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Issuer Quality and the Credit Cycle, European Evidence

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Antti Myllärinen

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Aalto University
School of Economics

Aalto University
School of Economics

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Antti Myllärinen

Abstract
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ISSUER QUALITY AND THE CREDIT CYCLE, EUROPEAN EVIDENCE

PURPOSE OF THE STUDY

The objective of this thesis is to link patterns of corporate debt financing in Europe to time-series variation in the pricing of credit risk. The purpose is to show that the credit quality of corporate debt issuers deteriorates during credit booms and this deterioration forecasts low excess returns to corporate bondholders. Further, empirical findings on issuer quality are used to investigate forces driving time-variation in expected corporate bond returns.

DATA AND METHODOLOGY

The data sample includes all public non-financial companies which are headquartered in Europe and have a market capitalization of 100 million euros or more. In addition bond data for German Government Bonds and high yield bond indexes are used. The period when the high yield bond index data has been available, 1998-2011, the annually measured company sample consists of 2,015 companies and 14,143 firm years. Quarterly dataset consists of 1,336 companies and 25,567 individual quarterly observations from January 2001 to September 2011. To test the hypotheses, time-series measures of debt issuer quality are formed. After that several ordinary least square (OLS) regressions are conducted in order to test the validity of the hypotheses.

RESULTS

The empirical result of this thesis shows that when issuer quality is low high yield corporate bonds subsequently underperform risk-free German Government Bonds of the same maturity. Decline in issuer quality uncovers a striking degree of predictability and often forecast significantly negative excess bond returns at 3- and 4-year horizons over and above traditional proxies for risk premium. These results are difficult to explain using rationally time-varying risk aversion or other drivers of countercyclical risk premium. Instead the findings suggest that intermediary frictions, investor over-extrapolation and reaching for yield drive variations in required high yield bond returns.

KEYWORDS

Issuer characteristic spread, issuer quality, high yield excess bond returns, European corporate bond markets

Aalto-yliopiston kauppakorkeakoulu

Aalto-yliopiston kauppakorkeakoulu
Pro Gradu -tutkielma
Antti Myllärinen

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ISSUER QUALITY AND THE CREDIT CYCLE, EUROPEAN EVIDENCE

TUTKIELMAN TAVOITTEET

Tämän pro-gradu tutkielman tavoitteena on selvittää yritysten velanoton ja velan hinnoittelun välistä suhdetta Euroopan talousalueen yhtiöiden keskuudessa. Työssä tutkitaan, kasvaako keskimääräisen velallisen riskisyys taloussuhdanteiden noustessa, alihinnoittelevatko sijoittajat lainaamansa velkarahan kyseisinä ajanjaksoina, ja johtaako mahdollinen alihinnoittelu toistuvasti negatiivisiin ylituottoihin. Lisäksi tutkimuksen päämääränä on löytää syitä mahdolliselle velan alihinnoittelulle.

LÄHDEAINEISTO JA MENETELMÄT

Lähdeaineisto koostuu eurooppalaisten julkisesti noteerattujen markkina-arvoltaan yli 100 miljoonan euron yritysten tilinpäätöstiedoista. Kaikki havainnoidut yritykset toimivat muilla kuin rahoitusalalla tai julkispalveluissa. Lisäksi tutkimuksessa käytetään Saksan valtion joukkovelkakirjalainojen ja korkeariskisten yritysten joukkovelkakirjalainaindeksien (kansankielessä roskalainat) aikasarjoja. Eurooppalaisten roskalainamarkkinoiden myöhäisen kehittymisen vuoksi tutkimuksen aikasarja ulottuu vuodesta 1998 vuoden 2011 syyskuulle. Empiirinen tutkimus suoritetaan ensisijaisesti vertailemalla suhteellisesti paljon ja vähän nettovelkaa kasvattavien yritysten konkurssiriskien eroja. Toinen laatumittari on roskalainojen osuus kaikista liikkeelle lasketuista pörssilistattujen yritysten joukkovelkakirjalainoista.

TULOKSET

Tulokset osoittavat, että niiden ajanjaksojen jälkeen, jolloin velan liikkeellelaskijoiden suhteellinen riskisyys on kasvanut, riskisempien yritysten joukkovelkakirjojen haltijat saavat sijoituksilleen toistuvasti negatiivista ylituottoa. Ylituotto määritellään tässä yhteydessä Saksan valtionlainojen tuoton ylittäväksi osaksi. Löydetty korrelaatio velallisen riskisyyden ja joukkovelkojen keskipitkän aikavälin (3-4 vuotta) tuottojen välillä on merkittävä ja vaikeasti selitettävissä ainoastaan perinteisiä tuottoa ennustavia mittareita käyttämällä. Sen sijaan tulokset viittaavat siihen, että sijoittajien liiallisella itsevarmuudella, tuoton tavoittelulla ja rahoituksen välittäjien (mm. pankit, vakuutusyhtiöt) roolilla on merkittävä osuus löydettyjen ilmiöiden selittämisessä.

AVAINSANAT

Velan liikkeellelaskijoiden laatu, velan liikkeellelaskijoiden riskisyys, roskalainojen ylituotot, Eurooppalaiset joukkovelkakirjamarkkinat

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1 INTRODUCTION

1.1 Background and Motivation for the Thesis

During the first half of financial year 2011 European companies issued EUR 38 billion of high-yield bonds, an amount which was already approaching 2010's record issuance of EUR 51 billion (The Economist, 2011). Escalated financial crises in Greece challenged the growth temporarily. On the other hand tentative signs of recovery were already in sight in the last quarter of the year 2011. The supply of high-yield bonds has been up because many European companies cannot get loans from deleveraging banks. At the same time demand has been strong because low interest rates and relatively high inflation in Europe drives investors to seek returns.

Despite of the on-going boom, high-yield corporate bonds are still relatively new instruments to European investors. Initially the idea of European high-yield bond markets was brought up in the early 1990s when the long prepared Single European Act enabled free movements of labour and capital in the beginning of 1993. However, high-yield bond market did not begin to grow substantially in the continental Europe before the introduction of the euro currency (Bondt and Marqués, 2004). After that high-yield market has seen two credit booms. Prior to 2001 telecom companies were popular issuers and from 2003 to 2007 bonds were primarily issued to fund leveraged buy-outs. During these periods investors granted credit at low promised yields to borrowers of low quality and experienced low returns when these borrowers later defaulted and credit spreads widened. Between these booms the new issuance market for high yield bonds has been almost dead silent and this silence descended also in 2008 after the latest financial crises started.

It is easy to see that the amount of new issuances has varied a lot during the last decade. Fluctuations in the quantity of credit has traditionally been seen to be driven by time-varying financing frictions due to changes in borrowers' net worth or in bank capital (Bernanke and Gertler, 1989; Holmstrom and Tirole, 1997; Kiyotaki and Moore, 1997; Kashyap Stein and Wilcox, 1993). Greenwood and Hanson (2011) challenged this traditional view by pointing out that traditional accounts ignore the possibility that time-varying investor beliefs or tastes play a role in determining the quantity and allocation of credit. Greenwood and Hanson saw that overheated credit markets reflect heightened investor risk appetites or over-optimism. This thesis absorbs the mindset of Greenwood and Hanson (2011) being the first academic paper studying the relationship between issuer quality and corporate bond returns in European context. The aim is to show that issuer quality has incremental forecasting power for corporate bond returns over and above traditional proxies for risk premium. Further, this thesis argues that investors are systematically incorrect in assessing credit quality at different stages of the credit cycle.

1.2 Research Gap

The scope of this study covers European publicly listed companies and high yield corporate bond markets. Euro area bond market has received fairly little academic attention even though its size is comparable to U.S. debt markets. For example, international corporate bonds denominated in euros and in US dollars outstanding in September 2011 were USD 12,232 and USD 8,770 billion, respectively (Bank for International Settlements, Quarterly review, December 2011). Previous empirical studies on European bond market have mainly analysed the integration and diffusion processes started after the inception of the common currency union. Especially the yield spreads between Euro-countries have been studied (For example Codogno, Favero and Missale 2003).

More specifically, this study focuses on linking the patterns of corporate debt financing to time-series variation in the pricing of credit. There are a few papers in corporate finance and macroeconomics which explains why the quantity of credit fluctuates over the credit cycle. Probably the most significant being the study conducted by Bernanke and Gertler (1989). Bernanke and Gertler introduced a model of the business cycle in which the higher borrowers' net worth reduces the agency costs of financing. In the model the strengthened borrower balance sheet expands investment demand which in turn tends to amplify the upturn. There are also papers that concentrate to explain the role of financial intermediaries in economic cycles. For example Holmstrom and Tirole (1997) studied the role of financial intermediates and found that all sorts of capital tightening hit hardest the poorly capitalized firms. The model of Bernanke and Gertler (1989) showed that the dynamics of the cycle is nonlinear: the weaker the initial position of borrower, the more powerful the exponential effect to the cash flow is when the external shock hits the company. This finding emphasises the importance of issuer quality as an explaining factor in future bond returns. In 1996 Bernanke, Gertler and Gilchrist introduced a theory of financial accelerator which was largely based on the paper of Bernanke and Gertler published seven years earlier. This theory proposed that borrowers facing relatively high agency costs in credit markets will bear the brunt of economic downturns. The reduced spending, production and investments by high agency costs borrowers will then increase the effects of recessionary shocks.

At the same time when the fluctuations in the quantity of credit are seen to be driven mainly by time-varying financing frictions, the possibility of time-varying investor beliefs and tastes in determining the quantity and allocation is almost fully ignored. Probably the most distinguished study taking this possibility into account is conducted by Greenwood and Hanson (2011). Greenwood and Hanson showed that the quality of corporate debt issuers deteriorates during credit booms and this deterioration forecasts low excess returns to corporate bondholders. Greenwood and Hanson also identified three possible interdependent explanations for the time-series variation in expected bond excess returns: countercyclical variation in the rationally determined price of risk, time-variation in intermediary risk tolerance and time-varying mispricing of assets. In Greenwood and Hanson's study excess corporate bond returns were defined as returns over Treasury Bonds of similar maturities. Greenwood and Hanson also studied the dependence of the high yield bond markets and the intermediary balance sheet strength but these findings were contradictory.

This master's thesis fills an important gap in the existing literature by studying the possibility that time-varying investor beliefs or tastes play a role in determining the quantity and allocation of credit in Europe. Thesis expands the idea presented by Greenwood and Hanson (2011) by first closely following the methodology used in the original study, comparing the obtained results and after that by developing the methodology applied by Greenwood and Hanson so that it better serves as a forecasting tool.

1.3 Research Objectives and Questions

The first objective of this thesis is to build a solid basis for understanding the reduced-form model introduced by Greenwood and Hanson (2011) in which corporate debt issuance responds to changes in the pricing of credit. The model explains why debt issuer quality may be useful for forecasting excess credit returns. The second objective is to empirically examine whether issuer quality is a better barometer of the credit market than the quantity of new issuances by using two different indicators for issuer quality. The research questions derived from these objectives can be stated as follows:

1. *How does the aggregate debt growth correlate with the future excess bond returns?*

The first question relates to the studies of Bernanke and Gertler (1989), Bernanke, Gertler and Gilchrist (1996) and Greenwood and Hanson (2011). Bernanke and Gertler introduced a theory where higher borrowers' net worth reduces the agency costs of financing. Bernanke Gertler and Gilchrist expanded this idea by introducing a financial accelerator to the original model which showed that borrowers facing relatively high agency costs in credit markets will bear the brunt of economic downturns. Greenwood and Hanson showed that aggregate credit growth forecast excess bond returns and the credit growth of low quality firms has higher predicting power than credit growth of high quality companies. Excess bond returns are defined as returns over German Government Bonds of similar maturities. The aim of this thesis is to show that the debt growth itself also is a defining feature of the credit cycle and especially debt growth of lower level companies has significant forecasting power.

2. *How the bond issuer quality fluctuations are correlated with the future excess bond returns?*

The second question focuses on issuer quality and the credit cycle. The variation in issuer quality is a central feature of the credit cycle, proved by Atkinson (1967) Gertler and Gilchrist (1996) and Greenwood and Hanson (2011). This study applies Greenwood and Hanson's approach to identify issuer quality fluctuations and tries to show that the same patterns in issuer quality and bond returns are significant also in the European bond markets. First this is done with the firm-specific data starting from the year 1980. This sample contains all non-financial European companies that have been stock listed between 1980 and 2011. The aim is to show that the quality fluctuations are not currency dependent and the pattern has existed already for a longer period. The actual research is done by studying the excess returns of euro and British pound denominated high-yield bonds. This reduces the time period to 13.5 years because of the lack of prevailing high yield bond index before year 1998.

3. *Does quality have an incremental forecasting power for corporate bond returns over and above traditional proxies for risk premium?*

The third research question relates to the incremental forecasting power of bond returns when the forecasting power of term spread, short-term government bond yields, past excess bond returns and credit spreads are controlled. Greenwood and Hanson (2011) showed that issuer quality is a significant predictor of future bond returns and remains significant even after adding risk and return variables into the calculations. In order to answer the third question the methodology used by Greenwood and Hanson is developed a bit further. For example quarterly data frequency is used and some variables are lagged to ensure the accuracy and the truthfulness of the results.

4. *Is there a relationship between financial intermediary balance sheet strength and excess bond returns?*

The fourth question focuses on the paper of Adrian, Moench and Shin (2010). Adrian and Shin argued that when market conditions get worse, the intermediary demand for high-yield assets decline. According to Adrian Moench and Shin, high yield securities are more heavily exposed to market-wide changes in the pricing of credit risk, and in order to manage the riskiness of the volatility, intermediaries dump their risky assets to the secondary market when market conditions weakens. This argument is tested with the behaviour of European insurance companies, broker-dealers and banks.

5. *What are the forces driving time-series variation in expected corporate bond returns and the relative quantity of high-yield bond issuances?*

The last part of the study relates strongly to the behaviouristic finance related studies conducted by Campbell and Cochrane (1999) as well as Rajan (2005). Campbell and Cochrane argued that investors are not systematically surprised when the bonds of low quality firms who often receive funding during booms later underperform. Rajan offered a slightly different explanation by suggesting that agency problems may encourage investors to reach for yield. Consistent with these ideas the aim is to show that issuer quality declines when yields on German Government Bonds are low or have recently fallen.

1.4 Scope and Limitations of the Thesis

This thesis and its results are limited by geography, time and company type. The research is limited to non-financial publicly listed companies which are headquartered in Europe[1] and have a market value equal or greater than 100 million Euros. The observed time period is 1998-2011. Only companies whose financial year ends at the yearend are counted. The study also uses high-yield bond return data to track the success of the high-risk bonds to German Government Bonds. The data source used is Bank of America Merrill Lynch European Currency High Yield Index. It tracks the performance of EUR and GBP denominated below investment grade corporate debt publicly issued in the Eurobond, sterling domestic or euro domestic markets.

This study also is limited by the quality of the dataset which is used. Lack of quarterly financial data available in Thomson ONE Banker database between the years 1998-2000 is the most severe one. The total length of studied time period is 13.5 years. Short time period requires as frequent financial dataset as possible and in this case the quarterly observations are used. However, Thomson ONE Banker does not offer balance sheet data on quarterly bases exclusively until the end of the year 2000. The lack of quarterly financial data affects to the first quality indicator used in this thesis. This indicator measures the characteristic spread between high and low net debt issuers' expected default probabilities. However, this deficiency can be controlled by testing the results with second quality measure; credit ratings assigned to new corporate bond issues. The obtained results are similar in magnitude and thus the missing data for first two years does not substantially change the basic results.

1.5 The most Relevant Findings

The most relevant and reliable finding of this thesis is that the quality of non-financial corporate debt issuers deteriorates during credit booms and this deterioration has a significant and negative relationship with high yield bond returns. While showing that corporate bonds significantly underperform riskless German Government Bonds after the periods when the issuer quality has been poor, the thesis also notes that the lagged annually observed values of issuer quality

[1] Classification of Countries by major area and region of the World, Department of Economic and Social Affairs of United Nations

fluctuations lose their forecasting power. To issue this problem the methodology is modified so that quarterly financial and market data can be used. This methodological change increases the accuracy of the model as a forecasting tool.

Further, empirical part of this thesis proves that issuer quality has an incremental forecasting power over and above term and credit spread, lagged bond returns and short-term German Government Bond yields at 3- and 4-year horizons. At the shorter horizons above mentioned control variables win the horse race against the issuer quality. Furthermore, obtained results suggest that the quality of debt issuance is a better forecasting tool for excess corporate bond returns than the aggregate quantity of debt issuance. This finding proposes that the quantity of debt issuance responds to common chocks which are unrelated to the pricing of credit risk.

However, the statistical significance of issuer quality is attenuated when results are controlled for financial intermediary balance sheet strength. Obtained results are in line with the existing literature which argues that fluctuations in intermediary equity capital or balance sheet health impact risk premiums (Gromb and Vayanos, 2002; He and Krishnamurthy, 2010; Garleanu and Pedersen, 2010; Duffie, 2010). Empirical part of this thesis also suggests that investors are taking excess investment risks when riskless rates are low or have recently fallen. Further, building on representativeness heuristics of Tversky and Kahneman (1974), the possibility that investors are prone to over-extrapolation is suggested. .

1.6 Key terms and Definitions

Credit Rating agency is a company that assigns credit ratings for issuers of certain types of debt obligations and instruments, for example bonds. In this study credit ratings for individual bonds are obtained primarily from Moody's and if not available, from Standard & Poor's (S&P).

Credit spread is the yield difference of risk bearing and risk free debt securities that have the same maturity.

Excess returns are log returns over German Government Bond returns. Excess returns can be also negative.

Fallen angel is a corporate or municipal bond that was investment-grade when issued but have been downgraded after the issuance. Bonds are downgraded by a rating agency, such as Moody's Investors Service or Standard & Poor's (S&P).

High-yield bond is a bond that is having a higher risk than investment-grade corporate bonds, treasury bonds and municipality bonds. Because of the higher risk of default, these bonds pay a higher yield than investment grade bonds. High yield bonds are those rated Ba1 or lower by Moody's or BB+ or lower by Standard & Poor's.

Investment-grade bond is a bond which has a relatively low risk of default. Investment-grade bonds have a credit rating of Baa3/ BBB- (Moody's and S&P, respectively) or higher.

