, as it is far less accurate and complete than the equity market data. Datta et al. (1997) start with 237 observations of initial debt offerings, but the final sample contains only 50 observations with sufficient data. The authors argue that this is similar to previous bond research by Dhillon and Johnson (1994), who, in their sample, has a success rate of approximately 25%.

B. First Day of Trading

The syndication period[10] of a bond is unpredictable and can be everything from a few hours to a couple of days long (Fung and Rudd, 1986). In order to get an overview of the syndication periods in the sample, data on trader quotes for the first 60 days subsequent to the offering date is collected from Thomson Reuters Datastream. Out of the 363 observations with complete bond data, 193, or 53% are traded on the day of offering. Whether this is due to illiquidity or that the bond is held up in syndication is unfortunately impossible to say. Accumulating the number of bonds that trades within the first seven days from the offering gives a sample of 256 observations, or a success rate of 71% out of the sample with otherwise complete data. While there is no distinct optimal trade-off between number of observations that can be included and any potential distortion arising from a longer period until the first trade, seven days and an inclusion rate exceeding two thirds is deemed best for this sample. A seven-day window is also in line with previous research by Cai et al. (2007).

For each individual bond, the holding period return is calculated as the return from buying the bond at the offering price and selling the bond at the first available day of trading. It would of course be optimal to have the same period from offering to first trade for all observations, but as can be observed in the previous literature the bond market's characteristics, with unpredictable syndication period's and illiquidity, makes this difficult. However, as the comparative benchmark index return is based on the same return period as each individual bond, underlying changes in the European bond market during the seven-day period are

[10] The syndication period refers to the duration between the official offering date and the date when the bond is released for trading.

accounted for when calculating the abnormal return. Fung and Rudd (1986) argue for this methodology by reasoning that as the syndication period is unpredictable, the most realistic assumption in order to replicate investor return, is that an order must be placed at the beginning of the syndication and that selling will not occur before the first day of trading. To further enhance the replication of the return data, the offering price is set as the purchase price while the selling price used is the quoted bid price. The quoted bid price, assuming trader quotes are indicative prices, is the actual price that a short term investor would be able to sell at immediately, while the fair market value might be at an unobservable transaction price in between the indicative bid and ask price. Using the bid price rather than the actual transaction price, assuming the latter lies between the bid and ask price, will have different effect on the observed abnormal returns depending on if the returns are positive or negative. If negative abnormal return is observed for a given issue, this is likely to be overstated as the bid will be further away from the benchmark index than the actual transaction price. If positive abnormal return is observed for a given issue, this is likely to be understated as the bid will be closer to the benchmark index compared to the actual transaction price. An illustration of this phenomenon can be seen in appendix 1 figures 1.1 and 1.2. By the same logic, the bid ask spread is likely to affect the magnitude of this margin of error, or bid-error as denoted from here on. If an issue has a relatively larger spread then it is more likely that the bid price deviates further from an actual transaction price compared to in an issue with relatively narrower spread. This phenomenon is illustrated in appendix 1 figures 1.3 and 1.4.

C. Determining Credit Rating

In order to match the bonds to the correct index and to examine the second hypothesis a rating variable is created. The rating variable is based primarily on issue rating[11]. If no such rating exists, issuer rating at the time of the issue is used as proxy. However, a problem arising when using ratings is that not all the bonds are officially rated or are issued by a company that has an official credit rating. Previous research is to some extent ambiguous in this area. Wasserfallen and Wydler (1988) in their study on the Swiss market determine credit quality on a scale of one to five based on criteria they classify as widely accepted in the market while Cai et al. (2007) does not have the problem of missing ratings. A plausible explanation for the difference in the number of rated bonds is the underlying market, as US companies are more

[11] The rating scale used is that of Standard & Poor's. Consequently, a rating is determined primarily on the rating given by Standard & Poor's if several ratings exist. If no rating is given from Standard & Poor's, the rating from Moody's and lastly Fitch is used by converting to the Standard & Poor's scale.

likely to be rated than Swedish ones. This could be a result of a more developed and mature bond market in the US, which also is the country where the three largest credit rating institutions were founded and reside. As a rather large part of the sample does not have an issue rating or a parent company rating at the time of the issue, and Wasserfallen and Wydler (1988) who also study another market then the US turn to alternative methods, this study uses current credit rating and shadow rating[12] as complements to enable a comprehensive matching. Hence, if none of the primary or secondary indicators of rating exists, then the current credit rating is used as proxy. If no current credit rating exists, the shadow rating given to the company from the credit analysts at the five largest financial institutions in Sweden is used as a proxy. While there of course is the chance that the credit risk of a given company is different today compared to the day of issue, it is rather irregular that ratings move between investment grade and high yield. An alternative would be to regard all unrated bonds as high yield; however, given the variety of firms in our sample the shadow rating approach should provide less distorted results. For the shadow rating, none of the observed ratings diverge enough to place a bond in two different categories depending on which institution's rating is used, hence, the shadow ratings seems to be consistent to whether a bond is investment grade or high yield[13]. To verify robustness of this assumption additional tests are run using a sample with only the companies for which an official credit rating exists at the time of issue.

D. Comparative Index

In previous research on bond underpricing, there is some discrepancy in the methodology used for calculating comparative holding period returns in order to compute an abnormal return on the asset. Wasserfallen and Wydler (1988) match new issues with seasoned issues first by trying to use a bond from the same issuer then secondly on rating class while also trying to minimize differences in coupon, time to maturity and call features. Weinstein (1978) use the mean return of all other bonds with the same rating in the sample in the corresponding period to calculate abnormal return while Fung and Rudd (1986) use both treasury returns and matching bonds to calculate abnormal return on the bonds.

[12] Shadow rating here refers to an unofficial credit rating given by a financial institution that is not a credit rating agency.

[13] After collecting shadow ratings, there are four bonds (from four companies) that still do not have a rating. By examining the characteristics of each of the issuers, they are manually determined as high yield bonds.

This study uses benchmark indices in order to compute abnormal returns, which is in accordance to more recent research (Welch, 2000; Cai et al., 2007). Six different benchmark indices from Bank of America Merrill Lynch are gathered through Bloomberg. The benchmark indices consists of one high yield index on the European market and five investment grade indices on the European market divided on maturity of 1-3 years, 3-5 years, 5-7 years 7-10 years and 10+ years. A sample firm is first matched based on the rating classification distinguishing between investment grade (AAA to BBB-) and high yield (BB+ or lower). Then, investment grade bonds are also matched on maturity to the proper benchmark index while no distinction is made in terms of maturity for high yield bonds. Matching on maturity and rating category is done in order to minimize differences in market reactions between the investigated bond and the benchmark index and is also in line with previous research by Cai et al. (2007). Ideally, the high yield bonds would also be matched on maturity as a secondary distinguisher. However, as no such indices exist to our knowledge, this is not possible. A secondary limitation is that the indices are based on European corporations, which could have a slightly different exposure to macroeconomic variables than the bonds in our sample. However, we argue that these indices are more representative to use than the indices available on only Swedish securities, as these to our knowledge only are government and mortgage indices. For example, Blanco et al. (2005) use a similar but reversed approach with the German government bond representing the risk free rate benchmark for all European securities, as no European risk free rate exist. To verify robustness of the results, abnormal returns are also calculated using Swedish government 3-month treasury bills.

E. CDS Index

In order to investigate the hypothesis that bond underpricing is related to the market level credit risk a CDS index is used. The index used is the iTraxx European Corporate Bond CDS index, as no Swedish CDS index exists. The iTraxx CDS index measures the average level of premium that has to be paid on the 125 underlying CDSs. By using an index we argue that it is possible to proxy the overall market credit risk to a great extent, as the impact of idiosyncratic firm risk diminishes with the number of CDSs included. A high value of the CDS index consequently means that the premium on the CDS (i.e. premium on the insurance) is high, implying that the risk is larger. A low value on the CDS index means that the premiums are lower and therefor also that the risk is lower. The iTraxx CDS index is actively re-weighted every six months, where each series contains the 125 most actively traded CDSs in Europe in the six months prior to the reweighting. To receive an as accurate measure of the current market conditions as possible, the index used is a combination of the individual series, where each series covers its six months respectively. The combined series range from iTraxx series 9 in 2009 to series 22 in 2016 and are gathered from Bloomberg Terminal.

While the iTraxx index is on a European level, the monetary unification in Europe has caused investors to view the euro area as a single bond market (Pagano and von Thadden, 2004). Even though Sweden still uses krona, many of the larger companies choose to issue in both krona and euro and both within and outside the Swedish bond market, which should cause significant market integration. Another potential consequence of the iTraxx index is an upward bias in the index level arising from the way it is constructed as the index constitutes the 125 most traded CDSs. It is reasonable to believe that as the riskiness of a firm changes to the worse, trading in the firm's corresponding CDS will increase. As such, a CDS index that re-weights every six months based on trading activity might be biased upwards. That being said, this bias shouldn't distort the results too much as the relationship between high and low periods of market credit risk ought to be maintained and no single company can affect the index significantly.

To investigate whether the usage of a European CDS index, rather than a Swedish CDS index, has an impact on the results a custom Swedish CDS index is created. The index consists of those OMXS30[14] companies for which a CDS exists. In total, there are 15 companies out of the 30 included in the index for which CDSs exists. The CDSs used are the 5 year Senior Secured and each CDS is given equal weight in the index. The reason for not using this index as the main proxy for market level credit risk, and rather as a robustness test, is that using only 15 securities might not be enough to diversify the idiosyncratic risk of the individual companies. Hence, this custom index might fail to capture the market level credit risk investigated in hypothesis five.