Issuer quality refers to the issuer default probability. In this thesis issuer quality is defined with two different ways. The first one is the average expected default probability between high and low net debt issuers. The second one is the ratings assigned to the new corporate bond issues.

Maturity date is a final payment date of the bond, at which point the principal and all remaining interest is due to be paid.

Principal amount is the amount borrowed or the part of the amount borrowed which remains unpaid after instalment of a loan.

Term spread is the yield difference of long and short-term debt securities that are otherwise identical.

Term structure of interest rates, also known as the yield curve, is a bond valuation method. The yield curve is a measure of the market's expectations of future interest rates given the current market conditions.

Yield to maturity is the internal rate of return (IRR) at the current market price assuming that the bond will be held until maturity and all required payments considering the bond will be made on schedule.

1.7 Structure of the Thesis

The rest of the thesis is structured as follows. Chapter two is a literature review that begins by introducing corporate default forecasting methodologies and continues by reviewing issuer quantity and quality related findings in corporate bond market. The third chapter presents the hypothesis of the study and the theoretical reasoning behind them. The fourth chapter states the research approach and describes the different quality measures used in this thesis. The fifth chapter describes the data and continues by showing the average, minimum, maximum and the standard deviation of the variables. The actual results of the study are presented in the sixth chapter. The chapter begins by proving the most intuitive hypothesis and continues to the more advanced ones by introducing multivariate regressions and the results derived from them. The chapter ends at the robustness checks. The seventh chapter sheds light on the forces driving time-series variation in expected corporate bond excess return. The final chapter draws conclusions and suggests paths for the future research.

2 LITERATURE REVIEW

This section reviews the academic literature of the credit risks, credit quality, credit quantity and debt issuer quality. First part of the chapter introduces the theoretical framework of credit risk modelling and the systematic abnormal returns pointed out by the previous empirical studies. Secondly this chapter sheds light on the credit quantity fluctuations which are seen to be driven by time-varying frictions, mainly due to borrowers' net worth or in bank capital (Greenwood and Hanson, 2011). The third objective of this chapter is to go through the previous studies concerning issuer quality fluctuations which are shown to be a central feature of credit cycle. Finally, intermediaries' role in financial shocks and how the intermediary balance sheet strength can forecast excess returns for risk bearing assets are discussed.

2.1 Corporate Default Forecasting and Credit Pricing

The value of corporate debt and capital structure are interlinked variables (Leland, 1994). Debt values and yield spreads cannot be determined without understanding the capital structure of the firm. Capital structure in turn affects the default probability. According to Merton (1974) the value of a particular issue of corporate debt depends essentially on three items: (1) the required rate of return on riskless debt, (2) the various provisions and restrictions contained in the indenture (primarily maturity date, coupon rate, call terms, seniority in the event of default and sinking funds) and (3), the probability that the firm is unable to satisfy some or all of the indenture requirements. While the first two items are equally important with the last one, this study concentrates to the relationship between the issuer quality, i.e. firm's default probability and associated bond returns. The next three sections show the corporate default forecasting framework in depth.

2.1.1. Univariate and Multivariate Credit-scoring Systems

Altman and Saunders (1997) argued that even in the late 1970s and the early 1980s most of the financial institutions relied virtually exclusively on subjective analysis to assess the credit risk of corporate loans. Essentially the various borrower characteristics like reputation, leverage, cash flow volatility and collaterals were used in judgements. Taffler (1995) showed that bankers who used subjective valuation methods tend to be overly pessimistic about credit risk of less developed countries. Based on Taffler's study, it is rational that over the past 30 years financial institutions and bankers have increasingly moved away from subjective systems towards more objectively based models like multivariate credit scoring systems. At the same time a number of systems have been developed to predict corporate defaults. Bellovary, Giacomino and Akers (2007) counted that between years 1965 and 2007 altogether 165 analyses of bankruptcy prediction studies were published. The richness of the methods and different modifications is so large that it is not rational to analyse all of them. This chapter introduces the most important methods to give an insight why the Merton's Distance-to-Default model (1974) is chosen as a primary bankruptcy predictor in this study.

Altman and Saunders (1997) classified four methodological approaches to develop multivariate credit scoring systems: (1) the linear probability model, (2) the discriminant analysis model, (3) the probit model and (4), the logit model. The linear probability model assumes that the probability of default varies linearly with the estimation factors. On the contrary discriminate analysis divides borrowers into high and low default risk classes and compares these classes to each other. The first pioneer of discriminant analysis was Beaver (1968). He developed a univariate discriminant analysis model using a number of financial ratios. Beaver's analysis was based on studying one financial ratio at the time and on developing a cut-off threshold for each ratio. A year later Altman (1968) introduced a statistical multivariate analysis technique and estimated a Z-score model. Altman's Z-score model became a cornerstone of the failure prediction studies. It also has remained as an accepted standard method and is used as a baseline method for comparative studies. The problem with discriminant models is their poor out-of-sample forecasting accuracy.

Models based on cumulative distribution function began to appear in the late 1970s. Probit model is a type of cumulative distribution function where the dependent variable can only take two values in this case defaulting or non-defaulting. Logit model on the other hand provides a probability for a firm to go bankrupt. The goal of logistic regression is to find the best fitting model to describe the relationship between the dichotomous characteristic of dependent variable and a set of independent variables. (Dimitras and Zanakis, 1996). Logit analysis was first proposed for bank failure prediction by Martin (1970) and for the prediction of business failure by Ohlson (1980).

2.1.2. Structural and Reduced-form Models

While in many cases multivariate credit-scoring systems have been shown to perform quite well over different time periods and countries, they have been subject to at least three sources of criticism (Altman and Saunders, 1997). First, multivariate models are predominately based on book value accounting data and hence the metrics are not likely to pick up the most subtle and fast-moving changes in borrower condition. Secondly the world is not linear and therefore the linear probability model and linear discriminate analysis may fail to forecast the future outcomes accurately compared to the models that relax the underlying linearity assumption. Thirdly Altman and Saunders argued that traditional credit-scoring bankruptcy prediction models are often only slightly linked to underlying theoretical models. As such, there have been a number of new approaches which generally falls into two main classes: structural models and reduced-form models (Leake, 2003).

Structural models

Structural models follow the framework set out by Merton (1974) in using the principles of option pricing to price default-risky debt. Default is seen as a call option held by equity holders, which is exercised when the value of firm falls below the value of debt. Merton (1974) priced this option by using the techniques developed by Black and Scholes (1973). In Black and Scholes model the price of a company's debt is a function of the firm's value, the default-free interest rate, the maturity of the debt, the expected volatility of firm's value and the company's net debt scaled with equity.

Merton's (1974) model, on which this thesis is fundamentally based, argues that firm's capital structure comprises from equity and a single zero-coupon bond. Default occurs when the firm's value at the maturity of the bond is below the principal value of debt. In Merton's model a company can default only on the maturity dates of its zero-coupon bond because before that date the company is not making repayments to its bondholders. In the event of default the repayment to bondholders is the market value of the firm. Merton's model assumes a flat term structure. This eliminates the possibility to examine the relationship between credit spreads and changes in the slope of the yield curve (Leake, 2003). Because default can occur only on the maturity date of the zero-coupon bond, default risk depends on the value of firm relative to the value of the debt. Assuming that the increase in interest rates do not affect to the value of firm, a higher interest rate results in a higher drift rate for the firm value process and hence lower the risk-neutral probabilities of default at maturity. All this leads to the situation where higher default-free interest rates are associated with lower credit spreads (Leake, 2003).

More recent structural models allow default to occur prior to the data on which the debt matures. For example in Longstaff's and Schwartz' (1995) model, the default is determined by the time when the value of the firm falls below the value of the debt. Following Merton's model, Longstaff and Schwartz assumed that the value of the firm follows a diffusion process with constant volatility but on the contrary to Merton's model, default-free interest rates are allowed to move randomly over time. However, this expansion to Merton does not alter the result that an increase in interest rates leads to a fall in default risks and hence lowers the credit spread.

Reduced-form models

Reduced-form models do not try to explain why default takes place but allows a hazard process to be specified. Since these models do not specify a firm value process, the payoff in the event of default is determined exogenously (Leake, 2003). Jonkhart (1979) created a simple model that linked the probability of default directly to the credit spreads without specifying a hazard rate process. Fons (1994) on his turn developed a simple bond pricing model to calculate the credit spread required by a risk-neutral investor on a default-risky bond issued at par[2], using historical default rates. Fons found that calculated credit spreads are always lower than credit spreads observed in the market, particularly for investment-grade bonds. Fons explained several reasons for this difference: lower liquidity in corporate bonds leads to a liquidity premium; tax effects favouring Treasuries over corporate bonds; risk-aversion of investors and the risk of downgrade of bonds.

More recent reduced-form models assumes stochastic interest rates, augmented with a hazard rate process (Altman and Saunders, 1997). Some researchers e.g., Jarrow and Turnbull (1995) used the underlying interest rate model of Heath and Morton (1992) and specified a constant hazard rate. [3] Similarly, Duffie and Singleton (1999) treated default as an unpredictable event governed by a hazard-rate process. However, the approach of Duffie and Singleton was distinguished by the parameterization of losses at default in terms of the fractional reduction in market value that occurs at default.

Hazard models are state of the art reduced-form default models. In order to use a broad range of information and to allow for time varying covariates, Shumway (2001) suggested a hazard model for the estimation of default probabilities that uses both accounting and market information. Shumway found that many accounting based ratios included in previous statistic models became insignificant when employed in hazard models. In contrast Shumway proved that market variables such a firm's market size, past stock returns and the idiosyncratic equity volatility are strongly related to default.

2.1.3. Merton's Distance-to-Default Model according to Bharath and Shumway

One application of the structural model is the Merton's distance-to-default (DD) model which applies the framework of Merton (1974). In this model the equity of the firm is a call option on the underlying value of the firm with a strike price equal to the face value of firm's debt. The model recognizes that neither the underlying value of the firm nor its volatility is directly

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[2] A bond selling at par has a coupon rate such that the bond is worth an amount equivalent to its original issue value or its value upon redemption at maturity.

[3] Other examples of reduced-form models include for example those of Madan and Unal (1994), Lando (1998), Artzner and Delbaen (1995), Das and Tufano (1995), Jarrow Lando and Turnbull (1997), Martin (1997), Hull and White (2000), Duffie Lando (2001)

observable. However, under the model assumptions both value of the firm and its volatility can be inferred from the value of equity, the volatility of equity and several other observable variables by using iterative procedure to solve a system of nonlinear equations. Bharath and Shumway (2008) noted that at least two assumptions in Merton's DD model are generally violated: first the value of each firm does not follow geometric Brownian motion in real life and secondly, each firm usually issue more than just one zero-coupon bond. Bharath and Shumway argued that it should be possible to construct a reduced-form model that can avoid the shortages of the original DD model.

Bharath and Shumway (2008) created a naïve alternative for Merton's DD model, which used the functional form suggested by the Merton's model but did not solve the model for an implied probability of default. This simplified calculations when the iterative procedure was omitted. Results of the research of Bharath and Shumway suggested that the value of the original Merton's DD model lied in its functional form rather than its solution of the Merton's option pricing model. In empirical tests Bharath and Shumway found that their naïve predictor performed slightly better in hazard models and in out-of-sample forecasts than both, Merton's DD model and the reduced-form model using the same inputs. However, the difference in results between the hazard model and the simple reduced-form model using the same inputs did not significantly differ from zero.

2.2 Empirical Findings on Bond Returns

Despite of the extensive studies in the field of bond pricing, the theories still cannot exclusively explain the market valuation of bonds. This chapter glances through the existing literature concerning excess bond returns and drivers affecting these results, excluding issuer quality and quantity. The fluctuations in issuer quality and the credit quantity are discussed in chapters 2.3 and 2.4.

Litterman and Scheinkman (1991) noted that even though the concept of duration is theoretically correct to characterize the price sensitivity of a bond to a parallel shift in the yield curve, in reality yields do not always move in a parallel fashion. Litterman and Scheinkman studied the returns of U.S. government bond returns empirically to determine the common factors that have affected returns on Treasury-based securities in the past. The analysis suggested that the most of the variation in returns on all fixed-income securities can be explained in terms of three attributes of the yield curve. Litterman and Scheinkman called these attributes level, steepness and curvature. More concrete study was conducted by Cambell and Ammer (1991) who studied the movements of stock and bond returns in relation to the expectations of future stock dividends, inflation and short-term real interest rates. By studying post-war U.S. data, Cambell and Ammer found out that excess 10-year bond returns are driven largely by news about future inflation. Real interest rates on the other hand were seen to have little impact on bond returns, although they did affect the short-term nominal interest rates and the slope of the term structure.

Also the maturity of new issues has been proved to predict excess bond returns (Baker, Greenwood and Wurgler, 2003); when the share of long-term debt issues of the total debt issues is high, future excess bond returns are low. Baker Greenwood and Wurgler found out that this predictive power comes in two parts. First inflation, the short-term interest rates and the term spread together predict excess bond returns. Secondly, these same variables explain the long-term share, and together predict excess bond returns. The results Baker, Greenwood and Wurgler found out are consistent with empirical evidence that firms use debt market conditions an effort to determine the lowest-cost maturity at which to borrow (Barnea, Haugen and Senbet, 1980; Fung and Rudd, 1986).

Greenwood and Vayanos (2010) showed that bond supply predicts excess bond returns. They examined empirically how the maturity structure of government debt affects bond yields and excess returns. They organized their empirical study around preferred habitat, in which shocks impact an arbitrage-free term structure. Consistent with the model, they found that the relative supply of long-term government bonds is positively related to bond yield spreads and excess returns. In addition the effect is stronger for longer-maturity bonds. The forecasting power of supply also remained after controlling results for term-structure slope. Olli Pohja (2010) found similar results when researching German Government Bond data in his Master's thesis work.

Vayanos (2010) studied liquidity and liquidity premiums as explaining factors for abnormal returns. He showed that during volatile times, investors' effective risk aversion increases and the negative correlation between volatility and price movements get stronger. Thus there is a flight to quality in a sense that the risk premium investors require per unit of volatility, increases. Vayanos also showed that an unconditional capital asset pricing models can understate the risk of illiquid assets because of the risk's time-varying nature. The reason for this is that illiquid assets become even riskier in volatile times in tandem with increased investors' risk aversion.

2.3 Fluctuations in the Quantity of Credit

Bernanke and Gertler (1989) developed a neoclassical model of business cycle which showed that higher borrower net worth reduces the agency costs of financing real capital investments. Business upturns increase net worth, lower agency costs and increase investment. The main implication of the study was that the upturn forms an accelerator effect in economy; strengthened borrower balance sheets resulting from good times expand investment demand which in turn tends to amplify the upturn. A possible example of the phenomenon is debt-deflation, first analysed by Irwin Fisher (1933). The debt-deflation decreases asset values, increases agency costs between borrowers and lenders and restricts the access to external finance to all market participants. The resulting fall in investments has negative effects on both aggregate supply and aggregate demand. The model of Bernanke and Gertler counted only two periods where entrepreneurs and lenders act; one where investors increased their wealth and one where they enjoyed their property. This theoretical assumption created a gap between the model and the reality. Gertler (1988) closed this gap and argued in his multiple period setting that borrower's net worth should be augmented to include not just current endowment but also the secure part of the future endowments.

Kashyap, Stein and Wilcox (1993) studied the relationship between monetary policy and companies' financing decisions. They found that tighter monetary policy leads to a shift in firms' mix of external financing: commercial paper issuances rise while bank loans fall. However in order to work, this mechanism requires that the tightening of the supply of bank credit is not driven by output-induced effects on aggregate credit demand and businesses have some ability to substitute between the two sources of finance. If the decreased lending is driven by the slummed demand, the both, bank lending and other non-banking sources of lending should decrease. Kashyap Stein and Wilcox showed that capital mix can be a leading indicator concerning macroeconomic state. The argument of Stein and Wilcox that the mix may be a good proxy for the state of monetary policy, is also helpful in understanding the relationship of spreads between commercial paper and Treasury bills (CP-bill spread) as a leading indicator of the credit cycle.

Several explanations have been offered to clarify the predicting power of the spread and how they are related to the quantity of the credit. The first one suggests that the spread reflects the future default risk. Bernanke (1990) pointed out that this is at best only a partial explanation. For example it is hard to reconcile large swings in the spread with changes in default expectations, given that defaults on prime securities are extremely rare. A second proposal is presented by Friedman and Kuttner (1993). Friedman and Kuttner found empirical support for the argument that companies demand for funds change around the cyclical turning points, and hence commercial papers and treasury bills are imperfect substitutes. Friedman and Kuttner also showed that shocks to corporate cash flows appear to be an important determinant of prices and quantities in short-term credit markets. The third explanation discussed also by Friedman and Kuttner (1993), Bernanke (1990) and by Kashyap Stein and Wilcox (1993) argues that spreads contain information about the stance of the monetary policy. Tight monetary policy leads to increased commercial paper issuances and if the commercial paper market is less than perfectly deep in the sense of market saturation, the result will be an increase in paper rates relative to bill rates. However, Miron, Romer and Weil (1994) found only a little supportive evidence to Kashyap Stein and Wilcox's theory when their study concerning CP-bill spread went further back in time.

The impact of financial intermediation is also addressed. Holmstrom and Tirole (1997) studied the role of financial intermediation in credit quantity fluctuations. In their model the borrowing capacity for both firms and intermediaries was limited. They showed that all types of capital tightening hit poorly capitalized firms the hardest. In addition each shock - a credit crunch, a collateral squeeze and a saving squeeze - has a distinguishable impact on interest rates, monitoring intensity, the solvency of intermediaries and the firms' leverage.

2.4 Variation in Issuer Quality and Credit Cycles

Investment quality was first exclusively researched by W. Braddock Hickman (1958). He analysed the prospective bond quality from 1900 to 1943 by reviewing ratings assigned by the three biggest agencies (The same Agencies dominates the market also over 50-years after Hickman's paper, Moody's Fitch and S&P) and compered them to investors' experiences of default rates, yields and loss rates. He noted that the default rates peaked near or right after the years of heavy financing. Hickman's impression was that the quantity as well as the quality of bond financing is related to the long swings in the investment cycle. Hickman argued that marginal issues can be floated only in periods of overconfidence because otherwise these risky instruments do not find markets.

After Hickman, Atkinson (1967) studied U.S. corporate bond defaults in the post-war period and found that bonds defaulting from 1944 to 1965 were largely offered in years of business peaks or one year before the cycle hit the record. On the other hand during the period Atkinson conducted his study, the actual defaults were rare, partially because of the economic growth and the absence of severe recessions. Atkinson concluded that compared to the pre-war credit markets, both, the process whereby bonds are offered and subsequently defaults, continued to be associated with business cycles.

Bernanke Gertler and Gilchrist (1996) surveyed manufacturing firms and found that small companies experience substantially more pro-cyclical variation in sales, inventories and short-term debt than large firms do. An implication of the finding was that at the onset of recession borrowers facing high agency costs should receive a relatively lower share of credit extended. Because of this high agency cost, borrowers should account for a proportionally greater part of the decline in economic activity. Bernanke Gertler and Gilchrist also argued that reduced spending, production and investment by high-agency-cost borrowers will exacerbate the effects of recessionary chocks.

US junk bond boom in the late 1980s offered a good example of deteriorating issuer quality and investors' over-optimism. Grant (1992), Klarman (1991), Kaplan and Stein, (1993) have studied the 1980s boom and all of them have come into the same conclusion about issuer quality. Kaplan and Stein described the junk bond period as follows: "*The success of early deals attracted a large inflow of new money, and by the late 1980s too much financing was chasing too few good deals*". This high-yield bond boom was launched by Michael Milken, the executive of Drexel Burnham Lambert Inc. He practically created high-yield bond market from the scratch by closing the liquidity gap of falling angels and new issues. Milken's primary marketing statement was that the default risk of the new issue junk bonds was similar to existing small number of fallen angels. In reality, the main reason for low default rates for the recent issues in mid-1980s had been the economic growth in the early 1980s.

Klarman (1991), Asquith, Mullins and Wolff (1989) argued that the denominator in the defaulted bond share soared during the 1980s issuance boom, causing the risk under-pricing. U.S. high-yield market boomed after the mid-80s and therefore the relative size of older high yield bonds decreased. Asquith Mullins and Wolff pointed out that an average buy-and-hold investor who purchased a portfolio of bonds in 1977-1978, experienced a default rate of 34%. On the other hand bonds issued 1979-1983 or 1984-1986 had a default rate of 19-27% and 3-9%, respectively. The effect of bond age on the default was clearly evident from the results. Default rates were lower immediately after issue but rose over time. By the time the defaults for bonds issued 1979-1984 occurred, the overall market had grown much larger. The larger total market made the high default rates of old bonds appear small relative to the size of the overall market, which now was dominated by recently issued bonds with low default rates.

Probably the most far reaching study concerning the relationship of issuer quality and expected returns is done by Greenwood and Hanson (2011). They showed that issuer quality has incremental forecasting power for corporate bond returns over and above traditional proxies for risk premium, including credit spreads, short-term-interest yield and the term spread. Greenwood and Hanson also found out that the quality of debt issuance is a better of excess corporate bond returns than the aggregate quantity of the debt issuance. Greenwood and Hanson claimed that unlike issuer quality, the quantity of debt issuance responds to common shocks which are unrelated to the pricing of credit risk.

2.5 Intermediaries' Role in High Yield Bond Returns

A significant amount of investment is intermediated by brokers, dealers, investments banks and insurance companies and other market makers. This intermediation usually takes some time when the capital is transferred from one investment opportunity to another. In addition intermediaries may also bear investment risks. Thus, when a supply or demand shock takes place, initial price adjustments may be larger than they would have been in a market with perfect intermediation (Duffie, 2010).

Gromb and Vayanos (2002) stated that like other corporates, also intermediaries face operational constraints. Besides to budget restrictions, the most important ones are financial and regulative constraints. The role of funding constraints became apparent also in the global liquidity crisis in 2007 (Garleanu and Pedersen, 2010). Banks unable to fund their operations closed down and this way the crises spread all over the economy. The key driver in refinancing was the net worth of assets which lost their values. Garleanu and Pedersen constructed a model that captured several salient features of the last few financial crises. In the model crises generally start from the negative chocks which lead to losses for levered agents including the financial sector. Further, financial agents will face funding problems as they hit margin constraints. Constraints limit the flexibility of financial agents or intermediaries and this inflexibility leads to drop in treasury rates, spike to interest-rate spread as well as risk premiums. According to Garleanu and Pedersen, the outcome is increased price gap between securities with identical cash flows but different rating.

Also Kashyap Stein and Wilcox (1993), Shleifer and Vishny (1992) and Holmström and Tirole (1997) emphasized the importance of fluctuations in banks' and other intermediaries' balance sheets. Holmström and Tirole showed how capital constraints in intermediation can affect the equilibrium interest rates as well as interest rate spreads. Shleifer and Vishny argued that the tendency of investors to withdraw funds from intermediaries following negative performance limits the ability of intermediaries to exploit high returns.

Adrian, Moench and Shin (2010) studied the possibility that the financial intermediaries are affecting to the credit cycles. They found evidence that intermediary balance sheets provide a window on the transmission of monetary policy through capital market conditions. Particularly intermediary balance sheets that were marked to market, for example balance sheets of broker-dealers, were appropriate. Adrian Moench and Shin also described the link between the intermediary balance sheet and high yield bond returns: Because the majority of the liability side of financial institutions comes from short-term borrowing arrangements, their cost of borrowing is tightly linked to short-term interest rates. Simultaneously the leverage of the intermediaries is constrained by risk. In more volatile markets the leverage becomes riskier and the credit supply tends to be more constrained. Finally, by assuming that spreads were a proxy for the long-terms asset returns financed with short-term liabilities, Adrian, Moench and Shin showed that historically the intermediary demand for high-yield assets have declined when the market conditions have gotten worse.

3 HYPOTHESES

This chapter presents the research hypotheses and discusses how they are linked with the underlying theories. Overall, in line with Section 2.3 one of the main assumptions is that the aggregate credit growth and future corporate bond returns have an inverse relationship. While assuming that aggregate credit growth is the fastest during economic booms and demand for funds change around the cyclical turning points, this thesis simultaneously hypothesises that all types of capital tightening hit poorly capitalized firms the hardest. This assumption is in line with Section 2.4 that showed that the quantity as well as the quality of bond financing is related to the long swing in the investment cycle. Further, this thesis proposes that issuer quality has incremental forecasting power over and above traditional proxies for risk premium.

As presented in Section 2.5, three different reasons for the inverse relationship between issuer quality and excess bond returns will be presented: (1) time-variation in intermediary risk tolerance in markets characterized by limited capital or other intermediary financing frictions, (2) countercyclical variation in the rationally determined price of risk and (3) time-varying mispricing due to investor biases in evaluating credit risk over the cycle. All these hypotheses will be tested to find out the intermediaries' role in high yield bond performance.

The rest of this chapter is constructed as follows. Section 3.1 introduces a simple reduced-form model in which first three hypotheses are based on. Section 3.2 discusses the role of intermediary balance sheet strength to the high yield bond returns and in Section 3.3 Table 1 summarizes the hypotheses.

3.1 Issuer Quantity and Quality

Following Greenwood and Hanson (2011), this section introduces a simple reduced-form model in which corporate debt issuance responds to changes in the pricing of credit. This model explains why the debt issuer quality can be a useful proxy for forecasting excess credit returns and also explains why quality may contain information about expected returns beyond what is revealed by credit spreads. Hypotheses 1, 2 and 3 are derived from this theory.

The model builds on the credit spread definition of Duffie and Singleton (1999). Duffie and Singleton defined credit spread $s_{\theta,t}$ to be equal to expected credit losses $h_{\theta,t}$ plus expected excess returns. Expected excess return is a multiplication of expected return on credit assets $E(R_t)$ and the exposure β_θ of type θ firms to the market-wide pricing of credit risk.

$$s_{\theta,t} = h_{\theta,t} + \beta_\theta E(R_t) \tag{1}$$

Expected credit losses $h_{\theta,t}$ and returns $E(R_t)$ are time-varying variables. The time-varying nature of spreads suggests that credit spreads mean different things at different times. Spreads can be low because default probabilities are low or because expected excess returns are low. Following Greenwood and Hanson (2011) the assumption is that expected credit losses $h_{\theta,t}$ do not directly affect expected excess returns. In other words from now on credit spread and excess bond returns mean the same in this thesis. Thus the expected excess returns, $E\left[rx_{\theta,t+1}\right]$, on claim type θ is:

$$E\left[rx_{\theta,t+1}\right] = \beta_\theta E(R_t) \tag{2}$$

Stein (1996) showed that the deviation of optimal capital structure is costly if the company has too little or too much debt capital. Following Stein, this reduced-form model assumes that the target capital structure is chosen by maximizing the benefits of the cheap debt capital and simultaneously minimizing the effect of straying from the optimal debt ratio.

In this model the target capital structure has two independent components: a_t is a common capital structure component for all firms and $c_{\theta,t}$ is a firm specific component for all firms θ. Firms choose their capital structure by maximising the following function:

$$max_{d_{\theta,t}}\left[\left(h_{\theta,t} - s_{\theta,t}\right) \times d_{\theta,t} - \left(\frac{y}{2}\right) \times \left(d_{\theta,t} - \left(a_t + c_{\theta,t}\right)\right)^2\right] \tag{3}$$

=

$$max_{d_{\theta,t}}\left[-\beta_\theta E(R_t) \times d_{\theta,t} - \left(\frac{y}{2}\right) \times \left(d_{\theta,t} - \left(a_t + c_{\theta,t}\right)\right)^2\right] \tag{4}$$

where y reflects the cost of deviating from the target capital structure (as explained in section 3.2). The optimal choice of leverage $d_{\theta,t}$ can be derived from the equation (4) and hence is:

$$d_{\theta,t} = a_t + c_{\theta,t} - \left(\frac{\beta_\theta}{y}\right) * E(R_t) \tag{5}$$

Equation (5) suggests that companies borrow more when the expected returns on credit assets [$E(R_t)$] are low (assuming that the exposure to the market-wide pricing of credit risk (β_θ), and the cost of deviating from the target leverage (y), remain unchanged). The Q-theory (Tobin, 1977) is a classical justification of this argument; the optimal scale of corporate investments and hence debt issuance rises when rationally required returns on assets decline.

For simplicity all companies in this model are either low default risk (L) or high default risk (H) entities. The central assumption is that $\beta_L < \beta_H$ meaning that bonds of high default risk firms are more heavily exposed to market-wide changes in the pricing of credit risk. The logic behind this argument can be seen from the equation (5). Since $\beta_L < \beta_H$, fluctuations in expected returns $E(R_t)$ have a larger impact on the issuance of high default risk firms than on the issuance of low default risk firms. When assuming that half of the debt is issued by low risk companies and the other half by high risk companies the equation (5) can be presented as follows.

$$d_{L,t} + d_{H,t} = \left(2a_t + c_{L,t} + c_{H,t}\right) - \left(\frac{\beta_L+\beta_H}{y}\right) * E(R_t). \qquad (6)$$

Equation (5) and more detailed version of it, equation (6), offers the common ground for the first hypothesis. In line with Tobin's Q-theory (Tobin, 1969) the assumption is that when the required return on credit assets decline, the scale of investments activities and hence debt issuances increase. The hypothesis is that during the periods of increased investment activities investors underestimate risks and in general require too low returns for their investments. After the turning point of the cycle, this underestimation is reflected as a lower or even negative excess bond returns. Excess bond returns equal to the credit spread between risk-free Government Bonds and corporate bonds of same maturity.

H1: *Aggregate corporate debt growth can forecast excess bond returns. Debt growth and excess returns have a negative correlation.*

The challenge with the quantity based approach is that the common capital structure component (a_t) in equation (6) remains for all companies. Thus it is useful to examine the difference in debt issuance between high- and low-default risk firms. By looking at the quality of the issuance, the impact of the common factor a_t which affects the debt issuance of all firms, disappears. Thus the comparison of the quality mix helps to isolate the information that issuance contains about the expected returns. Following Greenwood and Hanson (2011), the difference in issuer quality is measured with the default risk of high net debt issuers with that of low net debt issuers.

$$d_{H,t} - d_{L,t} = (c_{H,t} - c_{L,t}) - \left(\frac{\beta_H - \beta_L}{y}\right) * E(R_t) \tag{7}$$

H2: *Debt issuer quality can forecast excess bond returns. Issuer quality and excess returns have a negative correlation.*

The reduced-form model described above suggests that the both coefficients of quality and quantity will be negative as long as the variance is bigger than zero. However, the quality becomes more important explanatory factor when the variance of non-firm specific (a_t) determinants of optimal capital structure grows large or the variance of firm specific determinants approach to zero (Greenwood and Hanson, 2011). The same applies also for the credit spread.[4] For example, if aggregate debt issuance fluctuates significantly due to shocks to aggregate investment opportunities, the quality mix should be better return indicator. The model also suggests that the results are the strongest when forecasting the returns of the low-grade bonds which have the greatest exposure to market-wide changes in the pricing of credit.

H3: *Issuer quality has incremental forecasting power over and above the term and credit spreads as well as short-term risk-free interest yields.*

3.2 Intermediary Balance Sheet Strength and Time-varying Investors' Beliefs

Fourth and fifth hypotheses are related to the financial frictions created by the financial intermediaries. These frictional explanations assume that risk premiums fluctuate due to the health of financial intermediary balance sheets. Following Gromb and Vayanos (2002), the assumption is that financial intermediaries always reduce the wedge between asset prices and enable the efficiency of the financial markets. On the other hand intermediaries also are financially constrained and their positions cannot exceed the certain level of wealth. So even if intermediaries reduce the wedge between assets, they make the wedge more sensitive to supply shocks. Intermediary's wealth serves as collateral and hence a reduction in a wealth can reduce

[4] Relevant calculations are presented in Appendix 1.

the intermediary's ability to invest. This inability to invest is closely related to fire sales (Shleifer and Vishny, 1992). Following Adrian, Moench and Shin (2010) this thesis hypothesises that the difference in default risk of high net debt issuers with that of low net debt issuers will be high when intermediary balance sheets are strong. The difference in default risk of high and low net debt issuers is called issuer characteristic spread.

> **H4:** *Intermediary balance sheet strength is a significant determinant of the issuer characteristic spread.*

Rajan (2005) argued that certain institutional investors are keen on taking excessive risks and reaching the yield when riskless nominal rates are low or have recently fallen. Analogically, the low yield curve in 2008-2010 and the subsequent high yield credit boom in 2010 suggest that investors may have taken excessive risks. Similarly to Rajan, Klarman (1991) argued that the 80's junk bond boom in U.S. was fuelled by investors who still wanted to earn same high nominal rates than in the early 1980's. Furthermore, Barberis, Shleifer and Vishny (1998) argued that investors think that the economy either evolves according to a more or less persistent process. Barberis, Shleifer and Vishny saw that following low-default realizations investors start to believe that the business environment has fundamentally changed and the low default environment is more persistent than it truly is. Low credit quality firms are expected to be safer than they really are and this wrong risk analysis decreases the price of the credit. Recognizing that the credit is cheap, low quality firms will then issue large amount of debt, making then even more likely to default in the future. Following Barberis, Shleifer and Vishny, the next hypothesis is that issuer characteristic spread is wide when term spread, nominal rates and past default rates are, or has recently been, at the low level.

> **H5:** *Past default rates and bond returns, term spread and short-term risk free yield are significant determinants of the issuer characteristics spread.*

3.3 Summary of the Hypotheses

Table 1 presents the research questions presented in Section 1.2 and the hypotheses presented in Sections 3.1 and 3.2. Excess bond returns mentioned in the first hypothesis equal to the credit spread between risk-free Government Bonds and corporate bonds of the same maturity.

Table 1 Summary of the hypotheses

This Table presents the research questions and the hypotheses of this study. The left side of Table 1 presents the research questions also presented in Section 1.3. The right side of the table presents the hypotheses of this thesis.

	Research questions		**Hypotheses**
1.	How does the aggregate debt growth correlate with the future excess bond returns?	H1	Aggregate corporate debt growth can forecast excess bond returns. Debt growth and excess returns have a negative correlation.
2.	How the bond issuer quality fluctuations are correlated with the future excess bond returns?	H2	Debt issuers quality can forecast excess bond returns. The relationship between quality and the expected returns is negative.
3.	Does quality have an incremental forecasting power for corporate bond returns over and above traditional proxies for risk premium?	H3	Issuer quality has incremental forecasting power above term and credit spread as well as short term risk-free interest yield.
4.	Is there a relationship between the intermediary balance sheet strength and excess bond returns?	H4	Periods of strong balance sheet of financial intermediaries are followed by low excess returns on corporate bonds.
5.	What are the forces driving time-series variation in expected corporate bond returns and the relative quantity of high-yield bond issuances?	H5	Past default rates and bond returns, term spread and short term risk free yield are significant determinants of the issuer characteristics spread.

4 METHODOLOGY

This section introduces the methodology used in this thesis. The main focus of the thesis is to analyse issuer quality and subsequent bond returns. While bond returns are easy and straightforward to observe, the issuer quality is more subjective variable. Following Greenwood and Hanson (2011), the issuer quality is measured with two main metrics. The first one compares the default risk of high net debt issuers with that of low net debt issuers, denoted as issuer characteristics spread *ISS*. The second quality measure is formed by using credit ratings assigned to new corporate bond issues.

4.1 Issuer Characteristic Spread

The primary issuer quality method used in this study is a particular application of Merton's (1974) model which was developed by the proprietors of the KMV Corporation[5]. The original model is called Merton's distance to default (DD) model. Merton's DD model applies the framework in which the equity of the firm is a call option on the underlying value of the firm with a strike price equal to the face value of the firm's debt. The model recognizes that neither the value of the firm nor the volatility of the assets is directly observable. Both can be inferred from the value and the volatility of the equity by using an iterative procedure to solve the system of nonlinear equations.