F. Sample

The final sample consists of all observations where the first trade of the bond occurs within seven days of the offering date and the other necessary data on the issue is complete. The

[14] OMXS30 is a capitalization weighted index consisting of the 30 most traded stocks on the Stockholm Stock Exchange.

initial sample consists of 537 bond issues on the Swedish market in the period 2009-01-01 to 2016-01-20. Of these observations, 174 are missing data on the offering price and are consequently removed. Out of the remaining 363 observations, 320 observations have available price data within 60 days of the issue. Since we require the bond to have pricing data available within seven days of the offering, another 64 observations are excluded leaving us with a final sample of 256 observations. The composition of our final sample can be seen in table 1.

Table 1
Sample Description - Bonds

Number of bonds represents all bonds with complete data that are traded within seven days of the offering date. Investment grade includes all bonds that have a rating between AAA and BBB-, High yield include all bonds with a rating lower than BBB- and No rating represents the bonds for which no rating can be found. Seasoned issue are the bonds issued by a company that has previously issued bonds while First issue are bonds issued by a company that has never issued a bond before. Listed issue are issues that become listed upon issuing and Private placement are those bonds that are not listed on an exchange. Offering size displays the average and median of the size of the bonds in thousands of Swedish Krona and Maturity length describes the average and median maturity in years of the bonds at the issue.

	Number	*Percentage*
Number of bonds	**256**	
Investment grade	212	83%
High yield	40	16%
No rating	4	2%
Seasoned issue	219	86%
First issue	37	14%
Listed issue	243	95%
Private placement	13	5%
Offering size - TSEK (average)	515 459	–
Offering size -TSEK (median)	400 000	–
Maturity length - years (average)	4	–
Maturity length - years (median)	4	–

From table 1 it can be seen that a majority of the bonds, 212 (83%), are classified as investment grade bonds while a minority, 40 (16%) are high yield bonds. In the sample, there are also 4 (2%) bonds for which no rating can be found. A majority of the bonds, 219 (86%) are seasoned issues while the remaining 37 (14%) are first issues. The proportion between seasoned and first issues is similar to that found by Cai et al. (2007) (85/15%) while the proportion of investment grade bonds (83%) is slightly higher compared to both Cai et al. (70%) and Datta et al. (1997) (64%). Most of the bonds in the sample are listed issues and only 15 issues are private placements. The average offering size is slightly above 500 000 TSEK Swedish krona while the median is 400 000 TSEK, indicating that the sample is skewed to the right. Meanwhile, both the average and median maturity amounts to four years.

Table 2
Sample Description - Companies

Numbers of companies display the number of unique issuers. Investment grade shows all companies that have a rating between AAA and BBB-, High yield include all companies with a rating lower than BBB- and No rating represents the companies for which no rating can be found. Public and Private indicates if the issuing company is listed on an exchange at the time of the issue. Total assets display the average and median value of the firms' assets in terms of thousands of Swedish krona at each bond issue.

	Number	*Percentage*
Number of companies	**64**	
Investment grade	35	55%
High yield	25	39%
No rating	4	6%
Public	42	66%
Private	22	34%
*Total assets - TSEK (average)**	23 707 635	–
*Total assets - TSEK (median)**	21 452 303	–

*At the time of the first issuance for each company.

Table 2 shows that that all 256 bonds are issued by a total of 64 companies, implying an average of four bond issues per company during the sample period. This finding explains the high percentage of seasoned issues in table 1. For the individual companies, a majority are classified as investment grade. However, the percentage of companies that are classified as investment grade (55%) are less than that of the total amount of investment grade bonds (82%), suggesting that on average the investment grade companies issue a higher number of bond than the companies that are high yield (6.1 compared to 1.4). The descriptive statistics also reveal that two thirds of the companies in the sample are public while one third of the companies are private. Finally, the average of total assets of the companies at issue is slightly higher than that of the median, indicating that as with issue size there is a slender skew to the right in term of company size.

G. Credit Default Swap Data

The CDS data consists of daily index levels for the entire sample period. The index used is the iTraxx European Corporate Bond CDS index which contains the 125 most traded European CDSs. Further the index data is divided into three categories, high, low and normal. Descriptive statistics on the CDS index is displayed in figure 1.

Figure 1

Credit Default Swap Index

The graph presents the level of the iTraxx European Corporate Bond CDS index during the sample period. The two dashed lines represent the high category (80th percentile) and the low category (20th percentile) respectively. CDS index level display the mean, median, 20th percentile and 80th percentile of the data series. Number of bond issues presents the number of issues in the sample that are conducted in a period of Low CDS (20th percentile) and High CDS (80th percentile) respectively.

	Mean	Median	Low CDS	High CDS
CDS index level	143.15	133.42	88.91	190.80
Number of bond issues			75	40

From figure 1 it can be seen that the CDS index level fluctuates substantially during the sample period. The period for the CDS index ranges from 2009-01-01 to 2016-01-20 and includes 1860 daily observations[15]. The CDS index reaches its highest value of 355 bps in late November 2011 while the lowest value of 63 bps is observed in March 2015. The sample is characterised by two periods of significantly higher levels of CDS; first during the three first months of 2009 and second during the period of late 2011 through late 2012. The first period of high CDS index values reflect the wake of the financial crisis, while the second reflects the European sovereign debt crisis. The average value for the CDS index level during the sample period is 143 bps while the median is slightly below, indicating that high values deviate further from the median than the low values. The 80th percentile in the sample, which represents the lower boundary for the issues categorised as *High CDS*, is 191 bps. The upper boundary for the *Low CDS* issues is 89 bps, which represents the 20th percentile. Out of the 256 bonds included in our complete data set, 115 (45%) issues are conducted during a day that belongs to the upper 20% or the lower 20% of the CDS index level. A majority of these

[15] In order to compute the lagged CDS index data from 2008-12-04 is included.

115 issues, 75 (65%), are conducted in the *Low CDS* environment while 40 (35%) are conducted in the *High CDS* environment.

V. Empirical Results

In this section the empirical findings from our study are presented, the section will be ordered as follows. First, hypotheses one to three are tested using univariate t-tests and ANOVA tests. Second hypotheses two to four are tested using multivariate OLS regressions. Third, hypothesis five is tested using univariate t-tests, ANOVA tests and multivariate OLS regressions. Note that positive abnormal returns imply underpricing while negative abnormal returns imply overpricing.

Table 3
Univariate Analysis of Abnormal Returns

Table 3 displays average abnormal returns for the complete sample and for six different subsamples. Complete Sample displays the average abnormal return for the entire sample of 256 bonds. Investment grade represents the average abnormal return of the bonds that have a rating between AAA and BBB- while High yield represents the average abnormal return for the bonds that have a lower rating than BBB- or no rating. Seasoned issue display the average abnormal return of the bonds that are not the first offering from a company while First issue displays the average abnormal return of the bonds that are first issues. Public displays the average abnormal return for the bonds issued by companies that are listed while Private displays the average abnormal return for the bonds issued by a company that is not listed. Investment grade vs High yield displays an ANOVA test between investment grade and high yield. Seasoned issue vs First issue displays an ANOVA test between first issues and seasoned issues. Public vs Private displays an ANOVA test between public and private. The statistical significance is indicated by ***/**/* for the 1%/5%/10% level respectively.

	Average	t-statistic	F-statistic	P-value
Complete Sample	-0.0010***	-2.89		
Investment grade	-0.0017***	-4.97		
High yield	0.0022**	2.17		
Investment grade vs High yield			20.16	0.000
Seasoned issue	-0.0012***	-3.22		
First issue	0.0000	0.03		
Seasoned issue vs First issue			1.46	0.228
Public	0.0003	0.65		
Private	-0.0020***	-4.14		
Public vs Private			12.41	0.001

As expected, table 3 shows that the results regarding underpricing differ substantially depending on the category of bonds investigated. The complete sample shows an average abnormal return of approximately -10 bps significant on the 1% level. This implies that the bonds in our sample are on average overpriced, contrary to the first hypothesis and previous results (e.g. Weinstein, 1978; Wasserfallen and Wydler, 1988; Cai et al., 2007). However, breaking the sample down into sub-categories gives explanation for this finding. The subsamples of most interest are investment grade and high yield, which relate to our second hypothesis. This is not only the most important categorisation of bonds in financial markets in general but also in previous research on bond underpricing. Similar to Datta et al. (1997) we find that investment grade bonds are on average overpriced. The investment grade bonds are overpriced by approximately 17 bps which is significant on the 1% level. The results on high yield bonds are also consistent with those of Datta et al. (1997), high yield bonds are on average underpriced with approximately 22 bps significant on the 5% level. Thus, we find support for the second hypothesis that riskier bonds are more underpriced. The statistical significance of the ANOVA test is high at the 1% level, hence supporting the previous result of the univariate t-test and the second hypothesis; that there is a difference in the underpricing of high yield and investment grade bonds respectively. These results together with the sample descriptive, which reveals that investment grade issues constitute 83% of our final sample, helps explain why we found overall overpricing in the complete sample. It is possible that the high proportion of investment grade issues as compared to previous US research is a result of the less developed Swedish market (e.g. Datta et al., 1997; Cai et al., 2007 as revealed in the sample subsection). As such, the results reveal that rather than as hypothesised, that the young market cause increased underpricing due to enhanced information asymmetry, it could be the case that firms subject to greater information asymmetry are less prone to enter such a bond market.

Similar to investment grade issues, seasoned issues are also overpriced by 12 bps on average significant on the 1% level. This is reasonable as our sample description indicate that most of the seasoned issues are from investment grade companies[16]. First issues show a very small underpricing on average; however this result is not statistically significant. Hence, the relationship between abnormal returns in seasoned and first issues are as expected, i.e. seasoned offerings are priced higher than first issues. These results also offer an explanation as to why the first hypothesis is rejected, the seasoned issues constitute 86% of the total sample; hence an overpricing in seasoned issues will significantly affect the average abnormal return in the entire sample. However, the ANOVA test on these subsamples shows that there is no statistical significant difference between first issues and seasoned issues.