Bharath and Shumway (2008) created a naïve alternative for the Merton's DD model after proving that assumptions about the firm's value following Brownian motion are generally always violated. This model captures both the functional form and the same basic inputs of the Merton's DD model without using the Merton's DD probability as an explanatory variable. The model has been shown to forecast default probability with better accuracy than the original Merton's DD model. In this thesis the expected default frequency is calculated following Bharath and Shumway (2008). The equation for the expected default probability is:

$$EDF_{i,t} = \varphi\left[-\frac{\left(ln\left(\frac{E_{i,t}+F_{i,t}}{F_{i,t}}\right)+\mu_{i,t}-0.5\sigma_{i,t}^2\right)}{\sigma_{i,t}}\right] \tag{8}$$

[5] Acquired by Moody's in 2002. Nowadays Moody's KMV Corporation.

Where $E_{i,t}$ is the market value of equity and $F_{i,t}$ the face value of all liabilities computed as short-term liabilities plus one half of long-term liabilities. $\mu_{i,t}$ is the asset drift which is estimated by using the prior 52-week stock returns, φ[-] is the normal standard cumulative distribution function and $\sigma_{V\,i,t}$ is the asset volatility estimated with the equity volatility $\sigma_{Ei,t}$.

$$\sigma_{V\ i,t} = \left(\frac{F_{i,t}+E_{i,t}}{F_{i,t}}\right)\sigma_{E\ i,t}+\left(\frac{F_{i,t}}{F_{i,t}+E_{i,t}}\right)\left(0.05 + 0.25 * \sigma_{E\ i,t}\right) \quad (9)$$

where $E_{i,t}$ is the market value of equity, $F_{i,t}$ the face value of all liabilities computed as short-term liabilities plus one half of long-term liabilities. On the right side of the equation (9) the debt ratio is multiplied with $\left(0.05 + 0.25 * \sigma_{E\ i,t}\right)$. Five percentage points represent term structure volatility and 25% times the equity volatility simulates the volatility associated with default risk (Bharath and Shumway, 2008). Highly levered firms with high asset volatility and low returns should have the highest *EDF*s. Other group with high *EDF* are newly issued small companies which are growing at the large speed.

As shown in Section 3.1, changes in target leverage are not informative about expected returns and in addition have a common component that is shared by all firms. Thus it is useful to examine the difference in debt issuance between high- and low- default risk firms. To do this company sample is divided to 5 different groups (quintiles). All quintiles have the same amount of observations and are rebalanced periodically. When comparing the difference in debt issuance the lowest and the highest quintiles are used to minimize the influence of outlier firms and to remove the possibility of compositional shifts happened in the economy. The limitation of using quintiles is that some company specific information is ignored.

As shown, the difference in debt issuance is measured with the expected default frequency between high and low net debt issuers. The remainder is called as characteristics spread, *ISS*. In this comparison the quality β_t and debt issuance can vary continuously across firms.

$$ISS = E_t\left[\beta_i | High\ d_{i,t}\right] - E_t\left[\beta_i | Low\ d_{i,t}\right] \quad (10)$$

Previous papers have shown that characteristic spread is wide during credit booms and narrow in the bottom of the cycles (Atkinson, 1967; Grant, 1992; Klarman, 1991; Kaplan and Stein, 1993; Greenwood and Hanson, 2011). In practise this means that during economic booms the share of lower quality firms of all companies acquiring debt finance is larger. Building on equation (10), the credit quality of firms issuing large amount of debt relative to their size to that of firms issuing or retiring debt will be compared. The comparison is based on periodical changes in debt, Thus in each year *t*, the expected difference in default frequencies between high and low net debt issuers is recalculated. This ratio is denoted by ISS^{EDF}.

$$ISS^{EDF} = \frac{\sum_{i\epsilon \text{ High net debt issuers}} EDF_{i,t}}{N_t^{\text{High net debt issuers}}} - \frac{\sum_{i\epsilon \text{ Low net debt issuers}} EDF_{i,t}}{N_t^{\text{Low net debt issuers}}} \tag{11}$$

The annual change in debt is the change in assets minus the change in book equity scaled by the lagged assets. This measure counts all changes in liabilities, i.e. also credit payable changes and changes in other non-interest bearing debts are recognized. *N* denotes the number of firms.

4.2 The High Yield Share

The second quality measure, the high yield share, is used to control the results of issuer characteristic spread. It is formed by using credit ratings assigned to new corporate bond issues. Fallen angels are not counted. The primary source for credit ratings is Moody's. If the Moody's rating is missing, the Standard & Poor's rating is used.

$$HYS_t = \frac{\sum_{\text{High yield}} B_{i,t}}{\sum_{\text{High yield}} B_{i,t} + \sum_{\text{InvGrade}} B_{i,t}} \tag{12}$$

In equation (12) B_t denotes the principal value of bond *i* issued in year *t*. The high yield share is measured periodically. In empirical part of the thesis the high yield share is changed into a logarithmic form because it provides a good fit with the other linear independent variables. There is one annual period when the high yield share has been 0%. In this case the value is replaced by the logarithmic value of the second smallest high yield share value obtained.

The advantage of *HYS* is its simplicity compared to *EDF*. However, there are several drawbacks when using *HYS*. The first one is that when assuming that loan and bond markets are at least partially integrated, the high yield share tracks only the fluctuations in bond markets. European debt markets are dominated by bank loans and therefore *EDF* should be favoured because it reflects broader measure of debt issues including both bank loan and bond market financing. Secondly the relative sizes of markets have fluctuated significantly because the high yield bond market in Europe is relatively small. There are periods when the high yield issuances count almost one third of total issuances and on the other hand periods when the share of high yield bonds have been zero. The paper of Greenwood and Hanson (2011) supports the assumptions presented above. Despite of these shortages, *HYS* is included as an explanatory factor in this thesis. The reason for this is that *HYS* may reflect the general credit market confidence and thus can deliver some extra value to the research. For example, Greenwood and Hanson (2011) argued that high yield bond issuances are not driven by investors' ability to bear higher risk, but rather by their willingness to take risk. If this is the case, *HYS* should follow the general economic cycle with the high accuracy.

While ISS^{EDF} and *log(HYS)* are the explaining variables emphasized throughout the thesis, the aim is to show that findings of this paper are not sensitive to the specific method used to measure the issuer quality. In order to do this excess bond returns are also forecasted with bankruptcy hazard rate estimated by Shumway (2008) and with several other issuer characteristic spread compilations. The alternative methods and the results are classified in Section 6.6.

5 DATA AND SUMMARY STATISTICS

This chapter introduces the data collection process and outlines the final data sample used in the empirical part of this study. Descriptive statistics of the data are included in the end of this section.

5.1 Data Collection Process and the Final Dataset

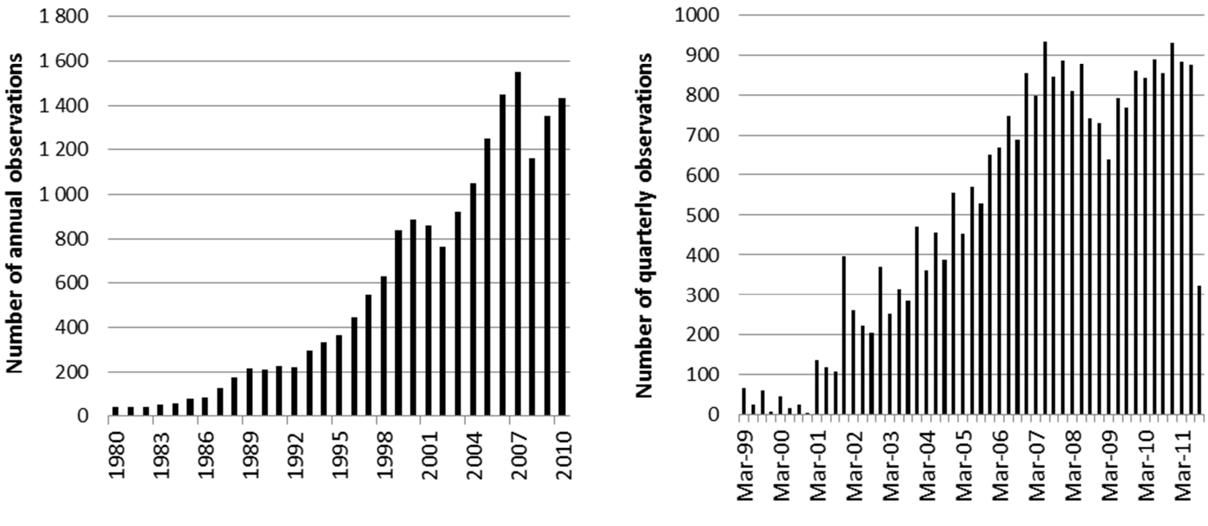
The main focus of this thesis is to find the relationship between the issuer quality and excess high yield corporate bond returns. In order to do this the high yield bond index data is used. However, high yield corporate bond markets did not practically exist in United Kingdom or in continental Europe before the inception of euro currency (Bondt and Marqués, 2004). The first high-yield index was launched in December, 31st, 1997, by Merrill Lynch (Current Bank of America Merrill Lynch). This index is a proxy for high yield bond returns throughout the thesis and thus is the single most important time series of the study. BofA Merrill Lynch European Currency High Yield Index tracks the performance of euro and British pound denominated below investment grade corporate debt publicly issued in the Eurobond, sterling domestic or Euro domestic markets. In this context Eurobonds refer to the bonds issued by European corporates denominated in non-European currencies. According to BoFa Merrill Lynch, qualifying securities must have a below investment grade rating based on an average of Moody's, S&P and Fitch and an investment grade rated country of risk. In addition, qualifying securities must have at least one year remaining term to final maturity, a fixed coupon schedule and a minimum amount outstanding of EUR 100 million or GBP 50 million. Index constituents are capitalization-weighted based on their current amount outstanding. This index defines the geographical scope and type of companies studied in the thesis.

This thesis concentrate to analyse the credit behaviour of non-financial companies and therefore financial firms are excluded (ICB industry code of 8000 or SIC code 6000-6999) from the research sample. In addition governmental entities (SIC code 9000-9999) are not counted in because of their regulated nature. Both currently active and non-active corporates are taken into account to avoid the survival bias. To be included into the sample company has to have at least two consecutive years of balance sheet and market data available. When calculations are performed with quarterly financial data, company has to have at least four consecutive quarters of data available. Any firm-year without a preceding year/quarter data available is excluded from the final sample. Companies included in the final sample have to be headquartered in one of the European countries[6]. Company specific data is collected by using Thomson ONE Banker.

After the adjustments mentioned above, the corporate sample consists of 4,201 companies headquartered in one of the European countries. Further, companies whose financial year does not end on December or whose market value is less than 100 million euros are ruled out. Results are also calculated without these controls. When the end of the financial year is not controlled, all results looks smoothed. On the other hand the omission of companies which have less than 100 million euros market cap does not change the obtained results significantly. Figure 1 shows the number of annual and quarterly observations in the final sample. The final sample from 1980 to 2010 consists of 2,034 companies and altogether 17,691 firm years. The period when the high yield bond index data has been available, 1998-2010, the annual company sample consists of 2,015 companies and 14,143 firm years.

Figure 1 Number of annually and quarterly observed firms

This Figure shows the number of companies in the final annual and quarterly samples. The final annual sample from 1980 to 2010 consists of 2,034 companies and altogether 17,691 firm years. Firm years are presented on the left side of Figure 1. Quarterly sample consists of 1,336 companies and 25,567 individual quarterly observations from January 2001 to September 2011. Quarterly observations are presented on the right side of Table 1.



[6] Classification of Countries by major area and region of the World, Department of Economic and Social Affairs of United Nations

Quarterly sample consists of 1,336 companies and 25,567 individual quarterly observations from January 2001 to September 2011. Reliable quarterly measured balance sheet data beyond the year 2001 was not exclusively available and is thus omitted from the analysis. Appendix 2 describes the distribution of the observations by countries.

5.2 Definition of Variables

This section shortly describes all variables used in this thesis. Summary statistics are shown in Table 2. This table describes mean, standard deviation and extreme values of firm characteristics and time-series variables. Excess bond returns and different compilations of issuer characteristic spread are described in detail while other variables are more common and thus explained more briefly.

Excess bond returns (rx^{x}_{t+k}) is a continuous variable describing the excess returns of corporate bond indexes compared to German Government Bond indexes. Excess bond returns are calculated for high yield, AAA-grated and BBB-grated[7] bond indexes and presented in a logarithmic form. Corporate bond indexes used are offered by Bank of America Merrill Lynch and on an average have an average time to maturity of five years. Because of the average maturity of five years, the 5-year German Government Bond index is used as a risk free bond index when calculating excess bond returns. Excess bond returns are calculated for 1-, 2-, 3- and 4-years cumulatively by summing the log-returns together.

Debt issuer quality, ISS^{X} compares the highest and the lowest characteristic quintiles of low and high debt issuers of the specific year. Companies are divided to quintiles periodically. The main quality characteristic is the expected default frequency, *EDF*. This explanatory variable follows the Merton's (1974) Distance-to-Default model. Few other characteristics are used to compare the results given by *EDF*. These characteristics include Shumway distress, leverage, size, age, CAPM-volatility and dividend policy. ISS^{X} classifies the companies by their annual change of total assets minus the change in book equity scaled with the lagged assets. ISS^{X} takes both loan and bond market debt growth into the calculations and is hence more reliable measure of debt growth than the share of high yield issuances. In the case of ISS^{EDF}, Greenwood and Hanson

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[7] Standard & Poor's rating. Moody's ratings would be Aaa and Baa2, respectively.

(2011) showed that ISS^{EDF} is statistically equivalent of credit ratings by having 54% correlation with S&P credit ratings during the time period from 1985 to 2008. Firm characteristics related to ISS^{X} are measured as of December *t* or in the end of each quarter depending on the time frequency used. Since the measurements are done in the end of the each period, ISS^{X} captures any incremental risk that creditors are assuming. This is appropriate because if the transaction(s) significantly raises leverage, the company is no longer a low risk player and also credit markets should notice this.

High Yield Share, HYS, is defined as the high yield bond share of all new corporate bond issues denominated in euros or in British pounds. In addition bonds have to be issued by companies headquartered in Europe between January 1999 and September 2011. The rating is obtained from Moody's. If the Moody's rating is missing, the Standard & Poor's rating is used.

Other variables in the study are:

Net debt issues (Δd/A)	the change in assets minus the change in book equity plus deferred taxes minus preferred stocks scaled by the lagged assets
Net equity issues (Δe/A)	growth of balance sheet equity and net of retained earnings scaled by lagged assets
External finance (e+d)/A	sum of net debt and the net equity issuance scaled by total assets
Expected Default frequency	Merton's (1974) expected default frequency calculated according to Bharath and Shumway (2001)
Shumway distress	bankruptcy hazard rate estimated by Tyler Shumway (2001)
Leverage (D/A)	annual cash flow interest expense scaled by total assets
Market Cap log(MV)	logarithmic market capitalization of the company in the end of each period
Age	time period the company has been listed in stock exchange.
Dividend	annual cash dividends scaled by the average market value of equity during the period
$y^{G}_{S,t}$	2-year German Government Bond yield

$y^{G}_{L,t}$ -$y^{G}_{S,t}$	spread between the 10-year intermediate and 2-year German Government Bonds
$y^{BBB}_{5y,t}$ -$y^{G}_{5y,t}$	credit spread between BBB-bond index and 5-year German Government Bonds. *Bank of America Merrill Lynch Emu Corporate Non-financial BBB-bond Index* used in this study has an average maturity of 5 years.
$y^{AAA}_{5y,t}$ -$y^{G}_{5y,t}$	credit spread between AAA-bond index and 5-year German Government Bonds. *Bank of America Merrill Lynch Emu Corporate Non-financial AAA-bond Index* used in this study has an average maturity of 5 years.
rx^{HY}	one year lagged high yield bond excess returns

In addition to above mentioned variables, growth in industrial production, aggregate consumption growth, the recession dummy and the output gap are used as macroeconomic control variables. Log excess returns on corporate bonds are computed for bond index returns based on high yield (HY), BBB-rated and AAA-rated bonds, and are denoted by *rx*. Excess returns are the difference between corporate bond returns and German Government Bond returns of the same maturity.

To test the predicting power of the intermediary balance sheet strength to excess high yield bond returns, the following variables are used: Insurer balance sheet capital ($E/A_{Insurer}$) and insurer balance sheet growth ($dA/A_{Insurer}$); broker-dealer balance sheet capital (E/A_{BD}) and broker-dealer balance sheet growth (dA/A_{BD}); bank balance sheet capital (E/A_{Bank}) and bank balance sheet growth (dA/A_{Bank}); lagged equal weighted returns on bank stocks and bank loan loss provisions scaled by the total loans.

Table 2 Summary statistics

Panels A-E of Table 2 show mean, median, standard deviation and extreme values for firm characteristics (Panel A) and for time-series variables (Panels B-E). Panel A summarizes the firm-level characteristics. *Change in debt* is the change in assets minus the change in book equity, scaled by lagged assets. *Change in equity* is the growth of balance sheet equity and net of retained earnings, scaled by lagged assets. *External finance* is the sum of net debt and net equity issuance. *EDF* is the Merton (1974) expected default frequency, calculated following Bharath and Shumway (2008). *SHUM* is the bankruptcy hazard rate as estimated by Shumway (2001). *Leverage* is book debt over assets. *Market cap* is market value of the equity in millions of euros. *Age* is the number of years company has been listed in stock exchange. *Dividends* is annual cash dividend scaled by assets. In Panel B, for each characteristic X, ISS^X compares the average characteristic quintile of high and low debt issuers of that period. Characteristics include expected default frequency (EDF), market cap weighted EDF, Shumway distress, EDF deciles, leverage, volatility of residuals from CAPM regression, size, age, dividends, EDF level, short-term debt, long term debt and equity. "High" and "low" are associated so that the high associated with a higher default probability. *HYS* for both euro and British pound denominated bonds is the high yield share of total bond issues in Europe. "*HYS euro denominated bonds"* accounts only issuances done by European companies in euro currency. Panel C summarizes bond returns and the time-series control variables. $y^G_{S,t}$ is the short-term German Government Bond yield. $\left(y^G_{L,t} - y^G_{S,t}\right)$ is the spread between the yields on the intermediate- and short-term government and $\left(y^{BBB}_{L,t} - y^G_{S,t}\right)$ is the credit spread of BBB-rated bonds. rx^Y denotes excess returns. Excess returns are returns over risk free bond returns. Characteristics Y include 1,2,3 and 4-year excess returns for high yield, BBB- and AAA-rated bonds. *Excess equity returns* are sample stock returns over risk free bond returns. Panel D summarizes time-series measures of intermediary balance sheet strength. Characteristics include *bank balance sheet capital* (total assets minus liabilities all over assets) and *bank balance sheet growth* (percentage change in total assets); *insurer balance sheet capital* (total assets minus liabilities all over assets) and *insurer balance sheet growth* (percentage change in total assets); *broker dealer balance sheet capital* (total assets minus liabilities all over assets) and *broker dealer balance sheet growth* (percentage change in total assets); *lagged equal weighted returns on bank stocks* and *bank loan loss provisions* scaled by total loans and leases.