[16] This can also be seen by looking at the correlation matrix in appendix 2, table 2.10. The correlation matrix also reveals that there is no problem with multicollinearity with the included explanatory variables in the multivariate analyses.

Table 3 also shows that bonds issued by private companies are overpriced which is opposite to what was expected, the results are significant on the 1% level. Meanwhile, the average abnormal return for public companies is positive but far from statistically significant. The third ANOVA test between *Public* and *Private* also show that there is a statistically significant difference on the 1% level in the abnormal return between the two subsamples. The results from the ANOVA analyses therefor fail to support the third hypothesis that issues with larger information asymmetry, as proxied by *First issue* and *Private*, are subject to more underpricing. The fact that our findings regarding underpricing in public and private companies contradict several previous papers on the subject might be explained by the Swedish government corporate ownership model, which differs substantially from the US. Examining the sample it is evident that several of the private companies are government owned, which could distort the results. The correlation matrix in table 2.10 appendix 2 reveals a negative correlation of -0.51 between *Government ownership* and *Public or private*[17]. Hence, little weight is put on the results regarding *Public* and *Private* before a multivariate analysis is conducted where this can be accounted for.

A plausible contributing factor for the overall overpricing found in the univariate analysis in excess of the sample characteristics could be the usage of bid prices. As bid prices are likely to be below the actual transaction price, abnormal returns in the case of overpricing should be overstated when using bid prices. Correspondingly, abnormal returns in the case of underpricing should be understated (appendix 1 figure 1.2 and 1.1). Looking at the bid-ask spread for the different rating categories, we find that investment grade issues have an average bid-ask spread of 34 bps in the 60 days post issue while high yield issues average at 73 bps. Following the logic above, the underpricing found in our high yield sample is potentially understated, implying that the results are robust and that actual transaction prices could yield even higher abnormal returns and stronger statistical significance (appendix 1 figure 1.1). Meanwhile, the overpricing found in the investment grade sample could be overstated, implying that the results that to some extent deviate from previous research might not be as robust and statistically significant as implied (appendix 1 figure 1.2). Conducting the same univariate analysis using the mid prices as a robustness test confirms this. The overpricing of the complete sample and investment grade subsample is no longer statistically significant

[17] While it to some might seem reasonable to simply exclude government owned companies, such a limitation would decrease both the number of issues considerably and the representativeness of the sample due to the scarcity of issuers in the Swedish market. Further, it is worth noting that government ownership in this context does not imply a nonprofit purpose.

while the magnitude and statistical significance of the underpricing for the high yield subsample increases to the 1% level. Similarly, the statistical significance for the seasoned issues is removed while first issues show a statically significant underpricing. In this robustness test public firms are also significantly overpriced significant on the 1% level. Even though the usage of mid prices rather than bid prices yields better results in terms of our hypotheses we still believe that the bid prices are more representative. The bid price reflects the price that an investor can sell at immediately while the ask price takes into account the market makers spread. The results from the univariate test using mid prices rather than bid prices can be found in appendix 2 table 2.1.

The results presented in table 3 are overall robust when running the same tests using the 3-month Swedish government treasury bill index as benchmark index for abnormal returns. Some statistical significance is decreased but all previously statistically significant results are still at least significant at the 10% level and the signs of the average abnormal returns also remain the same for all subsamples. Swedish treasury bills are included in robustness tests for two reasons. First, the corporate indices are on a European level. Second, previous research (Fung and Rudd, 1986) use treasury bills as benchmark. The test can be found in appendix 2 table 2.2. The results for the overall sample and the investment grade issues are also robust when only examining issues with an official credit rating or an official parent company rating at the time of the issue. Unfortunately the numbers of high yield bonds in this sample are too low to test for statistical significance; however the sign of the abnormal return is unchanged. This test indicates that our usage of shadow ratings does not affect the results adversely. The test can be found in appendix 2 table 2.3.

Table 4
Multivariate Analysis

Table 4 displays seven OLS regression analyses with abnormal return as the dependent variable. Credit rating is a dummy variable that takes the value 1 for all bonds that have a rating between AAA and BBB- and 0 for all bonds with a rating lower than BBB-. First issue is a dummy variable that takes the value 1 for all issues where no issue has previously been conducted by the issuing company. Public or private is a dummy variable that takes the value 1 if the company has listed equity. Recent debt issue is a dummy variable that takes the value 1 if a previous bond issue has been conducted within one year of the issue. Recent equity issue is a dummy variable that takes the value 1 if equity has been issued within one year of the issue. Total assets represent the logarithmic value of the issuing firm's total assets at the time of issue. Government ownership is a dummy variable that takes the value 1 if the issuing company is owned by the government. Offering amount represents the logarithmic value of the nominal amount of the issue. Exchange is a dummy variable that takes the value 1 if the issue is listed on an exchange. Maturity length is the number of years to maturity. The statistical significance is indicated by ***/**/* for the 1%/5%/10% level respectively. White heteroscedasticity consistent t-statistics are given within the parentheses.

Regression	**1**	**2**	**3**	**4**	**5**	**6**	**7**
No of observations	256	256	256	256	256	256	256
Variable							
Credit rating	-0.0039***					-0.0029**	-0.0028**
	(-3.61)					(-2.54)	(-2.29)
First issue		0.0011				-0.0001	0.0004
		(1.05)				(-0.12)	(0.34)
Public or private			0.0024***			0.0013**	0.0010
			(3.50)			(2.18)	(1.45)
Recent debt issue				-0.0018**		-0.0004	-0.0003
				(-2.24)		(-0.38)	(-0.24)
Recent equity issue					0.0038	0.0014	0.0015
					(1.42)	(0.52)	(0.59)
Total assets							0.0003
							(0.66)
Government ownership							-0.0012
							(-1.28)
Offering amount							0.0003
							(0.65)
Exchange							-0.0021
							(-0.79)
Maturity length							0.0003*
							(1.92)
Constant	0.0023**	-0.0011***	-0.0020***	0.0003	-0.0012***	0.0011	-0.0097
	(2.19)	(-3.18)	(-4.66)	(0.41)	(-3.70)	(0.92)	(-0.76)
Adjusted R Squared	0.0699	0.0013	0.0428	0.0182	0.0211	0.0753	0.0915

Specification 1 in table 4 shows that *Credit rating* has a negative impact on abnormal returns significant on the 1% level, supporting the results from the univariate analysis and the second hypothesis. The statistical significance of *Credit rating* is also maintained at the 5% level in specification 6 and 7 in which several control variables are included. The second specification, with *First issue* as explanatory variable, shows a positive coefficient as expected but low statistical significance. In regression 3 the variable *Public or private* is positively significant on the 1% level which is in line with the univariate result and to the contrary of what was expected. However, when the government ownership, along with several other control variables is accounted for in specification 7, the statistical significance disappears as expected from the discussion in the univariate analysis. The government ownership control variable has a negative coefficient indicating overpricing, although with low statistical significance, a logical result considering the relatively high credit worthiness the Swedish state provides to its corporations. This indicates that the *Public or private* variable itself might not be the determinant but rather that it also captures the effect of other variables. This is verified by running regression 6 again in a new specification with *Government ownership* included as well, in which *Public or private* loses its significance. The results of this specification can be seen in table 2.4 in appendix 2.

Specification 4 shows that *Recent debt issue* has a negative coefficient as expected, significant on the 5% level. This indicates that recent information gathering in relation to a previous debt issue decreases underpricing and supports hypothesis four. However, the statistical significance of *Recent debt issue* disappears in specification 6 and 7. In regression 5 it can be seen that *Recent equity issue* has a positive coefficient as expected, but the coefficient cannot be statistically confirmed. Hence, we are unable to prove that a recent equity offering increases underpricing in a subsequent bond offering even though the coefficient indicates this. Overall these results support the bookbuilding process of both issuing debt and equity; however the statistical significance declines as more factors are accounted for.

In specification 7, the control variable *Maturity length* is positive and significant on the 10%[18] level, thus indicating that securities with longer maturity are underpriced to a greater extent. A plausible explanation for this could be that both the credit risk and the market risk increases with length, as the bond becomes more exposed with a longer time to maturity which could cause underpricing at the time of issue. Another explanation for this result could be found in Diamond's (1991) paper *Debt Maturity and Liquidity Risk*, where the author concludes that moderate quality borrowers will seek long term loans, as they risk not receiving re-financing in the short run, while higher quality borrowers will seek short term loans[19]. As such, the issuance of long-term debt could signal lower quality and hence require more underpricing. A third explanation could be that longer maturity bonds can be subject to more illiquidity. Sarig and Warga (1989) state that the liquidity of a bond decreases with age. Since longer maturity bonds by definition reach a higher age they argue that this liquidity risk is considered at the time of issue. Thus, underpricing might arise in order to compensate the buyer for the liquidity risk or to stimulate liquidity in the issue.

[18] In the robustness test using treasury bills *Maturity length* is positive and significant on the 5% level.

[19] Diamond (1991) also argue that low quality borrowers will seek long term financing but will only receive short time financing. However, looking at our sample we argue that it consists of high and moderate quality borrowers as none of the issues are rated below B-.

Out of the seven regressions in table 4, the adjusted R-squared is highest for specification 7, indicating that the additional control variables do help in explaining the abnormal returns. The results presented in table 4 are largely robust when replacing the benchmark bond indices with the 3-month Swedish government treasury bill index for abnormal return calculations. All coefficients have the same sign and are significant on at least the same level. One noteworthy difference is that the variable *Public or private* remains significant in specification 7 even though *Government ownership* is included. This indicates that the larger extent of underpricing found in public companies might not be completely explained by state ownership. A further examination of the private subsample reveals that a large part of the bonds in this sample are in the real estate sector, which is a variable that is not accounted for. Hence, it might be the case that the industry, which has not been discussed in previous research, might affect underpricing. The results from this robustness test can be seen in appendix 2 table 2.5.

Table 5
Univariate Analysis of Abnormal Return - High and Low CDS

Table 5 displays average abnormal returns for ten different subsamples. High CDS includes abnormal returns for all bond issues occurring in a High CDS period. High CDS is broken down according to rating and issue status, respectively, displaying the average abnormal returns. Low CDS includes abnormal returns for all bond issues occurring in a Low CDS period. Low CDS is broken down according to rating and issue status, respectively, displaying the average abnormal returns. High CDS vs Low CDS display an ANOVA test between High CDS and Low CDS. The statistical significance is indicated by ***/**/* for the 1%/5%/10% level respectively.

	Average	t-statistic	F-statistic	P-value
High CDS	-0.0003	-0.34		
Investment grade	-0.0005	-0.64		
High yield	0.0012	0.40		
Seasoned issue	-0.0004	-0.45		
First issue	0.0002	0.05		
Low CDS	-0.0010**	-2.51		
Investment grade	-0.0012***	-3.13		
High yield	0.0001	0.07		
Seasoned Issue	-0.0012**	-2.65		
First Issue	-0.0003	-0.29		
High CDS vs Low CDS			0.73	0.396

To investigate hypothesis five a univariate analysis on abnormal returns in the high and low CDS environments, respectively, is carried out. The univariate analysis of the two subsamples reveals several interesting results. The bonds issued in a high CDS environment show a very small and statistically insignificant average overpricing of 3 bps. Meanwhile, the bonds issued in a low CDS environment shows a larger average overpricing of 10 bps significant on the 5%

level. Investigating the investment grade issues and seasoned issues the same pattern can be seen. The negative abnormal return in the low CDS environment is significant at the 1% level for investment grade issues and at the 5% level for seasoned issues. For high yield bonds, none of the result shows statistical significance, likely related to the relatively few observations. Considering the average overpricing found in the entire sample, the relatively smaller overpricing in the high CDS environment is still as expected.

The ANOVA test reveals no statistically significant difference in average abnormal returns in the high CDS and low CDS environment, respectively. Hence, it cannot be concluded that there is a difference in the average underpricing in the two periods. It is worth noticing that the percentage of issues of high yield in the high CDS period (15%) is lower than the percentage in low CDS (19%). As the previous analysis indicate that high yield bonds are underpriced to a greater extent, the difference in the percentage of high yield and investment grade bonds respectively between the two periods could counteract the anticipated result. The results are robust when using abnormal returns based on the 3-month Swedish government treasury bills index, this test can be found in appendix 2 table 2.6.

The results are however not robust when performing the same analysis based on the custom Swedish CDS index (appendix 2 table 2.7). The abnormal returns in the high CDS environment amount to -19 bps and are significant on the 10% level while the abnormal returns in the low CDS environment amount to -12 bps significant on the 1% level, suggesting that there is more overpricing in the high CDS environment contrary to our hypothesis. Using the Swedish custom CDS index decreases the number of issues in a high CDS environment significantly from 40 to 24 and results in a higher proportion of investment grade issues compared to both the complete sample and the European high CDS sample. As can be seen from a comparison of the two CDS indices in figure 1.5 appendix 1, the custom Swedish CDS index has a larger part of its high CDS period during 2009 (43%) in connection to the to the financial crisis. Meanwhile, the high CDS period of the European index is more concentrated around the European sovereign debt crisis (82%). Consequently, the smaller number of issues in the high CDS environment in the robustness test might reveal that the European CDS index is not an appropriate proxy and that periods of extreme market level credit risk rather affects the number and types of issues than the abnormal returns (which according to previous research are dependent on the type of issue and issuer). The number of issues in the low CDS environment (based on the Swedish custom CDS index) also supports this, as the frequency of issues is higher during this period than the normal period. Even though there is a small bias from a slight increase in the number of issuers over time, we do not believe that it is enough to explain the results alone, especially considering a decrease again in 2015. The relationship between issuer frequency and market environment is also supported by the findings of Ameer (2012) on the Malaysian equity IPO market. To further examine the relationship between underpricing and the market credit risk a multivariate analysis is conducted.

Table 6

Multivariate analysis - CDS

Table 6 displays six OLS regressions with abnormal return as the dependent variable. CDS represents the CDS index level at the day of the bond issue. CDS lagged is a rolling 20 trading day's average of the CDS index. Credit rating is a dummy variable that takes the value 1 for all bonds that have a rating between AAA and BBB- and 0 for all bonds with a rating lower than BBB- or no rating. First issue is a dummy variable that takes the value 1 for all issues where no issue has previously been conducted by the issuing company. Public or private is a dummy variable that takes the value 1 if the company has listed equity. Recent debt issue is a dummy variable that takes the value 1 if a previous bond issue has been conducted within one year of the issue. Recent equity issue is a dummy variable that takes the value 1 if equity has been issued within one year of the issue. Total assets represent the logarithmic value of the issuing firm's total assets at the time of issue. Government ownership is a dummy variable that takes the value 1 if the issuing company is owned by the government. Offering amount represents the logarithmic value of the nominal amount of the issue. Exchange is a dummy variable that takes the value 1 if the issue is listed on an exchange. Maturity length is the number of years to maturity. The statistical significance is indicated by ***/**/* for the 1%/5%/10% level respectively. White heteroscedasticity consistent t-statistics are given within the parentheses.

Regression	**1**	**2**	**3**	**4**	**5**	**6**
No of observations	256	256	256	256	256	256
Variable						
CDS	0.0000		0.0000	0.0000	0.0000	0.0000
	(0.65)		(0.78)	(0.72)	(0.68)	(0.59)
CDS lagged		0.0000				
		(0.46)				
Credit rating			-0.0039***	-0.0032***	-0.0029**	-0.0028**
			(-3.62)	(-2.86)	(-2.55)	(-2.24)
First issue				0.0001	-0.0001	0.0005
				(0.13)	(-0.09)	(0.36)
Public or private				0.0015**	0.0013*	0.0009
				(2.30)	(2.17)	(1.29)
Recent debt issue					-0.0004	-0.0002
					(-0.34)	(-0.18)
Recent equity issue					0.0014	0.0015
					(0.53)	(0.59)
Total assets						0.0002
						(0.54)
Government ownership						-0.0014
						(-1.35)
Offering amount						0.0004
						(0.71)
Exchange						-0.0020
						(-0.71)
Maturity length						0.0003*
						(1.95)
Constant	-0.0014**	-0.0013**	0.0018*	0.0006	0.0007	-0.0105
	(-2.45)	(-2.17)	(1.61)	(0.44)	(0.47)	(-0.80)
Adjusted R Squared	-0.0030	-0.0034	0.0676	0.0760	0.0727	0.0888

From table 6 it can be seen that neither the level of CDS nor the lagged average level of the CDS from the previous 20 trading days has any explanatory power. The coefficients of both variables are approximately equal to zero and there is no statistical significance. This finding remains constant throughout all six regressions. Judging from these results, the market credit risk as proxied by the CDS index level seems to have no direct effect on the level of underpricing on the Swedish market. These results are largely in line with the inference drawn from the univariate analyses. Including the CDS variables does not affect the other variables. As in the previous multivariate analysis, *Credit rating* remains negative and statistically significant in all specifications which it is included in. *Public or private* is positive and significant in specification 4 and 5 but the statistical significance is yet again removed in specification 6, when government ownership and other control variables are incorporated. Out of the control variables, *Maturity length* remains significant in the second multivariate analysis. The results from the second multivariate analysis are robust when using the 3-month Swedish government treasury bill index as benchmark for the abnormal return calculations. The results are also robust when using the manually computed Swedish CDS index as proxy for market level credit risk. These tests can be seen in appendix 2 tables 2.8 and 2.9.

VI. Conclusion

This study contributes to the existing literature in two major ways. First, the bulk of the bond underpricing literature concentrates on the US market, whereas this study investigates the smaller and less developed Swedish bond market. Second, the paper attempts to offer an alternative explanation for bond underpricing and particularly the non-consistency of bond underpricing over time by including the market level credit risk. Contrary to our first hypothesis, we find that corporate bonds are on average overpriced in the Swedish market as measured by negative abnormal returns. The proportion of investment grade issues in our sample is substantially higher compared to previous research on the US market which we believe can be explained by the underdevelopment of the Swedish bond market. The investment grade issues which constitute 83% of the sample are overpriced, while the high yield issues are underpriced, which is in line with our second hypothesis. Hence, the large fraction of investment grade issues causes an overpricing in the sample as a whole. Regarding the third hypothesis, we find little evidence supporting information asymmetry as an explanatory factor for bond underpricing, as measured by first time issuers and whether the issuer is public or private. We do find support for the fourth hypothesis, that the bookbuilding process affects underpricing. As hypothesised a recent debt issue decreases underpricing which is statistically significant whereas a recent equity issue indicates to increase underpricing even though it cannot be statistically verified.

When separating the sample into issues conducted in a high and low credit risk environment respectively, we find significant overpricing in the low credit risk environment while we find no significant mispricing in the high credit risk environment. However the ANOVA test on the two different subsamples shows no significant difference in underpricing between the two periods. Further, the robustness test using the custom Swedish CDS index indicates that the European CDS index might not be an appropriate proxy and that the market level credit risk might affect the number of issues and issue characteristics rather than underpricing. While a further investigation on this topic is out of the scope of this paper, we believe that the relationship between market credit risk and both issuance frequency and issuer characteristics is an interesting topic for future research. When including the CDS index level, and a lagged 20 trading day average of the CDS index level, in an OLS regression we find that neither of the two variables has any significant explanatory power, further indicating that the market level of the CDS does not affect the underpricing of Swedish corporate bonds.