	Mean	Median	St.dev	Min	Max
Panel A: Firm-level data 1998-2011 (quarterly observations)					
Change in debt: Δd/A	0.04	0.01	0.35	-0.99	19.18
Change in equity: Δe/A	0.03	0.01	0.33	-1.00	15.57
External finance: (e+d)/A	0.04	0.01	0.31	-0.96	19.18
Expected Default Frequency: EDF	0.09	0.00	0.28	0.00	1.00
Shumway distress: SHUM	0.03	0.00	0.10	0.00	0.98
Leverage: D/A	0.48	0.50	0.26	0.00	1.00
Market Cap, EURm	2,879	483	12,528	100	209,056
Age	11.54	9.25	9.76	0.00	47.25
Dividends	0.03	0.01	0.14	0.00	0.53
Panel B: Debt issuer quality 1998-2011 (quarterly observations)					
ISS^{EDF} Expected Default Frequency (high-low)	0.13	0.20	0.42	-1.19	0.68
ISS^{EDF} Market Cap weighted	0.00	0.00	0.30	-0.82	0.64
ISS^{SHUM} Shumway distress (high-low)	0.85	0.78	0.34	0.42	1.53
ISS^{EDF} deciles	0.25	0.37	0.94	-2.43	2.00
ISS^{lev} Leverage(high-low)	0.25	0.36	0.37	-0.95	0.82
ISS^{σ} CAPM σ(high-low)	0.85	0.78	0.34	0.42	1.53
ISS^{MV} Size(small-large)	0.07	0.09	0.33	-0.77	0.67
ISS^{Age} Age(young-old)	-0.60	-0.55	0.42	-1.86	0.07
ISS^{Div} Dividends(nonpayer-payer)	-0.02	-0.01	0.08	-0.19	0.14

Panel B continues (quarterly observations)	Mean	Median	St.dev	Min	Max
ISS^{level}	0.03	0.02	0.03	-0.05	0.10
$ISS^{lt\text{-}debt}$	-0.11	0.05	0.51	-1.71	0.62
$ISS^{st\text{-}debt}$	0.04	0.06	0.35	-0.78	0.71
ISS^{equity}	0.10	0.21	0.56	-1.40	1.33
HYS: Euro and British Pound denominated bonds	0.07	0.06	0.05	0.00	0.24
HYS: Euro denominated bonds	0.06	0.06	0.04	0.00	0.17
Panel C: Returns on macroeconomic controls, %, 1998-2011 (quarterly observations)					
Macroeconomic controls:					
$y^{G}_{S,t}$	2.95	3.15	1.21	0.52	5.07
$y^{G}_{L,t}$-$y^{G}_{S,t}$	1.64	1.76	0.79	0.22	2.86
$y^{BBB}_{5y,t}$-$y^{G}_{5y,t}$	1.51	1.27	0.99	0.37	5.57
Industrial production growth	0.00	0.01	0.02	-0.05	0.05
Consumption growth	0.01	0.01	0.01	-0.04	0.01
Recession dummy	0.15	0.00	0.36	0.00	1.00
Output gap	-0.01	0.00	0.02	-0.05	0.02
Returns:					
rx^{HY}_{t+1}	0.01	0.03	0.21	-0.55	0.57
rx^{BBB}_{t+1}	0.01	0.01	0.06	-0.15	0.18
rx^{AAA}_{t+1}	0.00	0.00	0.02	-0.05	0.04
rx^{HY}_{t+2}	0.01	0.06	0.28	-0.61	0.66
rx^{BBB}_{t+2}	0.02	0.00	0.07	-0.17	0.17
rx^{AAA}_{t+2}	-0.01	-0.01	0.02	-0.06	0.04
rx^{HY}_{t+3}	-0.03	-0.01	0.25	-0.53	0.40
rx^{BBB}_{t+3}	0.02	0.02	0.06	-0.16	0.13
rx^{AAA}_{t+3}	-0.01	-0.01	0.01	-0.05	0.01
rx^{HY}_{t+4}	-0.03	0.02	0.25	-0.48	0.47
rx^{BBB}_{t+4}	0.02	0.01	0.07	-0.17	0.14
rx^{AAA}_{t+14}	-0.01	-0.01	0.01	-0.05	0.00
Excess equity returns	-0.22	-0.20	0.29	-0.71	0.26
Panel D: Intermediary Balance Sheets, (quarterly observations)					
E/A_{bank}	0.08	0.08	0.01	0.04	0.09
dA/A_{bank}	0.03	0.02	0.09	-1.00	2.26
$E/A_{Insurer}$	0.10	0.10	0.04	0.03	0.16
$dA/A_{Insurer}$	0.02	0.01	0.06	-0.26	2.05
E/A_{BD}	0.41	0.41	0.04	0.32	0.48
dA/A_{BD}	0.05	0.02	0.20	-0.94	2.20
Lagged bank equity returns	0.04	0.04	0.12	-0.31	0.28
$LoanLosses_{Bank}$	0.0027	0.0017	0.0023	0.0005	0.0123

6 EMPIRICAL RESULTS

This section presents the empirical results of this thesis. Sections 6.1 and 6.2 show how issuer characteristic spread and high yield share have developed over time. Sections 6.3 and 6.4 analyse the predictive power of issuer quality measures with and without control variables. Section 6.5 focuses on showing how the quantity and the quality of corporate debt issues correlate together. Section 6.6 concludes the chapter by presenting various adjustments to the construction of ISS^{EDF} in order to prove the robustness of the obtained results.

6.1 Characteristic Spread of the Expected Default Probability

Following the discussion above, this section compares the credit quality of firms issuing large amounts of debt to that of firms issuing little debt or retiring debt.[8] For each year *t*, the estimate of the firm's default probability is calculated by following Bharath and Shumway (2008). The difference between default probabilities of high and low net debt issuer is denoted by ISS^{EDF}. [9]

Figure 2 describes the characteristic spread, *ISS*, for issuer quality between the lowest and the highest quintiles with black solid line. The figure also shows CEPR[10] recession periods with darker grey and economic growth pauses with lighter grey. $ISS^{EDF}_t = 1$ means that firms with high net debt issuance had *EDF*'s on average one fifth (quintile) higher than firms with low net debt issuance. The usage of quintiles minimizes the influence of outlier firms or secular trends. ISS^{EDF} is not sensitive to the split up method used and results remain alike even if 5th, 10th or 30th percentiles are used.

The influence of the business cycle can be removed by regressing ISS^{EDF} on the output gap (Hodrick Prescott, 1997) and saving the residuals. The orthogonalized series, shown with dashed line from the year 1993 onwards, still captures the same peaks and busts of the original series. This supports the idea that credit cycle is somewhat different to business cycle and thus the

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[8] $ISS = E_t[\beta_i | High\ d_{i,t}] - E_t[\beta_i | Low\ d_{i,t}]$

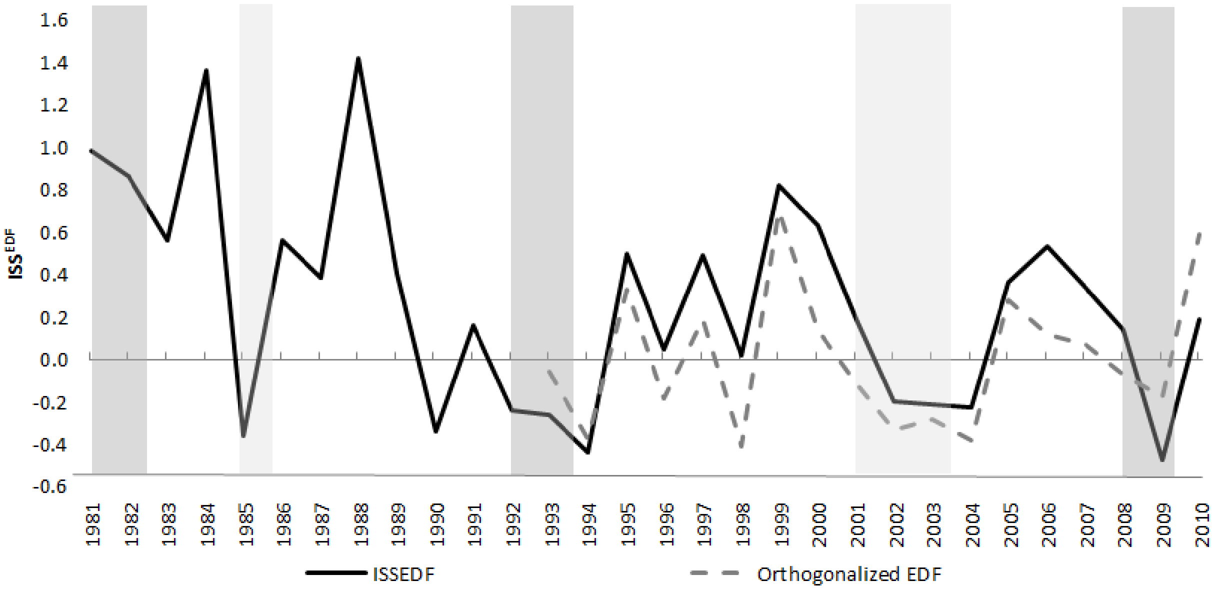
[9] $ISS^{EDF} = \frac{\sum_{i\epsilon\ High\ debt\ issuers} EDF_{i,t}}{N_t^{High\ debt\ issuers}} - \frac{\sum_{i\epsilon\ Low\ debt\ issuers} EDF_{i,t}}{N_t^{Low\ debt\ issuers}}$ where *EDF* is calculated as following the methodology of Bharath and Shumway (2008). The methodology is explained thoroughly in Section 4.1.

[10] Centre for Economic Policy Research, a registered charity founded in 1983

business cycle predictors do not perfectly fit to external capital analysis. Orthogonalized ISS^{EDF} is based on the output gap recorded by OECD.[11]

Figure 2 Annually measured characteristic spread for issuer quality

This Figure shows the variation in annually measured characteristic spread for issuer quality, denoted by ISS^{EDF}. ISS^{EDF} compares the average default probability of high net debt issuers with the default probability of low net debt issuers (top and bottom quintiles, respectively). *EDF* is the expected default frequency of Merton (1974). The dotted line shows a version of ISS^{EDF} that has been orthogonalized with respect to the output gap. Grey areas in the figure describe the European recession periods.



ISS^{EDF} has been high in the early and the late 1980s, 1999 - 2001 and again 2005-2008. On the other hand ISS^{EDF} has dropped sharply in 1984, 1989, 2001 and in 2009. ISS^{EDF} tends to be low on recessions and high in economic booms. It also appears that ISS^{EDF} reacts to smaller downturns which are not classified as recessions. For example in 1985 ISS^{EDF} dropped sharply. In that year the upward trend of world's economy lost some of its momentum because of the strengthened dollar. For example in Japan and Western Europe the increase in overall demand and production slowed down (World Economic Survey, United Nations, 1985). Period from 2001 to 2003 is not officially a recession period but according to CEPR during this period European industrial production fell and private investments declined. On the other hand government consumption in Europe rose by 2.2% and 2.7% in 2001 and 2002, respectively. In the late 2003

[11] Output gap is the difference between potential GDP and actual GDP or actual output. The calculation for the output gap is Y*–Y where Y* is actual output and Y is potential output.

European economy started to show weak signs of recovery and this can also be seen from the issuer characteristic spread which started to increase already in 2004. From the perspective of the European high yield bond markets, it is also evident that ISS^{EDF} has captured both high yield booms experienced in Europe. As shown in Figure 2, time series correspond closely to the historical accounts of credit cycle boom and busts. However, even though ISS^{EDF} generally follows economic cycles, the correlation is less than perfect and the lead-lag relationship varies over time.

6.2 The High Yield Share

A second quality measure used in this thesis is formed using the credit ratings assigned to new corporate bond issues. High yield share[12] is the principal amount of the high yield corporate bond issuances scaled by all public bond issuances.

Figure 3 plots both ISS^{EDF} and *HYS* to give a clear view from the variables. The time period is now shortened by almost ten years compared to the Figure 2, because of the lack of European high-yield bond market data before year 1998. As shown before, the high yield market did not start to develop rapidly in continental Europe until the euro currency was introduced to world financial markets as an accounting currency on 1st of January 1999. In Britain the first major speculative grade bond issues were made during the fiscal year 1998. High yield share in this study captures both euro and British pound denominated issuances.

Similar to ISS^{EDF}, *HYS* takes high values when the issuer quality is poor. The series plots well two previous high yield booms in Europe. It is noteworthy that between these booms the high-yield credit issuance market was practically dead and this period characterized by the lack of new speculative grade issuances repeated itself again in 2009. It seems that on both times high yield share has reached its peak approximately one year earlier than ISS^{EDF}. This phenomenon can be explained so that the bond market is more prone to negative market signals compared to the bank lending channels. In a market situation where the high yield market issuances do not find investor demand, banks still might be willing to finance lower quality companies. The correlation between annual ISS^{EDF} and *HYS* is 40.8%.

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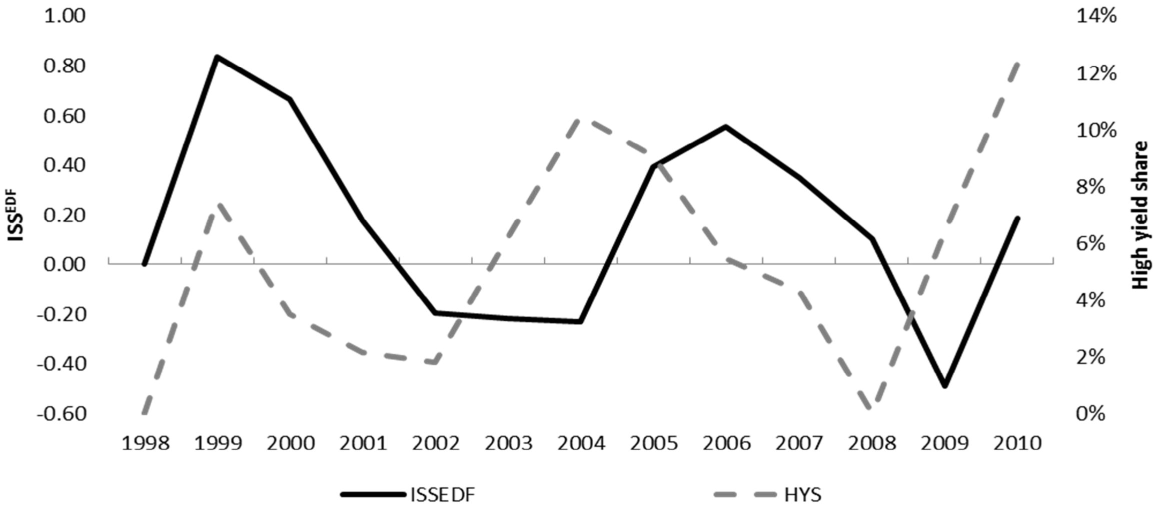
[12] $HYS_t = \frac{\sum_{High\ yield} B_{i,t}}{\sum_{High\ yield} B_{i,t} + \sum_{InvGrade} B_{i,t}}$, where $B_{i,t}$ denotes the principal amount of bond issued in year *t*.

Figure 3 Annually measured ISS^{EDF} and *HYS*

This Figure plots the high yield share on new corporate bond issues on the right scale and for a comparison, ISS^{EDF} on the left scale. ISS^{EDF} compares the average default probability of high net debt issuers with the default probability of low net debt issuers. *HYS* is the fraction of non-financial corporate bond issues with a high yield rating obtained primary from Moody's. If Moody's rating has not been available, S&P rating is used.



Both *HYS* and ISS^{EDF} capture the quality fluctuations in the credit markets but the advantage of *HYS* is its simplicity. However, *HYS* captures only bond issues and omits loan issues totally while ISS^{EDF} includes both loan and bond market financing. In European framework this should make a significant difference because traditionally European companies have related heavily on bank financing. For example in late 1990s, 80% of external debt financing issued by German companies was bank loans (Zingales, 2003). Furthermore, if loan and bond markets were at least partially integrated components of the broader corporate credit markets, measures based on total debt issuance should be more informative about future bond returns. That assumption is supported at least by Becker and Ivashina (2010), who showed that firms substitute from loans to bonds at times characterized by tight lending standards, high levels of non-performing loans and loan allowances, low bank share prices and tight monetary policy. Finally, ISS^{EDF} holds the definition of the firm quality constant over time. *HYS* in contrast relies on the assumption that the meaning of the credit ratings has remained constant. For example Servaes and Tamayo (2010) argued that the agencies have become more conservative in assigning ratings since 1970s.

6.3 Univariate Forecasting Regressions

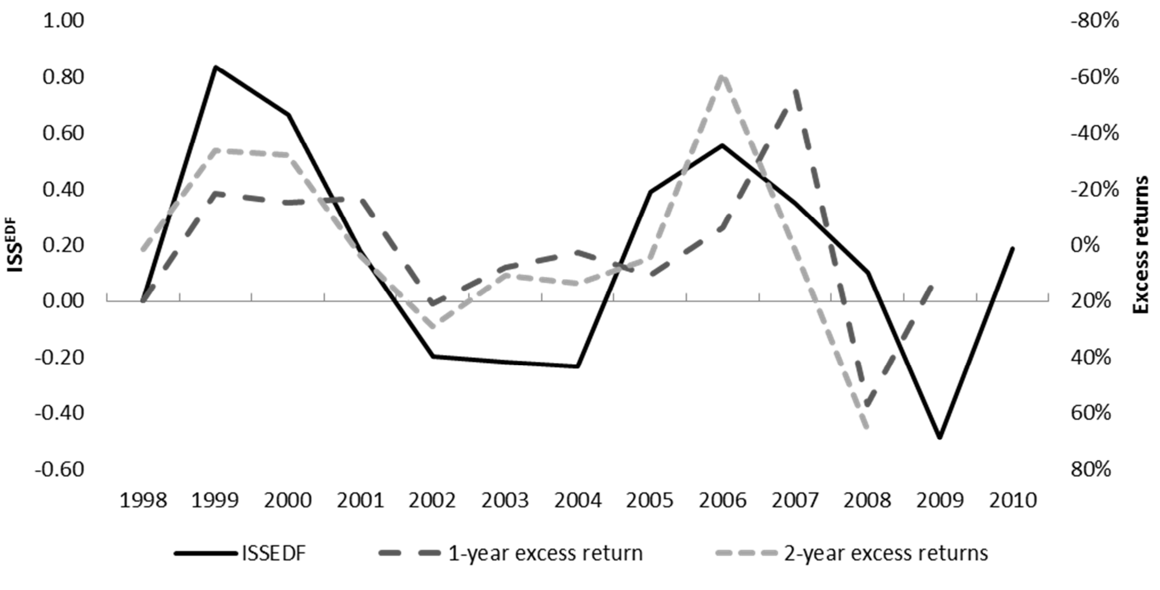
This section presents how well issuer quality can explain excess bond returns. The aim is to show that regardless of the issuer quality barometer used, periods of poor issuer quality are followed by low excess returns on corporate bonds. After that the methodology of Greenwood and Hanson (2011) is improved so that it better fits for the forecasting purposes. Finally, the results obtained by using the developed methodology are presented with the time-series controls.

6.3.1. Annual Data

Figure 4 shows one of the main results of this thesis. In short, it seems that periods of poor issuer quality are followed by low excess returns on corporate bonds. In Figure 4, annual ISS^{EDF} is plotted alongside with cumulative high yield excess returns over the following two years. Returns are plotted in reverse scale so the negative correlation between series appears positive visually. The correlation between ISS^{EDF} and 1-year excess high yield bond returns is -44% and for 2-year excess returns -68%. For 3-year excess returns the correlation decreases down to -19% and for longer time periods it practically disappears. Graphs for 3- and 4-year excess returns are not showed in Figure 4.

Figure 4 Issuer quality and subsequent 1- and 2-year high yield excess bond returns

This Figure plots issuer quality (left axis) alongside cumulative excess high yield bond returns at 1- and 2 year horizons (right axis). Returns are plotted in reverse scale. Issuer quality is measured with ISS^{EDF}. ISS^{EDF} is the difference between the average EDF quintile of high and low net debt issuers.



As shown, the correlation between ISS^{EDF} and high yield excess returns is significant at 1- and 2-year horizons. However, obtained results do not directly mean that issuer characteristic spread would be a good return forecasting tool. The problem is that methodology used by Greenwood and Hanson (2011) is inappropriate for real life forecasting in its original form. The reason for this is that value of ISS^{EDF} should be known for the on-going year already in the beginning of the year, even though the financial figures needed cannot be available until the end of the year.

In order to avoid this problem the issuer quality data is lagged in this study by one period. When using annual data this means that the issuer quality data from year *t* cannot be used before year *t+1*. The changed approach is presented in the equation (13). Lagging decreases the forecasting power of ISS^{EDF} significantly; the correlation between ISS^{EDF} and 1-year excess high yield bond returns is -28.6% and for 2-year excess returns the correlation is -19.9% compared to the previous -44% and -68%, respectively. From now on both ISS^{EDF} and *log(HYS)* are lagged if not otherwise mentioned. The reason for this is the previously mentioned forecasting ability.

$$rx_{t+k}^{HY} = a + b \times X_{t-1} + u_{t+k} \tag{13}$$

In equation (13) the issuer quality explains excess corporate bond returns. rx_{t+k}^{HY} denotes the cumulative 1-, 2-, 3- or 4-year excess returns on high yield bonds calculated in logarithmic form. X_{t-1} denotes either annual ISS^{EDF} or *log(HYS)*[13]. Both variables are lagged by one year. u_{t+k} is the error term.

Table 3 shows forecasting regressions of cumulative excess returns on quality measures. The top left regression in Panel A shows that ISS^{EDF} has the coefficient of determination, R^2, of 0.12 for high yield excess returns at a 1-year horizon. The coefficient of -0.26 implies that one standard deviation rise in ISS^{EDF} (0.38 quintiles) lowers excess high yield returns by 9.9% over the following year. When looking at the 2-year forecasting period, the R^2 declines from 0.12 to 0.04. Also coefficient decrease in magnitude.

[13]Following Greenwood and Hanson (2011) *log(HYS)* with both annual and quarterly data is used because it provides a good fit but qualitatively similar results to *HYS*. The problem with logarithmic *HYS* is that there are periods when the *HYS=0* and *Log(HYS)* cannot be calculated. For those periods *HYS* is set to be equal to the second smallest *HYS* value observed in the sample.

Table 3 Issuer quality and returns to corporate credit

This Table shows the univariate time-series forecasting regression of log excess returns on issuance quality ISS^{EDF} and on *log(HYS)* of the form $rx^{HY}_{t+k} = a + b \times X_{t-1} + u_{t+k}$. In Panel A, the dependent variable rx^{HY}_{t+k} is the cumulative 1-, 2-, 3, or 4-year excess return on high yield bonds calculated with Bank of America (BoFa) Merrill Lynch European Currency High Yield Bond - Index. In Panel B and C, the dependent variable is the cumulative 1-, 2-, 3, or 4-year excess return on BBB- and AAA- rated corporate bonds calculated with BoFa Merrill Lynch Emu Corporate non-financial BBB- and AAA- rated bond indexes, respectively. *X* denotes either annually measured ISS^{EDF} or *log(HYS*). u_{t+k} is the error term. *t*-statistics for k-period forecasting regressions are based on Newey-West (1987) estimator allowing for serial correlation up to k-lags.

	$X_{t-1} = ISS^{EDF\ (annual)}$ 1999-2010				$X_{t-1} = log(HYS)^{(annual)}$ 1999-2010			
	1-year	2-year	3-year	4-year	1-year	2-year	3-year	4-year
	Panel A: High Yield Excess Returns (rx^{HY})							
b	-0.26	-0.19	0.16	0.18	-0.29	-0.74	-0.78	-0.49
[t]	[-2.39]	[-1.79]	[0.91]	[1.72]	[-3.09]	[-3.03]	[-7.64]	[-3.40]
R^2	0.12	0.04	0.05	0.07	0.13	0.43	0.78	0.38
	Panel B: BBB Excess Returns (rx^{BBB})							
b	-0.05	-0.02	0.07	0.06	0.01	-0.05	-0.03	0.05
[t]	[-1.21]	[-0.54]	[1.26]	[0.98]	[0.31]	[-0.56]	[-0.39]	[0.65]
R^2	0.05	0.01	0.17	0.08	0.00	0.04	0.02	0.05
	Panel C: AAA Excess Returns (rx^{AAA})							
b	-0.01	-0.01	0.00	0.01	0.00	-0.01	-0.01	-0.01
[t]	[-0.74]	[-0.55]	[0.36]	[1.27]	[0.65]	[-0.41]	[-0.47]	[-0.46]
R^2	0.04	0.02	0.01	0.07	0.00	0.01	0.04	0.02

The reason for the low forecasting power lies on the lagged ISS^{EDF} values. If the data is not lagged, the explanatory power of ISS^{EDF} is concentrated in the first two years with some additional forecasting power at third year, but after that the forecasting power is ISS^{EDF} disappears.[14]

Moving down to Panel B and C, it is easy to see that the negative correlation between excess returns and ISS^{EDF} remain similar to the Panel A. The main finding of the left side of Panels B and C is that the higher the bonds are rated, the lower the forecasting power of ISS^{EDF} is. This pattern of coefficients is consistent with the model presented in section 3.1 in where the lower-rated bonds had a greater exposure to a common credit-related factor.

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[14] See Appendix 3

The right half of the Table 3 shows the regression results when the *log(HYS)* is used as an independent variable instead of ISS^{EDF}. Starting from the 1-year returns, the coefficient of -0.29 implies that one standard deviation rise (0.30 quintiles) in *log(HYS)* reduces high yield excess returns by -8.8%. However, on the contrary to ISS^{EDF}, the coefficient rises in magnitude when moving from 1- to 2-year forecasting horizon with some additional forecasting power at third year. It is also important to notice that the regression results from *log(HYS)* are statistically significant at the 1% level for the full 4-year forecasting horizon. After that the forecasting power of *log(HYS)* diminishes. The difference between ISS^{EDF} and *HYS* can also be seen from the Figure 2, where ISS^{EDF} and *log(HYS)* are plotted alongside; *Log(HYS)* generally leads ISS^{EDF} by 12-18 months. This can be interpreted so that the high yield market is already closed when riskier companies still are able to raise debt funding from banks. Now when both variables are lagged, the proactive nature of high yield share gives us a relatively better forecasting power to excess bond returns.

When moving down to Panel B and C, it is easy to see that the coefficients of *log(HYS)* remain generally negative also with BBB- and AAA-rated corporate bonds. Similar to the ISS^{EDF} the forecasting power of *HYS* decreases already when forecasting BBB-rated bond returns and remains insignificant thereafter.

Results presented in this section are analogical to those Greenwood and Hanson (2011) found by researching U.S corporates from 1962 to 2008. Greenwood and Hanson split their observation period to two subperiods, the latter starting from 1983. This division reflected the pre-high yield bond period and the period when the high yield bonds became liquid instruments. The predictive power of the results in this Section is similar when compared to the latter period in Greenwood and Hanson's paper. However, this requires that the lagging for ISS^{EDF} and *Log(HYS)* is ignored. Coefficients differ mainly because Greenwood and Hanson used deciles instead the quintiles. When taking also this difference into the account, the coefficients are almost identical. For example the ISS^{EDF} coefficient for 2-year excess high yield bond returns measured with deciles is -0.19 in this study, whereas Greenwood and Hanson reported a coefficient of -0.21. When lagging is taken into the consideration, the results start to differ significantly; ISS^{EDF} loses its statistical significance as excess bond returns predictor whereas *log(HYS)* remains a significant predictor.

6.3.2. Quarterly Data

The short time period studied in this thesis (1998-2011) decreases the statistical significance of the obtained results and brings problems like multicollinearity to the regressions when the annual data is used. This problem can be at least partially solved by using quarterly data which basically quadruples the amount of observations. This reduces the multicollinearity between explanatory variables and increases the statistical significance of the results.

Quarterly data is collected and computed analogically to annual data. For example equation (13) requires in its original form that all values in the equations should be annualized. The methodology presented in Chapter 4 can also be changed so that the raw quarterly financial and market data can be used but the increased volatility impairs the interpretation of the results. Therefore Merton's DD model applied in this study is constructed with annualized volatility and asset drifts.

Figure 5 Quarterly measured issuer quality and subsequent high yield bond returns

This Figure shows the quarterly measured issuer quality fluctuations alongside with 1-year excess high yield bond returns. Issuer quality is measured with *log(HYS)*. *Log(HYS)* is the log fraction of non-financial corporate bond issuance with a high yield rating obtained primary from Moody's. *Log(HYS)* is constructed using trailing 12-month high yield share data (left axis). Cumulative excess high yield bond returns for the following year are plotted in reverse scale (right axis).

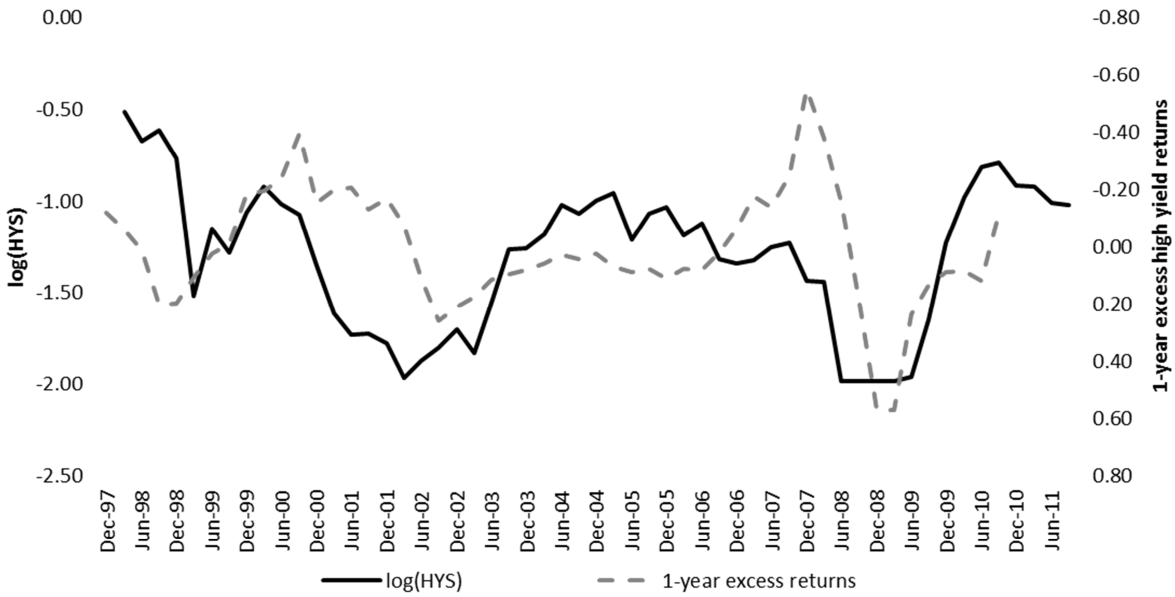

Figure 5 shows that the main results of this thesis are neutral to the data frequency used; periods of poor issuer quality are followed by low excess returns on corporate bonds also when the quarterly data is employed. *Log(HYS)* is shown as 12-months trailing average share of nominal high yield issuances. 1-year excess high yield bond returns are recorded cumulatively and plotted in reverse scale. The time period is shortened by two years compared to previous section where the annual data was used. The reason for this is that Thomson ONE Banker does not offer balance sheet data on quarterly bases exclusively before the end of year 2000. However, the magnitude of coefficients and the significance of results remain unchanged regardless of the time period used. Appendix 4 offers the requisite support for this argument.

Table 4 Quarterly measured issuer quality and returns to corporate credits

This Table presents the univariate time-series forecasting regression of log excess returns on quarterly measured issuer quality ISS^{EDF} and *log(HYS)* of the form $\boldsymbol{rx^{HY}_{t+k} = a + b \times X_{t-1} + u_{t+k}}$. In Panel A, the dependent variable $\boldsymbol{rx^{HY}_{t+k}}$ is the cumulative 1-, 2-, 3, or 4-year excess return on high yield bonds calculated with Bank of America (BoFa) Merrill Lynch European Currency High Yield Bond - Index. In Panel B and C, the dependent variable is the cumulative 1-, 2-, 3, or 4-year excess return on BBB- and AAA- rated corporate bonds calculated with BoFa Merrill Lynch Emu Corporate non-financial BBB- and AAA- rated bond indexes, respectively. *X* denotes either ISS^{EDF} or *log(HYS*) and $\boldsymbol{u_{t+k}}$ is the error term. *t*-statistics for k-period forecasting regressions are based on Newey-West (1987) estimator allowing for serial correlation up to k-lags.

	$X_{t-1} = ISS^{EDF}$ *(quarterly, annualized debt change)*				$X_{t-1} = log(HYS)$ *(quarterly, annualized debt change)*			
	1-year	2-year	3-year	4-year	1-year	2-year	3-year	4-year
	Panel A: High Yield Excess Returns (rx^{HY})							
b	-0.11	-0.19	-0.27	-0.20	-0.23	-0.38	-0.41	-0.56
[t]	[-1.90]	[-1.84]	[-3.14]	[-3.45]	[-1.76]	[-2.36]	[-2.93]	[-4.87]
R^2	0.07	0.12	0.43	0.23	0.15	0.25	0.38	0.64
	Panel B: BBB Excess Returns (rx^{BBB})							
b	-0.02	-0.03	-0.04	-0.02	-0.07	-0.10	-0.09	-0.10
[t]	[-1.49]	[-1.34]	[-1.86]	[-1.14]	[-1.94]	[-2.60]	[-2.97]	[-2.85]
R^2	0.03	0.06	0.22	0.05	0.19	0.26	0.32	0.40
	Panel C: AAA Excess Returns (rx^{AAA})							
b	0.00	-0.01	-0.02	-0.02	-0.01	-0.01	-0.01	-0.03
[t]	[-0.43]	[-0.70]	[-2.73]	[-3.92]	[-0.97]	[-0.70]	[-0.40]	[-3.37]
R^2	0.00	0.02	0.31	0.32	0.04	0.03	0.01	0.38

Table 4 presents the univariate time-series forecasting regression of log excess returns on quarterly measured issuer quality ISS^{EDF} and *log(HYS)*. When analysing the results it is easy to notice that Table 4 offers a slightly different conclusion compared to the results presented in Table 3. In Table 3 the annual ISS^{EDF} values lost their predictive power when ISS^{EDF} was lagged but the same does not apply to the results calculated with more frequent data. Quarterly measured

ISS^{EDF} offers more accurate view from the credit market conditions compared to the situation where the issuer quality deterioration can be noted only once a year. In addition all results showed in Panels A, B and C are in line with the reduced-form model presented in the third chapter. For example, the coefficients, i.e. the predictive power of issuer quality, decreases the higher rated the issuer companies are. The left half of the Panel A shows that the predictive power of ISS^{EDF} is concentrated on first three years. For example the second column in Panel A shows that ISS^{EDF} has an R^2 of 0.12 for high yield excess returns at a 2-year horizon. The coefficient of -0.19 implies that one standard deviation rise in ISS^{EDF} (0.46 quintiles) lowers excess high yield returns by 8.7% over the following two years.

The right half of the Table 4 shows the regression results when *log(HYS)* is used as the explanatory variable. The negative correlation between the excess returns and the high yield share remains throughout the panels. The coefficient of -0.38 in Panel A at a 2-year horizon implies that a one standard deviation rise in *log(HYS)* (0.38 quintiles) lowers excess high yield returns by 14.4% over the following two years. For a 3-year horizon the rise of one standard deviation in ISS^{EDF} and *log(HYS)* lowers future excess returns by 12.4% and 15.6%, respectively. Overall a consistent picture emerges whether the forecast is done by using quarterly measured ISS^{EDF} or *log(HYS)*. On the other hand it is clear that the annually measured ISS^{EDF} can only show the current credit conditions but is a poor predictor of future excess returns. The difference between annually and quarterly observed *log(HYS)* is smaller compared to the annually and quarterly observed ISS^{EDF} and the results obtained are more comparable with each other.