We find some evidence that the maturity length of the bond has an impact on underpricing, and suggest that this might be related to liquidity risk. Previous studies are unable to prove that liquidity risk has a direct impact on underpricing (e.g. Cai et al., 2007) but emphasize that this is most likely because of insufficient data. Hence, we believe that further research is needed on the subject as more comprehensive data becomes available.

VII. References

Aboody, D., & Lev, B. (2000). Information asymmetry, R&D, and insider gains. *The journal of Finance*, *55*(6), 2747-2766.

Alexander, G. J., & Stover, R. D. (1977). Pricing in the new issue convertible debt market. *Financial Management*, 35-39.

Allen, F., & Faulhaber, G. R. (1989). Signalling by underpricing in the IPO market. *Journal of financial Economics*, *23*(2), 303-323.

Ameer, R. (2012). Macroeconomic factors and initial public offerings (IPOs) in Malaysia. *Asian academy of management journal of accounting and finance*, *8*(1), 41-67.

Arora, N., Gandhi, P., & Longstaff, F. A. (2012). Counterparty credit risk and the credit default swap market. *Journal of Financial Economics*, *103*(2), 280-293.

Benveniste, L. M., Busaba, W. Y., & Wilhelm, W. J. (2002). Information externalities and the role of underwriters in primary equity markets. *Journal of Financial Intermediation*, *11*(1), 61-86.

Benveniste, L. M., & Spindt, P. A. (1989). How investment bankers determine the offer price and allocation of new issues. *Journal of financial Economics*, *24*(2), 343-361.

Blanco, R., Brennan, S., & Marsh, I. W. (2005). An empirical analysis of the dynamic relation between investment‐grade bonds and credit default swaps. *The Journal of Finance*, *60*(5), 2255-2281.

Bonthron, F. (2014). The development of the Swedish market for corporate bonds. *Economic Commentaries. Sveriges Riskbank*, (7).

Brealey, R., Leland, H. E., & Pyle, D. H. (1977). Informational asymmetries, financial structure, and financial intermediation. *The journal of Finance*, *32*(2), 371-387.

Brimmer, A. F. (1960). Credit conditions and price determination in the corporate bond market. *The Journal of Finance*, *15*(3), 353-370.

Brooks, C. (2014). *Introductory econometrics for finance*. Cambridge university press.

Byström, H. (2005). Credit default swaps and equity prices: The iTraxx CDS index market. *Working Papers, Department of Economics, Lund University*, (24).

Cai, N. K., Helwege, J., & Warga, A. (2007). Underpricing in the corporate bond market. *Review of Financial Studies*, *20*(6), 2021-2046.

Chui, M. K., Domanski, D., Kugler, P., & Shek, J. (2010). The collapse of international bank finance during the crisis: evidence from syndicated loan markets. *BIS Quarterly Review, September*.

Conard, J. W., & Frankena, M. W. (1969). The Yield Spread Between New and Seasoned Corporate Bonds, 1952–63. In *Essays on Interest Rates, Volume 1* (pp. 143-222). NBER.

Cornell, B., & Green, K. (1991). The Investment Performance of Low-grade Bond Funds. *The Journal of Finance*, *46*(1), 29-48.

Corwin, S. A. (2003). The determinants of underpricing for seasoned equity offers. *The Journal of Finance*, *58*(5), 2249-2279.

Coudert, V., & Gex, M. (2010). Credit default swap and bond markets: which leads the other. *Financial Stability Review, Banque de France*, *14*(2010), 161167.

Datta, S., Iskandar-Datta, M., & Patel, A. (1997). The pricing of initial public offers of corporate straight debt. *the Journal of Finance*, *52*(1), 379-396.

Dhillon, U. S., & Johnson, H. (1994). The effect of dividend changes on stock and bond prices. *The Journal of finance*, *49*(1), 281-289.

Diamond, D. W. (1989). Reputation acquisition in debt markets. *The Journal of Political Economy*, 828-862.

Diamond, D. W. (1991). Debt maturity structure and liquidity risk. *The Quarterly Journal of Economics*, 709-737.

Ericsson, J., Jacobs, K., & Oviedo, R. (2009). The determinants of credit default swap premia. *Journal of Financial and Quantitative Analysis*, *44*(1), 109-132.

Fitch. (2010). European Corporate Funding Disintermediation-Structural Shift to Bonds from Loans to Continue. *Fitch Ratings*.

Fung, W. K., & Rudd, A. (1986). Pricing new corporate bond issues: An analysis of issue cost and seasoning effects. *The Journal of Finance*, *41*(3), 633-643.

Garfinkel, J. A. (1993). IPO underpricing, insider selling and subsequent equity offerings: Is underpricing a signal of quality?. *Financial Management*, 74-83.

Goldstein, M. A., & Hotchkiss, E. S. (2007, October). Dealer behavior and the trading of newly issued corporate bonds. In *Afa 2009 san francisco meetings paper*.

Gompers, P. A. (1996). Grandstanding in the venture capital industry. *Journal of Financial economics*, *42*(1), 133-156.

Gunnarsdottir, G., & Lindh, S. (2011). Markets for swedish non-financial corporations' loan-based financing. *Sveriges Riksbank*, 2.

Hickman, W. B. (1958). Corporate bond quality and investor experience. *NBER Books*.

Hull, J., Predescu, M., & White, A. (2004). The relationship between credit default swap spreads, bond yields, and credit rating announcements. *Journal of Banking & Finance*, *28*(11), 2789-2811.

Ibbotson, R. G. (1975). Price performance of common stock new issues. *Journal of financial economics*, *2*(3), 235-272.

International Monetary Fund. (2015). World Economic Outlook Database.

International Organization of Securities Commissions. (2012). The Credit Default Swap Market.

Ivashina, V., & Scharfstein, D. (2010). Bank lending during the financial crisis of 2008. *Journal of Financial economics*, *97*(3), 319-338.

Jegadeesh, N., Weinstein, M., & Welch, I. (1993). An empirical investigation of IPO returns and subsequent equity offerings. *Journal of Financial Economics*, *34*(2), 153-175.

Kang, J. K., & Lee, Y. W. (1996). The pricing of convertible debt offerings. *Journal of Financial Economics*, 41(2), 231-248.

Leite, T. (2006). Bookbuilding with heterogeneous investors. *Journal of Financial Intermediation*, *15*(2), 235-253.

Lindvall, J. R. (1977). New issue corporate bonds, seasoned market efficiency and yield spreads. *The Journal of finance*, *32*(4), 1057-1067.

Ljungqvist, A. P. (1997). Pricing initial public offerings: Further evidence from Germany. *European Economic Review*, *41*(7), 1309-1320.

Longstaff, F. A., Mithal, S., & Neis, E. (2005). Corporate yield spreads: Default risk or liquidity? New evidence from the credit default swap market. *The Journal of Finance*, *60*(5), 2213-2253.

Loughran, T., & Ritter, J. R. (2004). Why has IPO underpricing changed over time?. *Journal of Financial Management, 33*(3), 5-37.

Maese, J. E. (1985). Competitive versus negotiated municipal revenue bond issues: An investigation of underpricing. *Financial Management*, 26-32.

Masulis, R. W. (1988). *The debt/equity choice*. Financial Management Assoc.

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of financial economics*, *13*(2), 187-221.

Norden, L., & Weber, M. (2004). Informational efficiency of credit default swap and stock markets: The impact of credit rating announcements. *Journal of Banking & Finance*, *28*(11), 2813-2843.

Norden, L., & Weber, M. (2009). The co-movement of credit default swap, bond and stock markets: An empirical analysis. *European financial management*,*15*(3), 529-562.

Pagano, M., & von Thadden, E. L. (2004). The European bond markets under EMU. *Oxford review of economic policy*, *20*(4), 531-554.

Ritter, J. R. (1984). The" hot issue" market of 1980. *Journal of Business*, 215-240.

Rock, K. (1986). Why new issues are underpriced. *Journal of financial economics*, *15*(1), 187-212.

Roxburgh, C., Lund, S., & Piotrowski, J. (2011). Mapping global capital markets 2011. *McKinsey Global Institute*, 1-38.

Sarig, O., & Warga, A. (1989). Bond price data and bond market liquidity. *Journal of Financial and Quantitative Analysis*, *24*(03), 367-378.

Sherman, A. E., & Titman, S. (2002). Building the IPO order book: underpricing and participation limits with costly information. *Journal of Financial Economics*, *65*(1), 3-29.

Slovik, P., & Cournède, B. (2011). Macroeconomic impact of Basel III.

Spindt, P. A., & Stolz, R. W. (1992). Are US Treasury bills underpriced in the primary market?. *Journal of Banking & Finance*, *16*(5), 891-908.

Tran, A. L., & Jeon, B. N. (2011). The dynamic impact of macroeconomic factors on initial public offerings: evidence from time-series analysis. *Applied Economics*, *43*(23), 3187-3201.

Vinson, C. E. (1970). Pricing Practices in Primary Convertible Bond Market. *Quarterly Review of Economics and Business*, *10*(2), 47-60.

Wasserfallen, W., & Wydler, D. (1988). Underpricing of newly issued bonds: Evidence from the Swiss capital market. *The Journal of Finance*, *43*(5), 1177-1191.

Weinstein, M. I. (1978). The seasoning process of new corporate bond issues.*The Journal of Finance*, *33*(5), 1343-1354.

Weinstein, M. (1981). The systematic risk of corporate bonds. *Journal of Financial and Quantitative Analysis*, *16*(03), 257-278.

Welch, K. D. (2000). The Underpricing in Corporate Bonds at Issue. *University of Kansas School of Business*.

White, H. (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica: Journal of the Econometric Society*, 817-838.