6.4 Multivariate Forecasting Regressions

The next step is to examine the incremental forecasting power of the results obtained by the univariate regressions. Following Greenwood and Hanson (2011) two sets of control variables are of interest. The first set tests whether issuer quality has any forecasting power beyond common proxies for ex-ante risk premium such as the term spread (Fama and French, 1989) or the short-term German Government Bond yield (modifying the results of Fama and Schwer, 1977). The second set of control variables tests in what extent results in Table 3 and 4 are driven by firms responding to mean reversion in credit spreads or excess returns. If companies were more willing to issue debt capital when the credit spreads are on low level, the findings presented in Tables 3 and 4 would be less useful for forecasting returns but still interesting from an economic point of view.

The question, whether the issuance can contain any incremental information about returns that is not contained in other observables, is crucial for this thesis. When assuming that companies and individual managers respond naively to the changes in credit spreads, the answer for the question is negative. However, as noted by Greenwood and Hanson (2011), spreads mean different things at different times. Basically there are two environments where spreads are high. They may be wide because expected default losses are high or because expected returns are high. And as Greenwood and Hanson (2011) argued, issuance may contain information beyond spreads if companies issue more when they perceive credit as being cheap (i.e. expected returns for investors are low). If this assumption holds, ISS^{EDF} and *log(HYS)* should remain their significant forecasting power especially in circumstances when the new economic boom is starting but interest rates are still at the low level.

6.4.1. Multicollinearity in Multivariate Forecasting Regressions

The usage of multivariate regressions together with cumulative time-series causes multicollinearity. For example issuer quality can be compared to the balance sheet items which, unlike income statement data, do not start from zero after each period. The same applies to the cumulative excess bond returns and the control variables like yields. The rolling nature of these variables combined to the short time period studied causes high correlation of explanatory variables, presented in Table 5.

Greenwood and Hanson (2011) grouped controlling explanatory variables basically into three different categories. The first group included the gap between long and short-term government bond yield plus the yield of short-term government bonds. The second group contained the credit spread of BBB-rated bonds and the risk free government bonds as well as the last twelve month (LTM) excess returns. The third group included macroeconomic variables. In this thesis the multicollinearity is a problem especially inside these groups, not between them. If the multicollinearity is ignored, the R^2 will be high but the individual variables themselves are not significant and get highly varying coefficients compared to the univariate regressions. This arises in the context of very closely related explanatory variables as a consequence of the difficulty in observing the individual contribution of each variable to the overall fit of the regression (Brooks, 2008). One solution for the multicollinearity is to drop all but one of the correlated variables or change them to a ratio. The dropping would decrease the comparability of the results to the previous studies and hence there is a strong theoretical reasoning for including correlated variables in the model.

Table 5 Correlation matrix for control variables

This Table shows the correlations of explanatory controlling variables: $y^G_{L,t}$ -$y^G_{S,t}$ is the spread between the 10-year and 2-year German Government Bonds, $y^G_{S,t}$ is the 2-year German Government Bond yield, $y^{BBB}_{5y,t}$ -$y^G_{5y,t}$ is the credit spread between BBB-bond index and 5-year German Government Bonds. rx^{HY} is the one year lagged high yield bond excess returns. Rest of the variables are macroeconomic control variables. These variables include the output gap that is the difference between potential and actual gross domestic product, unemployment growth, industry production growth, individual consumption growth and the recession dummy.

	$y^G_{L,t}$-$y^G_{S,t}$	$y^G_{S,t}$	$y^{BBB}_{5y,t}$-$y^G_{5y,t}$	rx^{HY}_t	Output gap	Un-employment growth	Industry production growth	Individual consumption growth	Recession dummy
$y^G_{L,t}$-$y^G_{S,t}$	1.00	-	-	-	-	-	-	-	-
$y^G_{S,t}$	-0.79	1.00	-	-	-	-	-	-	-
$y^{BBB}_{5y,t}$-$y^G_{5y,t}$	0.17	-0.20	1.00	-	-	-	-	-	-
rx^{HY}_t	0.26	-0.32	-0.64	1.00	-	-	-	-	-
Output gap	-0.75	0.89	-0.20	-0.37	1.00	-	-	-	-
Unemployment growth	0.71	-0.73	0.40	0.10	-0.81	1.00	-	-	-
Industry production growth	-0.37	0.36	-0.68	0.42	0.41	-0.70	1.00	-	-
Individual consumption growth	-0.53	0.63	-0.52	0.03	0.74	-0.88	0.80	1.00	-
Recession dummy	0.11	-0.14	0.62	-0.44	-0.15	0.37	-0.59	-0.37	1.00

The problem with the closely related explanatory variables is solved in this thesis as follows. First term spread ($y^G_{L,t}$ -$y^G_{S,t}$) and the short-term German Government Bond yield ($y^G_{S,t}$) are grouped together by employing the Principal Component Analysis (from now on PCA). Secondly the credit spread of BBB-rated and the risk-free Government Bonds ($y^{BBB}_{5y,t}$ -$y^G_{5y,t}$) and the last twelve month (LTM) excess returns (rx^{HY}) are grouped together. BBB-rated bond index used in this study has historically had a maturity of five years.[15] Therefore also the controlling German

[15] BoFa Merrill Lynch Emu Corporate non-financial BBB-rated bond index

Government Bond has the same maturity. The third PCA-component is formed from the macro-economic variables. Macro-economic variables include unemployment growth, industry production growth, individual consumption growth and the recession dummy. Following Greenwood and Hanson (2011), the output gap is kept separately.

The rationale to use the PCA-component is clear; multicollinearity inside groups is significant and in all cases the PCA-component explains clearly over 80% control variables' total variation. While the PCA-component reduces the multicollinearity in the sample, the high explanatory power of variables inside the each PCA-component enables the interpretation of PCA-component coefficients. The PCA-components are calculated by using the normalized loadings.

6.4.2. Multivariate Regression Results

Table 6 shows the return forecasting regression of the form:

$$rx_{t+k}^{HY} = a + b \times X_{t-1} + c \times \left[\left(y_{L,t}^{G} - y_{S,t}^{G}\right) + y_{S,t}^{G}\right] + d \times \left[\left(y_{5y,t}^{BBB} - y_{5y,t}^{G}\right) + rx_{t}^{HY}\right] + u_{t+k} \quad (14)$$

where rx_{t+k}^{HY} denotes 1-, 2-, 3- or 4-year cumulative excess returns on high yield bonds and X_{t-1} denotes either ISS^{EDF} or *log(HYS)*. Term spread and short-term German Government Bond yields are grouped into one principal component denoted by $\left[\left(y_{L,t}^{G} - y_{S,t}^{G}\right) + y_{S,t}^{G}\right]$. Credit spread and LTM excess high yield bond returns form another principal component denoted by $\left[\left(y_{5y,t}^{BBB} - y_{5y,t}^{G}\right) + rx_{t}^{HY}\right]$. In equation (14) letters (*a*-*d*) denotes the coefficients. u_{t+k} is the error term.

Table 6 shows the results derived from the quarterly data. In Panel A the X_{t-1} is the quarterly measured *log(HYS)* and in Panel B quarterly measured ISS^{EDF}. In general, controlling the term spread, short-term German Government Bond yield, credit spread and lagged excess returns has significant impact on the coefficient on ISS^{EDF} and *log(HYS)* at 1- and 2- year horizons but for longer periods the significance of control variables diminishes. For example in the univariate forecasting regression the slope of coefficient for 2-year *log(HYS)* is -0.38 and when thee both PCA-components are added the coefficient becomes insignificant and positive.

Table 6 Multivariate forecasting regressions

This Table shows the time-series forecasting regression of log excess returns on high-yield bonds on measures of debt issuer quality with and without time-series controls of the form: $rx_{t+k}^{HY} = a + b \times X_{t-1} + c \times \left[\left(y_{L,t}^{G} - y_{S,t}^{G}\right) + y_{S,t}^{G}\right] + d \times \left[\left(y_{5y,t}^{BBB} - y_{5y,t}^{G}\right) + rx_{t}^{HY}\right] + u_{t+k}$ where rx_{t+k}^{HY} denotes 1-, 2-, 3- or 4-year cumulative excess returns on high yield bonds. In panel A X_{t-1} denotes quarterly measured *log(HYS)* from 2001 to 2011 and in Panel B X_{t-1} denotes quarterly measured ISS^{EDF} from 2001 to 2011. Term spread and short-term German Government Bond yields are grouped into one principal component denoted by $\left[\left(y_{L,t}^{G} - y_{S,t}^{G}\right) + y_{S,t}^{G}\right]$. Credit spread and LTM excess high yield bond returns form another principal component denoted by $\left[\left(y_{5y,t}^{BBB} - y_{5y,t}^{G}\right) + rx_{t}^{HY}\right]$. u_{t+k} is the error term. *t*-statistics for *k*-period forecasting regressions are based on Newey-West (1987) standard errors allowing for serial correlation up to *k*-lags.

	1-year returns				2-year returns				3-year returns				4-year returns			
Panel A: X_{t-1}=log(HYS)$^{\text{(quarterly, annualized debt change)}}$																
log(HYS)	-0.23	-0.19	-0.19	-0.09	-0.38	-0.24	-0.09	0.15	-0.41	-0.40	-0.45	-0.33	-0.56	-0.56	-0.66	-0.66
	[-1.76]	[-1.76]	[-1.56]	[-0.79]	[-2.36]	[-2.11]	[-0.58]	[1.23]	[-2.93]	[-3.44]	[-2.72]	[-2.30]	[-4.87]	[-4.64]	[-4.75]	[-4.41]
$[y^{G}_{L,t} - y^{G}_{S,t} + y^{G}_{S,t}]$		-0.08		-0.09		-0.12		-0.14		-0.07		-0.08		0.00		0.00
		[-3.59]		[-0.79]		[-2.95]		[-4.46]		[-2.48]		[-2.88]		[-0.12]		[0.22]
$[y^{BBB}_{5y,t} - y^{G}_{5y,t} + rx^{HY}_{t}]$			0.02	0.04			0.10	0.13			-0.02	0.03			-0.04	-0.05
			[0.37]	[1.60]			[2.23]	[4.74]			[-0.41]	[0.82]			[-2.17]	[-1.83]
R^2	0.15	0.42	0.16	0.46	0.25	0.52	0.39	0.75	0.38	0.51	0.38	0.52	0.64	0.64	0.65	0.65
Panel B: X_{t-1}=$ISS^{\text{EDF(quarterly,annualized debt change)}}$																
ISS^{EDF}	-0.11	0.03	-0.13	0.00	-0.19	0.00	-0.20	-0.05	-0.27	-0.30	-0.27	-0.24	-0.20	-0.33	-0.14	-0.23
	[-1.90]	[0.31]	[-2.17]	[0.08]	[-1.84]	[0.07]	[-2.41]	[-0.91]	[-3.14]	[-2.60]	[-3.24]	[-1.97]	[-3.45]	[-4.17]	[-2.22]	[-2.20]
$[y^{G}_{L,t} - y^{G}_{S,t} + y^{G}_{S,t}]$		-0.09		-0.08		-0.14		-0.10		0.02		-0.02		0.09		0.05
		[-2.08]		[-2.48]		[-2.85]		[-2.92]		[0.53]		[-0.47]		[2.19]		[1.20]
$[y^{BBB}_{5y,t} - y^{G}_{5y,t} + rx^{HY}_{t}]$			0.07	0.07			0.13	0.12			0.10	0.11			0.15	0.12
			[2.32]	[3.28]			[5.39]	[8.07]			[3.30]	[4.21]			[3.64]	[2.70]
R^2	0.07	0.30	0.30	0.50	0.12	0.42	0.62	0.79	0.43	0.39	0.60	0.61	0.23	0.34	0.42	0.46

Simultaneously coefficient in univariate and multivariate regressions are -0.41 and -0.33 at a 3-year horizon, respectively. Moving down to Panel B, the quarterly measured ISS^{EDF} is regressed with control variables. Analogically to Panel A, at 1- and 2- year horizon the significance of ISS^{EDF} disappears. At 3- and 4-year horizons controls have only a little impact on the coefficients and to their significance.

To summarize, results presented in this section are twofold. First issuer quality does not have a significant forecasting power beyond common proxies for ex-ante risk premium at 1- and 2-year horizons. On the other hand proxies for ex-ante risk premium lose their significance at 3- and 4-year horizons. Observed results differ slightly from those of Greenwood and Hanson (2011). Their results remained significant also at 1- and 2-year horizons when they studied the hold time period from 1962 to 2008. However, issuer quality lost its predictive power at a 1-year horizon also in Greenwood and Hanson’s paper when the observation period was shortened to 25 years (1983- 2008).

6.5 Quantity and Quality of Debt Issuances

This section shows the relationship between the aggregate corporate credit growth, the quality of debt issuances and excess high yield bond returns. As discussed in Section 3.1, there should be a negative relationship between the quality of debt issuances and the aggregate corporate credit growth. In practise this means that the issuer quality should deteriorate when the aggregate lending grows. This section shows that while the aggregate credit growth has some excess return forecasting power compared to ISS^{EDF}, the variation in issuer quality still is a defining feature of credit cycle.

Figure 6 reveals the high correlation between quantity and quality; the correlation between issuer quality and aggregate debt growth is 59% in 1981-2011. The correlation has also increased over time, being 53% in 1981-1997 and as high as 89% in 1998-2011.[16] This raises a question whether issuer quality contains any information over and above the quantity of borrowing. In order to answer this question this section compares the forecasting power of issuer quality to aggregate

[16] Aggregate credit growth is also calculated by using the non-financial corporate debt growth data offered by European Central Bank. The data is reported from the year 1999 onwards. The correlation between ISS^{EDF} and aggregate debt growth in this case is 0.74% from 1998 to 2011.

credit growth. Sample firms are also grouped into five groups parallel to quintiles used in ISS^{EDF} compilation (denoted from $\Delta D_1/ D_1$ to $\Delta D_5/ D_5$). Following Greenwood and Hanson (2011) the assumption is that the debt growth amongst the low quality firms contains the most valuable information about future corporate bond returns.

Figure 6 Issuer quality and credit growth

This Figure plots annually measured ISS^{EDF} from year 1981 on the left axis. The aggregate sample credit growth (dashed line, dark grey) and the aggregate credit growth in Europe reported by ECB from year 1999 onwards (dashed line, light grey) are presented on the right axis. Issuer quality, ISS^{EDF}, is the difference between the average EDF quintile of high and low net debt issuers.

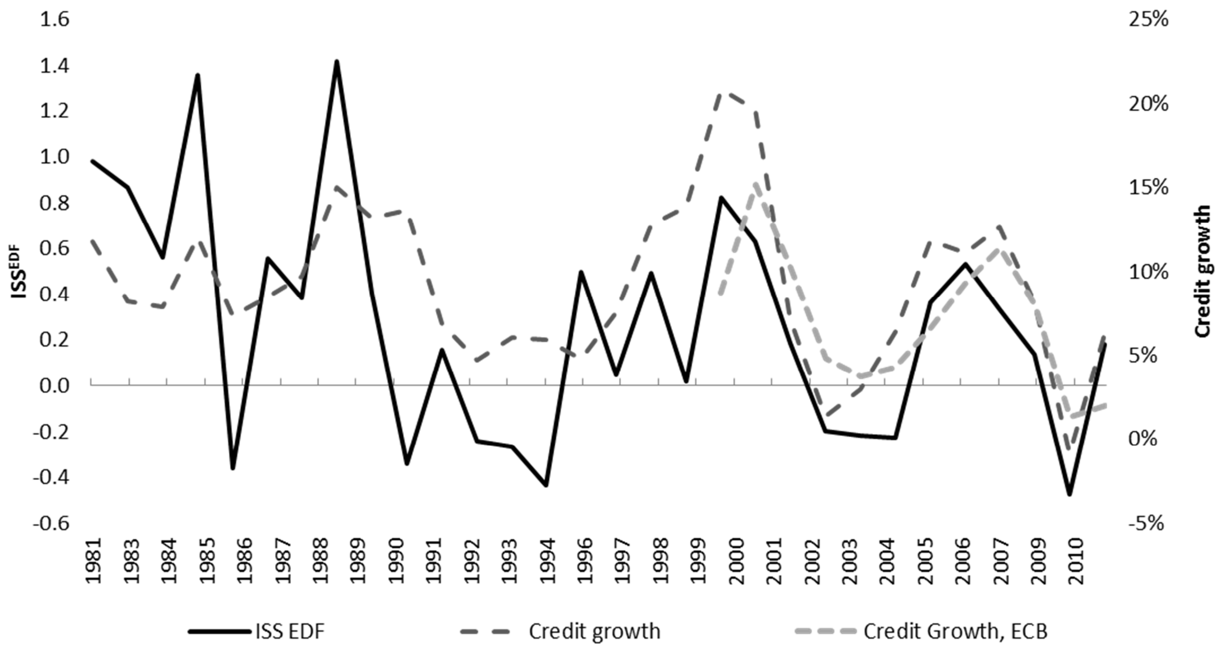

Table 7 shows the forecasting regression of cumulative 3-year high yield excess returns without and with controls in Panel A and B, respectively. The first three columns compare the forecasting power of aggregate debt growth and quarterly measured ISS^{EDF}. Greenwood and Hanson (2011) found that ISS^{EDF} forecast returns over and above the aggregate credit growth and figures in Table 7 support their observations; the forecasting power of quarterly measured ISS^{EDF} remains significant when regressed with aggregate debt growth. Also quarterly measured high yield share outperforms aggregate debt growth with and without controls. Actually *log(HYS)* is less affected by aggregate debt growth compared to ISS^{EDF}. Results for the high yield share are presented in Appendix 5.