VIII. Appendix

A. Appendix 1

Figure 1.1

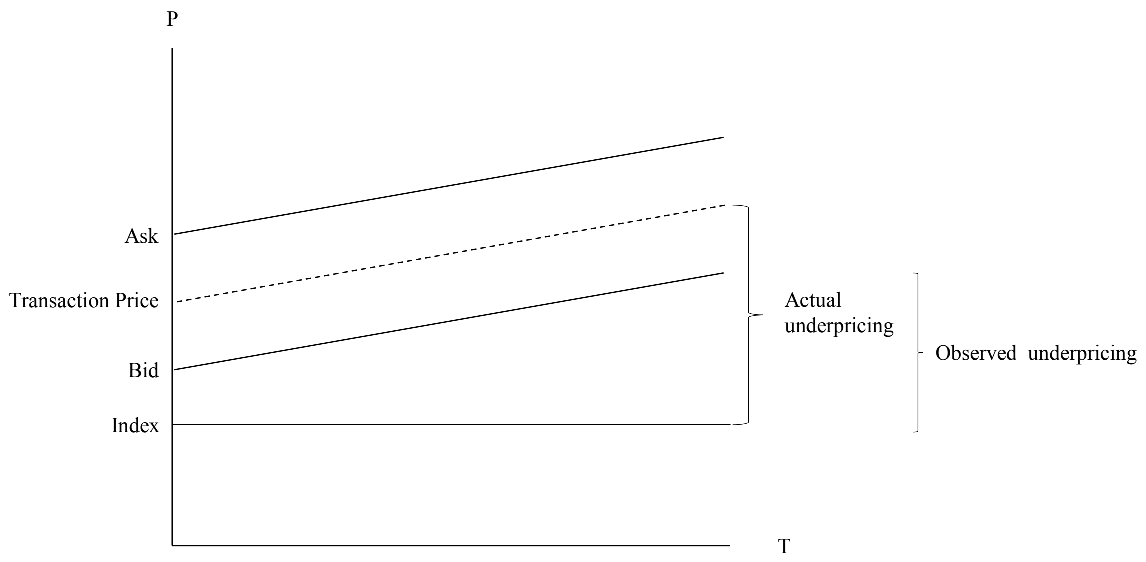


Figure 1.2

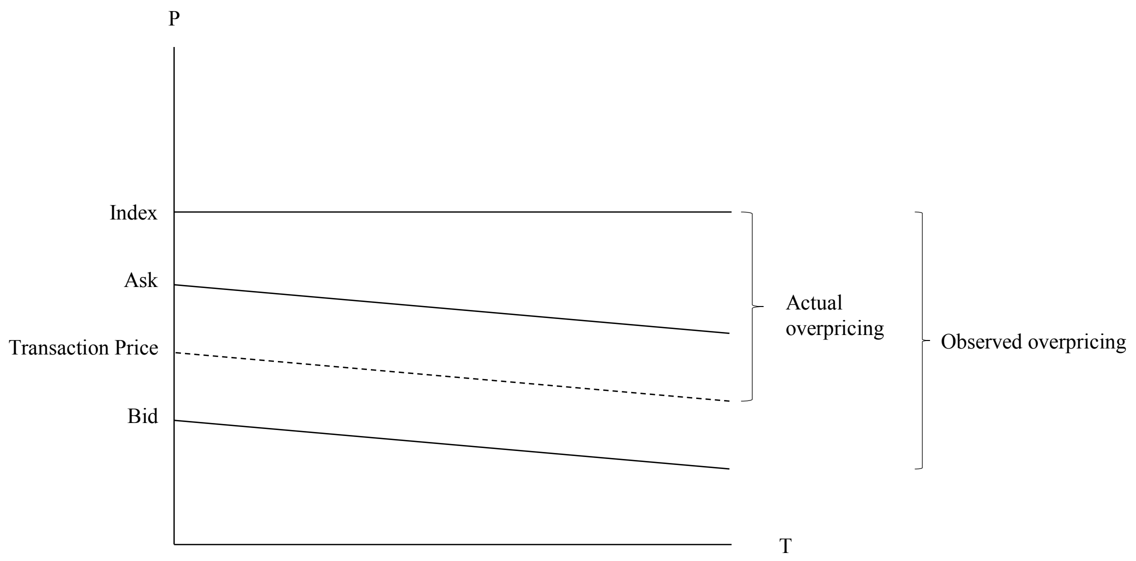


Figure 1.3

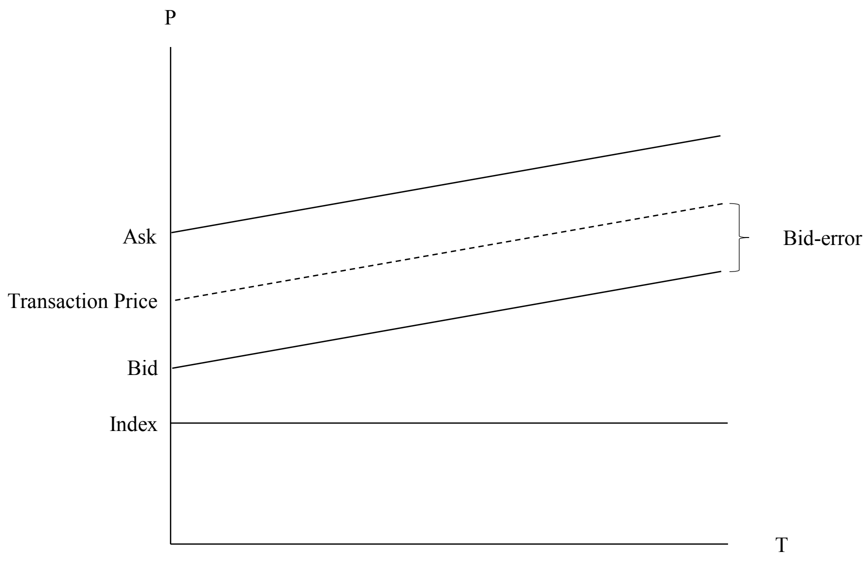


Figure 1.4

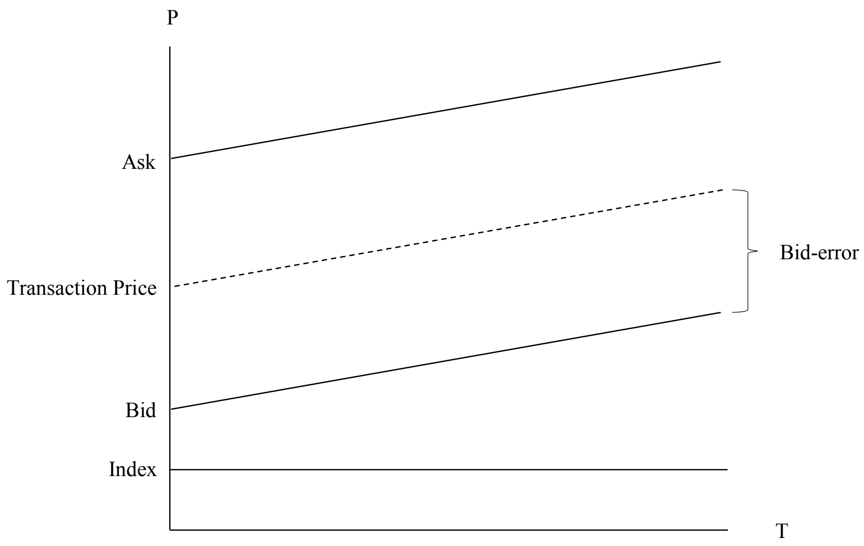
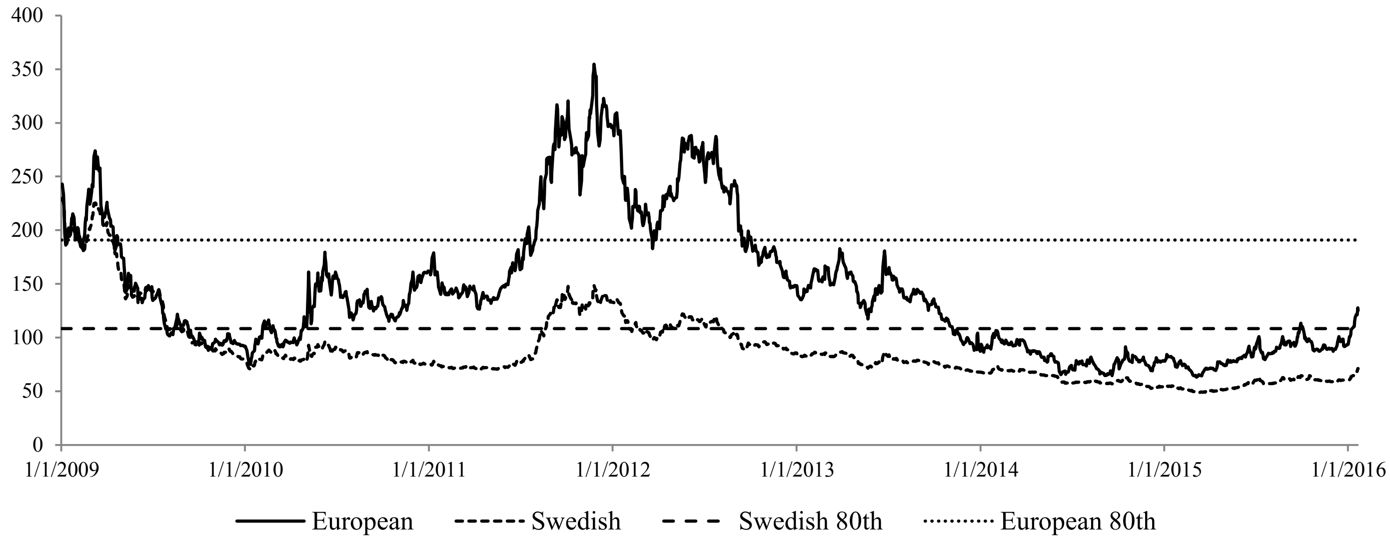


Figure 1.5

Figure 1.5

Credit Default Swap Indices

The graph presents the level of the iTraxx European Corporate Bond CDS Index and the Swedish custom CDS index during the sample period.



B. Appendix 2

Table 2.1
Univariate Analysis of Abnormal Returns - Mid Price

Complete Sample displays the average abnormal return for the entire sample of 256 bonds. Investment grade represents the average abnormal return of the bonds that have a rating between AAA and BBB- while High yield represents the average abnormal return for the bonds that have a lower rating than BBB- or no rating. Seasoned issue display the average abnormal return of the bonds which are not the first offering from a company while first issue display the average abnormal return of the bonds that are first issues. Public displays the average abnormal return for the bonds issued by companies that are listed while Private displays the average abnormal return for the bonds issued by a company that is not listed. Investment grade vs High yield displays an ANOVA test between the bonds classified as investment grade and high yield respectively. Seasoned issue vs First issue displays an ANOVA test between first issues and seasoned issues. Public vs Private displays an ANOVA test between bonds issued by public and private companies, respectively. The statistical significance is indicated by ***/**/* for the 1%/5%/10% level respectively.

	Average	**t-statistic**	**F-statistic**	**P-value**
Complete Sample	-0.0010	-0.50		
Investment grade	-0.0024	-1.01		
High yield	0.0058***	4.64		
Investment grade vs High yield			2.44	0.119
Seasoned issue	-0.0016	-0.70		
First issue	0.0027**	2.18		
Seasoned issue vs First issue			0.57	0.451
Public	0.0023***	3.99		
Private	-0.0036	-1.02		
Public vs Private			2.19	0.140

Table 2.2
Univariate Analysis of Abnormal Returns - Treasury Bills

Complete Sample displays the average abnormal return for the entire sample of 256 bonds. Investment grade represents the average abnormal return of the bonds that have a rating between AAA and BBB- while High yield represents the average abnormal return for the bonds that have a lower rating than BBB- or no rating. Seasoned issue display the average abnormal return of the bonds that are not the first offering from a company while first issue display the average abnormal return of the bonds that are first issues. Public displays the average abnormal return for the bonds issued by companies that are listed while Private displays the average abnormal return for the bonds issued by a company that is not listed. Investment grade vs High yield displays an ANOVA test between investment grade and high yield. Seasoned issue vs First issue displays an ANOVA test between first issues and seasoned issues. Public vs Private displays an ANOVA test between bonds issued by public and private companies, respectively. The statistical significance is indicated by ***/**/* for the 1%/5%/10% level respectively.

	Average	**t-statistic**	**F-statistic**	**P-value**
Complete Sample	-0.0006*	-1.87		
Investment grade	-0.0013***	-3.89		
High yield	0.0027**	2.63		
Investment grade vs High yield			20.66	0.000
Seasoned issue	-0.0008**	-2.29		
First issue	0.0005	0.49		
Seasoned issue vs First issue			1.83	0.177
Public	0.0008	1.58		
Private	-0.0018***	-3.70		
Public vs Private			15.20	0.000

Table 2.3
Univariate Analysis of Abnormal Returns - Issue Rating

Complete Sample displays the average abnormal return for the entire sample of the robustness test of 60 issues. Investment grade represents the average abnormal return of the bonds that have an official rating between AAA and BBB- while High yield represents the average abnormal return for the bonds that have an official rating lower than BBB-. The statistical significance is indicated by ***/**/* for the 1%/5%/10% level respectively.

	Average	t-statistic
Complete Sample	-0.0012*	-1.74
Investment grade	-0.0018***	-2.98
High yield	0.0106	–

Table 2.4
Multivariate Analysis - Government Ownership

Table 2.4 displays the result of three OLS regressions with abnormal return as the dependent variable. Credit rating is a dummy variable that takes the value 1 for all bonds that have a rating between AAA and BBB- and 0 for all bonds with a rating lower than BBB- or no rating. First issue is a dummy variable that takes the value of 1 for all issues where no issue has previously been conducted by the issuing company. Public or private is a dummy variable that takes the value 1 if the company has listed equity. Recent debt issue is a dummy variable that takes the value 1 if a previous bond issue has been conducted within one year of the issue. Recent equity issue is a dummy variable that takes the value 1 if equity has been issued within one year of the issue. Government ownership is a dummy variable that takes the value 1 if the issuing company is owned by the government. The statistical significance is indicated by ***/**/* for the 1%/5%/10% level respectively. White heteroscedasticity consistent t-statistics are given within the parentheses.

Regression	**1**	**2**	**3**
No of observations	256	256	256
Variable			
Credit rating		-0.0029**	-0.0028**
		(-2.54)	(-2.43)
First issue		-0.0001	-0.0000
		(-0.12)	(-0.01)
Public or private	0.0024***	0.0013**	0.0009
	(3.50)	(2.18)	(1.48)
Recent debt issue		-0.0004	-0.0004
		(-0.38)	(-0.38)
Recent equity issue		0.0014	0.0014
		(0.52)	(0.53)
Government ownership			-0.0009
			(-0.92)
Constant	-0.0020***	0.0011	0.0013
	(-4.66)	(0.92)	(1.13)
Adjusted R Squared	0.0428	0.0753	0.0749

Table 2.5
Multivariate Analysis - Treasury Bills

Table 2.5 displays the result of seven OLS regressions with abnormal return as the dependent variable. Credit rating is a dummy variable that takes the value 1 for all bonds that have a rating between AAA and BBB- and 0 for all bonds with a rating lower than BBB- or no rating. First issue is a dummy variable that takes the value 1 for all issues where no issue has previously been conducted by the issuing company. Public or Private is a dummy variable that takes the value 1 if the company has listed equity. Recent debt issue is a dummy variable that takes the value 1 if a previous bond issue has been conducted within one year of the issue. Recent equity issue is a dummy variable that takes the value 1 if equity has been issued within one year of the issue. Total assets represent the logarithmic value of the issuing firm’s total assets at the time of issue. Government ownership is a dummy variable that takes the value 1 if the issuing company is owned by the government. Offering amount represents the logarithmic value of the nominal amount of the issue. Exchange is a dummy variable that takes the value 1 if the issue is listed on an exchange. Maturity length is the number of years to maturity. The statistical significance is indicated by ***/**/* for the 1%/5%/10% level respectively. White heteroscedasticity consistent t-statistics are given within the parentheses.

Regression	**1**	**2**	**3**	**4**	**5**	**6**	**7**
No of observations	256	256	256	256	256	256	256
Variable							
Credit rating	-0.0040***					-0.0028**	-0.0027**
	(-3.77)					(-2.47)	(-2.19)
First issue		0.0013				-0.0001	0.0003
		(1.18)				(-0.08)	(0.22)
Public or Private			0.0026***			0.0015**	0.0016**
			(3.87)			(2.37)	(2.23)
Recent debt issue				-0.0020**		-0.0005	-0.0003
				(-2.47)		(-0.47)	(-0.22)
Recent equity issue					0.0041	0.0016	0.0016
					(1.56)	(0.59)	(0.62)
Total assets							0.0001
							(0.16)
Government ownership							-0.0006
							(-0.60)
Offering amount							0.0003
							(0.62)
Exchange							-0.0014
							(-0.50)
Maturity length							0.0004**
							(2.47)
Constant	0.0027***	-0.0008**	-0.0018***	0.0008	-0.0009***	0.0013	-0.0071
	(2.65)	(-2.25)	(-4.16)	(1.10)	(-2.65)	(1.08)	(-0.53)
Adjusted R Squared	0.0716	0.0025	0.0528	0.0224	0.0246	0.0845	0.0987

Table 2.6

Univariate Analysis of Abnormal Return - High and Low CDS using Treasury Bills

The table displays average abnormal returns for ten different subsamples. High CDS displays abnormal returns for all bond issues occuring in a High CDS period. High CDS is broken down according to rating and issue status, respectively, showing the average abnormal returns. Low CDS includes abnormal returns for all bond issues occuring in a Low CDS period. Low CDS is broken down according to rating and issue status, respectively, showing the average abnormal returns. High CDS vs Low CDS display an ANOVA test between High CDS and Low CDS. The statistical significance is indicated by ***/**/* for the 1%/5%/10% level respectively.

	Average	t-statistic	F-statistic	P-value
High CDS	-0.0001	-0.08		
Investment grade	-0.0004	-0.43		
High yield	0.0020	0.85		
Seasoned issue	-0.0002	-0.21		
First issue	0.0006	0.21		
Low CDS	-0.0008*	-1.94		
Investment grade	-0.0010**	-2.34		
High yield	0.0001	0.12		
Seasoned Issue	-0.0010**	-2.15		
First Issue	-0.0001	-0.06		
High CDS vs Low CDS			0.66	0.419

Table 2.7

Univariate Analysis of Abnormal Return - High and Low CDS using Swedish CDS index

The table displays average abnormal returns for ten different subsamples. High CDS includes abnormal returns for all bond issues occurring in a High CDS period. High CDS is broken down according to rating and issue status, respectively, showing the average abnormal return. Low CDS includes abnormal returns for all bond issues occurring in a low CDS period. Low CDS is broken down according to rating and issue status, respectively, showing the average abnormal return. High CDS vs Low CDS display an ANOVA test between High CDS and Low CDS. The statistical significance is indicated by ***/**/* for the 1%/5%/10% level respectively.

	Average	t-statistic	F-statistic	P-value
High CDS	-0.0019	-1.96		
Investment grade	-0.0020	-1.83		
High yield	-0.0010	-		
Seasoned issue	-0.0020	-1.94		
First issue	-0.0003	-		
Low CDS	-0.0012	-3.45		
Investment grade	-0.0015	-4.05		
High yield	0.0008	-		
Seasoned Issue	-0.0014	-3.33		
First Issue	-0.0006	-0.92		
High CDS vs Low CDS			0.90	0.346

Table 2.8
Multivariate Analysis - CDS using Treasury Bills

Table 2.8 displays six OLS regressions with abnormal return as the dependent variable. CDS represents the CDS index level at the day of the bond issue. CDS lagged is a rolling 20 trading day's average of the CDS index. Credit rating is a dummy variable that takes the value 1 for all bonds that have a rating between AAA and BBB- and 0 for all bonds with a rating lower than BBB-. First issue is a dummy variable that takes the value 1 for all issues where no issue has previously been conducted by the issuing company. Public or Private is a dummy variable that takes the value 1 if the company has listed equity. Recent debt issue is a dummy variable that takes the value 1 if a previous bond issue has been conducted within one year of the issue. Recent equity issue is a dummy variable that takes the value 1 if equity has been issued within one year of the issue. Total assets represent the logarithmic value of the issuing firm's total assets at the time of issue. Government ownership is a dummy variable that takes the value 1 if the issuing company is owned by the government. Offering amount represents the logarithmic value of the nominal amount of the issue. Exchange is a dummy variable that takes the value 1 if the issue is listed on an exchange. Maturity length is the number of years to maturity. The statistical significance is indicated by ***/**/* for the 1%/5%/10% level respectively. White heteroscedasticity consistent t-statistics are given within the parentheses.

Regression	**1**	**2**	**3**	**4**	**5**	**6**
No of observations	256	256	256	256	256	256
Variable						
CDS	0.0000		0.0000	0.0000	0.0000	0.0000
	(1.02)		(1.15)	(1.11)	(1.05)	(1.05)
CDS lagged		0.0000				
		(1.08)				
Credit rating			-0.0040***	-0.0031***	-0.0028**	-0.0026**
			(-3.80)	(-2.80)	(-2.51)	(-2.11)
First issue				0.0003	0.0000	0.0003
				(0.24)	(-0.04)	(0.26)
Public or Private				0.0017***	0.0015**	0.0014
				(2.60)	(2.37)	(2.04)
Recent debt issue					-0.0005	-0.0001
					(-0.41)	(-0.11)
Recent equity issue					0.0016	0.0016
					(0.60)	(0.61)
Total assets						0.0000
						(-0.01)
Government ownership						-0.0008
						(-0.78)
Offering amount						0.0004
						(0.75)
Exchange						-0.0011
						(-0.39)
Maturity length						0.0004**
						(2.57)
Constant	-0.0013**	-0.0013**	0.0020*	0.0005	0.0006	-0.0084
	(-2.22)	(-2.21)	(1.77)	(0.36)	(0.42)	(-0.62)
Adjusted R Squared	-0.0015	-0.0010	0.0711	0.0857	0.0836	0.0978

Table 2.9
Multivariate analysis - Swedish CDS index

Table 2.9 displays six OLS regressions with abnormal return as the dependent variable. CDS represents the CDS index level at the day of the bond issue. CDS lagged is a rolling 20 trading day's average of the CDS index. Credit rating is a dummy variable that takes the value 1 for all bonds that have a rating between AAA and BBB- and 0 for all bonds with a rating lower than BBB-. First issue is a dummy variable that takes the value 1 for all issues where no issue has previously been conducted by the issuing company. Public or Private is a dummy variable that takes the value 1 if the company has listed equity. Recent debt issue is a dummy variable that takes the value 1 if a previous bond issue has been conducted within one year of the issue. Recent equity issue is a dummy variable that takes the value 1 if equity has been issued within one year of the issue. Total assets represent the logarithmic value of the issuing firm's total assets at the time of issue. Government ownership is a dummy variable that takes the value 1 if the issuing company is owned by the government. Offering amount represents the logarithmic value of the nominal amount of the issue. Exchange is a dummy variable that takes the value 1 if the issue is listed on an exchange. Maturity length is the number of years to maturity. The statistical significance is indicated by ***/**/* for the 1%/5%/10% level respectively. White heteroscedasticity consistent t-statistics are given within the parentheses.

Regression	**1**	**2**	**3**	**4**	**5**	**6**
No of observations	256	256	256	256	256	256
Variable						
CDS	-0.0000		-0.0000	-0.0000	-0.0000	-0.0000
	(-0.10)		(-0.77)	(-0.68)	(-0.65)	(-0.93)
CDS lagged		0.0000				
		(-0.88)				
Credit rating			-0.0039***	-0.0032***	-0.0029**	-0.0028**
			(-3.58)	(-2.82)	(-2.53)	(-2.31)
First issue				0.0001	-0.0002	0.0004
				(0.11)	(-0.14)	(0.31)
Public or Private				0.0015**	0.0013**	0.0011
				(2.28)	(2.14)	(1.53)
Recent debt issue					-0.0004	-0.0004
					(-0.39)	(-0.32)
Recent equity issue					0.0014	0.0015
					(0.50)	(0.58)
Total assets						0.0004
						(0.80)
Government ownership						-0.0011
						(-1.03)
Offering amount						0.0002
						(0.44)
Exchange						-0.0026
						(-0.92)
Maturity length						0.0003**
						(1.79)
Constant	0.0001	0.0000	0.0031**	0.0017	0.0018	-0.0072
	(0.09)	(0.01)	(2.09)	(1.08)	(1.12)	(-0.56)
Adjusted R Squared	-0.0004	-0.0013	0.0683	0.0764	0.0731	0.0913

Table 2.10
Correlation Matrix

Table 2.10 displays a correlation matrix with all variables included in the multivariate analysis examining hypothesis 1-4.

	CR	*FI*	*PP*	*RD*	*RE*	*TA*	*GO*	*OA*	*EX*	*ML*
Credit rating	1									
First issue	-0.22	1								
Public or private	-0.37	0.10	1							
Recent debt issue	0.35	-0.60	-0.29	1						
Recent equity issue	-0.30	0.05	0.27	-0.23	1					
Total assets	0.51	-0.39	-0.15	0.50	-0.30	1				
Government ownership	0.26	0.05	-0.51	0.10	-0.14	-0.10	1			
Offering amount	-0.18	0.09	0.32	-0.25	0.15	-0.15	-0.12	1		
Exchange	0.18	-0.01	0.06	0.09	-0.10	0.07	0.13	0.00	1	
Maturity length	0.07	-0.03	-0.15	0.02	-0.05	-0.03	0.35	-0.12	0.01	1

Table 2.11
Correlation Matrix

Table 2.11 displays a correlation matrix with all variables included in the multivariate analysis examining hypothesis 5.

	CDS	*CDS_l*	*CR*	*FI*	*PP*	*RD*	*RE*	*TA*	*GO*	*OA*	*EX*	*ML*
CDS	1											
CDS lagged	0.98	1										
Credit rating	0.03	0.02	1									
First issue	-0.01	0.00	-0.22	1								
Public or private	0.01	-0.01	-0.37	0.10	1							
Recent debt issue	-0.04	-0.02	0.35	-0.60	-0.29	1						
Recent equity issue	-0.01	-0.05	-0.30	0.05	0.27	-0.23	1					
Total assets	0.11	0.12	0.51	-0.39	-0.15	0.50	-0.30	1				
Gowernment ownership	0.12	0.15	0.26	0.05	-0.51	0.10	-0.14	-0.10	1			
Offering amount	-0.15	-0.15	-0.18	0.09	0.32	-0.25	0.15	-0.15	-0.12	1		
Exchange	-0.16	-0.16	0.18	-0.01	0.06	0.09	-0.10	0.07	0.13	0.00	1	
Maturity length	0.03	0.03	0.07	-0.03	-0.15	0.02	-0.05	-0.03	0.35	-0.12	0.01	1

C. Appendix 3

Variable name	**Variable description**
AR **– Abnormal Return**	Abnormal Return displays the holding period return in excess of the benchmark index return for each bond issue.
CDS **– Credit Default Swap**	Credit Default Swap is a variable that indicates the level of the iTraxx CDS index in table 6 and 2.8. In table 2.9 it indicates the level of the custom Swedish CDS index.
CDS_l **– Credit Default Swap Lagged**	Credit Default Swap lagged is a lagged 20 trading day average of the iTraxx CDS index level in table 6 and 2.8. In table 2.9 it indicates the lagged 20 trading day average of the custom Swedish CDS index.
CR **– Credit rating**	Credit rating is a dummy variable that takes the value 1 for all bonds that have a rating between AAA and BBB- and 0 for all bonds with a rating lower than BBB-.
EX **– Exchange**	Exchange is a dummy variable that takes the value of 1 if the issue is listed on an exchange and 0 otherwise.
FI **– First Issue**	First issue is a dummy variable that takes the value 1 for all issues where no issue has previously been conducted by the issuing company and 0 otherwise.
GO **– Government Ownership**	Government ownership is a dummy variable that takes the value of 1 if the issuing company is owned by the government and 0 otherwise. Ownership is controlled manually for all companies.
ML **– Maturity Length**	Maturity length is the number of years to maturity. This is calculated by taking the number of days between the offering date and the maturity date according to the financial calendar divided by 360.
OA **– Offering Amount**	Offering amount represents the logarithmic value of the nominal amount of the issue.
PP **– Public or Private**	Public or private is a dummy variable that takes the value of 1 if the company has listed equity and 0 otherwise.
RD **– Recent Debt Issue**	Recent debt issue is a dummy variable that takes the value 1 if a previous bond issue has been conducted within one year of the issue and 0 otherwise. Data on previous issues during all years that the sample covers is already available. Data on issues one year prior to the sample is gathered manually.
RE **– Recent Equity Issue**	Recent equity issue is a dummy variable that takes the value of

	1 if equity has been issued within one year of the issue and 0 otherwise. For the companies that have outstanding equity, the respective issue date of the equity is located manually. No company in the sample has delisted during the sample period or within one year prior to the sample period.
TA **– Total Assets**	Total assets represent the logarithmic value of the issuing firm's total assets at the time of issue.