Table 7 Quantity, quality and future returns to credit

This Table shows the forecasting power of quantity and quality to future returns on credit. Quarterly measured trailing 12-month univariate regression is of the form: $\boldsymbol{rx^{HY}_{t+k} = a + b \times X_{t-1} + u_{t+k}}$ and time-series controlled multivariate regressions is of the form: $\boldsymbol{rx^{HY}_{t+3} = a + b \times X_{t-1} + c \times \left[\left(y^G_{L,t} - y^G_{S,t}\right) + y^G_{S,t}\right] + d \times \left[\left(y^{BBB}_{5y,t} - y^G_{5y,t}\right) + rx^{HY}_t\right] + u_{t+3}}$. $\boldsymbol{rx^{HY}_{t+3}}$ denotes the cumulative 3-year excess return on high yield bonds and X_{t-1} stands for quarterly measured ISS^{EDF}. Term spread and short-term German Government Bond yields are grouped into one principal component denoted by $\boldsymbol{\left[\left(y^G_{L,t} - y^G_{S,t}\right) + y^G_{S,t}\right]}$. Credit spread and LTM excess high yield bond returns form another principal component denoted by $\boldsymbol{\left[\left(y^{BBB}_{5y,t} - y^G_{5y,t}\right) + rx^{HY}_t\right]}$. $\boldsymbol{u_{t+k}}$ is the error term. $\Delta D_{Agg}/D_{Agg}$ is the annual percentage change in total debt for companies and $\Delta D_k/D_k$ denotes the aggregate debt growth of quintiles. Panel A shows regressions without and Panel B with principal component controls. *t*-statistics are based on Newey-West (1987) autocorrelation up to k-lags.

Panel A: Univariate

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Issuer Quality	ISS^{EDF}	-0.27		-0.28								
		[-3.14]		[-2.08]								
Agg. Debt growth	$\Delta D_{Agg}/D_{Agg}$		-0.10	0.00								
			[-2.18]	[0.05]								
Low EDF	$\Delta D_1/D_1$				-0.09					-0.02		-0.11
					[-2.31]					[-0.02]		[-2.51]
2	$\Delta D_2/D_2$					-0.12						
						[-2.26]						
3	$\Delta D_3/D_3$						-0.10					
							[-2.52]					
4	$\Delta D_4/D_4$							-0.10				
								[-1.83]				
High EDF	$\Delta D_5/D_5$								-0.11	-0.11		
									[-2.59]	[-1.58]		
High-Low	$\Delta D_5/D_5$ - $\Delta D_1/D_1$										-0.06	-0.11
											[-1.00]	[-1.58]
	R^2	0.43	0.24	0.43	0.18	0.33	0.22	0.24	0.29	0.29	0.04	0.29

Panel B: Multivariate

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Issuer Quality	ISS^{EDF}	-0.24		-0.20								
		[-1.97]		[-1.54]								
Agg. Debt growth	$\Delta D_{Agg}/D_{Agg}$		-0.05	-0.05								
			[-1.23]	[-0.56]								
Low EDF	$\Delta D_1/D_1$				-0.05					-0.06		-0.08
					[-1.57]					[-1.28]		[-1.49]
2	$\Delta D_2/D_2$					-0.09						
						[-1.70]						
3	$\Delta D_3/D_3$						-0.02					
							[-0.86]					
4	$\Delta D_4/D_4$							-0.07				
								[-1.20]				
High EDF	$\Delta D_5/D_5$								-0.06	-0.02		
									[-1.41]	[-0.39]		
High-Low	$\Delta D_5/D_5$ - $\Delta D_1/D_1$										0.04	-0.02
											[0.78]	[-0.39]
	R^2	0.61	0.49	0.61	0.53	0.55	0.46	0.49	0.50	0.53	0.47	0.53

Column (1) in Panel A shows the baseline results for the quarterly measured ISS^{EDF} at a 3-year horizon. Column (2) shows that the aggregate corporate credit growth has a negative relationship with excess high yield corporate bond returns. The result is significant at the 5% level (two-sided critical value). The aggregate credit growth, however, is less significant 3-year excess bond return predictor than ISS^{EDF}. This can be seen by analysing the column (3). The relationship remains unchanged when time-series variables are controlled in Panel B.

Columns (4)-(8) in Table 7 compare the forecasting power of debt growth for firms in *EDF* quintiles from 1 to 5. To preserve the comparison across columns each series is standardized to have mean zero and standard deviation one. Columns (4)-(8) shows that while the higher quintiles have better forecasting power to high yield excess bond returns on average, the relationship is not fully linear; the second quintile has the highest forecasting power. In addition the differences between coefficients are small. For example one standard deviation rise in $\Delta D_1 / D_1$ lowers return by 9% over the next 3-year horizon whereas one standard deviation rise in $\Delta D_5 / D_5$ lowers the returns only by 11%. The conclusion is that the actual debt growth of low and high net debt issuers is not a dominant feature of the credit cycle but the characteristic spread between these two groups is.

Column (9) in Table 7 shows how well low and high quality firms jointly forecast credit returns. In both Panels A (without the time-series controls) and B (with the time-series controls) results from this regression are insignificant. Parallel way to measure issuer quality is to compare the difference of $\Delta D_5 / D_5$ and $\Delta D_1 / D_1$ done in column (10). This approach is corresponds to $d_{H,t} - d_{L,t}$ in equation (7). The difference is that ISS^{EDF} compares the expected default frequencies of high and low debt issuance firms whereas $\Delta D_5 / D_5$ - $\Delta D_1 / D_1$ compares the debt growth of high and low *EDF* firms. As seen from the column (10), $\Delta D_5 / D_5$ - $\Delta D_1 / D_1$ negatively forecasts future returns and this remains true even after controlling for debt growth at high quality firms in column (11) in Panel A. However, the statistical significance of the results is low and the negative relationship disappears when the time-series controls are added to the regression in Panel B.

Columns (1)-(3) in Panel B show that ISS^{EDF} remains significant in relation to aggregate debt growth even after the time-series controls are added. On the other hand, the aggregate debt growth and subsequently quintiles on the columns (4)-(11) lose their statistical significance. This means that the debt growth of aggregate companies does not forecast excess bond returns over and above traditional proxies for risk premium. Findings in Panel B further verify the results obtained in Panel A: aggregate debt growth has only a little forecasting power when regressed with ISS^{EDF}. Further it seems that only the characteristic spread between high and low net debt issuers forecast bond returns with the high accuracy, not the actual debt growth of these two groups.

6.6 Robustness Checks

This section tests the robustness of the results reported earlier in this chapter. First the obtained results in Sections 6.3 and 6.4 are tested with macro variables and equity returns for both ISS^{EDF} and *log(HYS)*. After that several variations of issuer characteristic spread are constructed to test the sensitivity of the results to the different measures of issuer quality.

6.6.1. Macro Controls and Equity Returns

Table 8 shows the robustness specifications for both ISS^{EDF} in Panel A and *log(HYS)* in Panel B with and without the usual time series controls. Time-series controls are in the principal component form and constructed as described in Section 6.4.1.[17]

Following Greenwood and Hanson (2011) number of additional control variables are added to the baseline forecast returns. The first control variable is the output gap, reported by OECD (2011). The output gap is the difference between potential and actual gross domestic product. The output gap does not have a significant forecasting power over ISS^{EDF} or *log(HYS)*. When regressed with multivariate equation, output gap even strengthens the baseline results. Secondly the baseline results are regressed with the current high yield default rates reported by Moody's (Moody's Investors Service, 2011). Both ISS^{EDF} and *log(HYS)* are affected by the trailing 12-month default rates in some extent but maintain their statistical significance.

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[17] Term spread ($y^{G}_{L,t}$ -$y^{G}_{S,t}$) and the short term German Government Bond yield ($y^{G}_{S,t}$) are grouped together into one PCA-component. Further, Credit spread of BBB-rated and the risk-free Government Bonds ($y^{BBB}_{5y,t}$ -$y^{G}_{5y,t}$) and the last twelve month (LTM) excess returns (rx^{HY}) are grouped to another PCA-component.

Table 8 Robustness of the issuer quality metrics

This Table shows the robustness of the results presented earlier in Chapter 6. For univariate regressions the results are obtained by using the following regression: $\boldsymbol{rx^{HY}_{t+k} = a + b \times X_{t-1} + u_{t+k}}$ and for multivariate regressions by using the following regression: $\boldsymbol{rx^{HY}_{t+3} = a + b \times X_{t-1} + c \times \left[\left(y^{G}_{L,t} - y^{G}_{S,t}\right) + y^{G}_{S,t}\right] + d \times \left[\left(y^{BBB}_{5y,t} - y^{G}_{5y,t}\right) + rx^{HY}_{t}\right] + u_{t+3}}$. The dependent variable $\boldsymbol{rx^{HY}_{t+3}}$ is the 3-year cumulative excess log return on high yield bonds. In Panel A $\boldsymbol{X_{t-1}}$denotes ISS^{EDF} and in Panel B, $\boldsymbol{X_{t-1}}$ denotes *log(HYS*). Term spread and short-term German Government Bond yields are grouped into one principal component denoted by$\boldsymbol{\left[\left(y^{G}_{L,t} - y^{G}_{S,t}\right) + y^{G}_{S,t}\right]}$. Credit spread between BBB-rated and risk-free bond yield plus LTM excess high yield bond returns form another principal component denoted by $\boldsymbol{\left[\left(y^{BBB}_{5y,t} - y^{G}_{5y,t}\right) + rx^{HY}_{t}\right]}$. $\boldsymbol{u_{t+k}}$ is the error term. Additional controls include *Output gap* that is the difference between potential and actual gross domestic product, past *High yield bond default* rates and *Macro-economic variables* that are grouped into one PCA-component including trailing twelve month unemployment growth, industrial production growth, individual consumption growth and the recession dummy. *All variables* include all control additional controls. *Concurrent equity returns* and *Concurrent equity return volatility* are based on weighted market movements of the sample companies. *t*-statistics are based on Newey-West (1987) autocorrelation up to k-lags.

Panel A: $X_{t-1} = ISS^{EDF\ (quarterly,\ annualized\ debt\ change)}$						
	Univariate			With time-series controls		
	b	[t]	R^2	b	[t]	R^2
<u>Baseline results</u>	-0.27	[-3.14]	0.43	-0.24	[-1.97]	0.61
<u>Additional Controls:</u>						
Output Gap	-0.30	[-2.87]	0.44	-0.21	[-2.03]	0.63
High Yield Default rates	-0.19	[-1.93]	0.47	-0.25	[-1.54]	0.61
Macro-economic Variables	-0.19	[-1.95]	0.51	-0.24	[-1.95]	0.61
All Variables	-0.14	[-1.30]	0.53	-0.24	[-1.49]	0.61
Lags of Variables	-0.17	[-1.28]	0.47	-0.22	[-1.46]	0.61
<u>Link to Equity Markets</u>						
Concurrent Equity Returns	-0.36	[-2.67]	0.47	-0.27	[-1.89]	0.63
Concurrent lagged Equity Returns	-0.36	[-3.02]	0.50	-0.25	[-1.95]	0.63
Concurrent Euity Return Volatility	-0.17	[-1.30]	0.46	-0.23	[-1.45]	0.61
Concurrent lagged Returns Volatility	-0.18	[-1.68]	0.46	-0.20	[-1.56]	0.62
Panel B: $X_{t-1} = log(HYS)^{(quarterly,\ annualized\ debt\ change)}$						
<u>Baseline result</u>	-0.41	[-2.93]	0.38	-0.33	[-2.30]	0.52
<u>Additional Controls:</u>				Macro-economic		variables
Output Gap	-0.42	[-3.29]	0.44	-0.33	[-2.32]	0.52
High Yield Default rates	-0.27	[-1.54]	0.40	-0.31	[-1.96]	0.52
Macro-economic Variables	-0.29	[-2.30]	0.50	-0.28	[-1.70]	0.54
All Variables	-0.21	[-1.46]	0.51	-0.23	[-1.15]	0.54
Lags of Variables	-0.23	[-1.78]	0.47	-0.20	[-0.88]	0.53
<u>Link to Equity Markets</u>	on third row in Table 8 contain trailing twelve month					
Concurrent Equity Returns	-0.40	[-3.08]	0.45	-0.42	[-1.43]	0.53
Concurrent lagged Equity Returns	-0.44	[-3.47]	0.45	-0.34	[-1.61]	0.52
Concurrent Euity Return Volatility	-0.36	[-2.09]	0.38	-0.42	[-2.79]	0.53
Concurrent lagged Returns Volatility	-0.33	[-2.22]	0.40	-0.36	[-2.62]	0.52

unemployment growth, industrial production growth, individual consumption growth and the recession dummy. These variables are grouped as one PCA-component in order to avoid multicollinearity in the sample. The data is from the ECB database[18] and contains the weighted average figures for 17 Euro countries. The last two columns specify the results where all control variables are regressed together with the baseline results. On fourth row the variables are regressed without lagging. Fifth row presents the results where all variables are lagged by one period. Both *log(HYS)*and ISS^{EDF} are more heavily affected than before but still correlate negatively with the excess bond returns.

"Link to Equity Markets" parts of the Table 8 compare equity returns and return volatility to the obtained baseline regressions. As seen, neither ISS^{EDF} nor *log(HYS)* is affected by the 12-month trailing volatility of equity returns or the actual trailing cumulative returns. This supports the view that the credit cycle differs somewhat from the actual business cycle.

When comparing the obtained results to the previous literature, the differences are clear. Greenwood and Hanson (2011) reported robust results even after controlling ISS^{EDF} and *log(HYS)* with all above mentioned variables. In addition they found that neither the consumption wealth ratio developed by Ludvigson and Ng (2001) nor the linear combination of forward interest rates of Cochrane and Piazzesi (2005), has impact on the estimated coefficients on ISS^{EDF}. While the findings of this thesis are robust when regressed with equity returns, the statistical significance of the results is in general affected when all control variables are included. In few cases the *t*-value drops down to 1.30 in univariate regressions which equals 20% level at two-sided *t*-test. However, in general obtained results in this section are significant at the 10% significance level.

6.6.2. Alternative Construction of $\mathbf{ISS^{EDF}}$

The next step is to test how different adjustments to the construction of ISS^{EDF} affect to the results obtained earlier. The high yield share is relatively simple quality measurement tool but the ISS^{EDF} is more subjective way to measure issuer quality. Therefore this section constructs different compilations for ISS^{EDF} and after that measures issuer quality with totally different techniques. Table 9 shows the main results of these tests.

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[18] http://sdw.ecb.europa.eu/

The first row in Table 9 shows the results for actual level of ISS^{EDF}. Original equation for ISS^{EDF} split the observations into the quintiles to eliminate the effect of outliers. It seems that the usage of quintiles also increases the statistical significance of the results because *t*-values for ISS^{EDF} are slightly higher compared to the actual levels of ISS^{EDF}. Second and third row in Table 9 show whether the maturity of debt issuances makes any difference at all.

Table 9 Alternative measures of issuer and credit quality

This Table analyses the different measures of issuer and credit quality. For univariate regressions the results are obtained by using the following regression: $rx_{t+k}^{HY} = a + b \times X_{t-1} + u_{t+k}$ and for time-series controlled multivariate regressions by using the following regression: $rx_{t+3}^{HY} = a + b \times X_{t-1} + c \times [(y_{L,t}^{G} - y_{S,t}^{G}) + y_{S,t}^{G}] + d \times [(y_{5y,t}^{BBB} - y_{5y,t}^{G}) + rx_{t}^{HY}] + u_{t+3}$. The dependent variable rx_{t+3}^{HY} is the 3-year cumulative excess log return on high yield bonds. X_{t-1} is a changing quality measure. Term spread and short-term German Government Bond yields are grouped into one principal component denoted by $[(y_{L,t}^{G} - y_{S,t}^{G}) + y_{S,t}^{G}]$. Credit spread between BBB-rated and risk-free bond yield plus LTM excess high yield bond returns form another principal component denoted by $[(y_{5y,t}^{BBB} - y_{5y,t}^{G}) + rx_{t}^{HY}]$. u_{t+k} is the error term. The upper part of Table shows alternative constructions for ISS^{EDF} and the lower part alternative measures of credit quality. Table reports the coefficient and t-statistic as well as the regression R^2. *t*-statistics are based on Newey-West (1987) autocorrelation up to k-lags.

	Univariate			With time-series controls		
	b	[t]	R^2	b	[t]	R^2
Baseline results	-0.27	[-3.14]	0.43	-0.24	[-1.97]	0.61
Alternative Constructions of ISS^{EDF}						
Level of EDF	-3.96	[2.81]	0.42	-2.85	[-1.67]	0.62
Long term Debt iss. EDF	-0.22	[-3.31]	0.36	-0.10	[-1.53]	0.49
Short-term Debt iss. EDF	-0.30	[-3.06]	0.28	-0.11	[-1.34]	0.47
Equity iss. EDF	-0.10	[-1.69]	0.09	0.02	[-0.37]	0.39
Market Cap Weighted EDF	-0.24	[-3.57]	0.33	-0.13	[-1.92]	0.51
EDF, decile	-0.12	[-3.40]	0.35	-0.06	[-1.57]	0.51
Alternative measures of Credit Quality						
Shumway Distress	-0.36	[-2.76]	0.31	-0.30	[-2.32]	0.62
Leverage (debt/Assets)	-0.21	[-2.57]	0.15	0.02	[0.43]	0.46
CAPM σ	-0.34	[-2.05]	0.20	-0.20	[-1.05]	0.50
Dividends (Non-payer – Payer)	-0.53	[-0.84]	0.04	0.01	[0.01]	0.45
Size log(MV), (Small – Big)	-0.02	[-0.09]	0.00	-0.11	[-0.97]	0.46
Age (young – old)	-0.27	[-2.35]	0.34	-0.13	[-1.20]	0.49

High yield excess returns are regressed with both long term and short-term liabilities growth but the basic conclusions remain unchanged: both long and short-term liability growth predict negatively excess bond returns at a 3-year horizon. The fourth row in Table 9 shows the characteristic spread of low and high net equity issuers. Changes in equity capital do not seem to have that strong predictive power than the debt issuances have. When the trailing 12-month debt changes are market cap weighted on the fifth row, the statistical significance of the results slightly rises in univariate regressions. Finally, following the methodology of Greenwood and Hanson (2011) companies are divided in deciles instead of quintiles. Therefore companies are divided quarterly to ten different categories instead of five categories (quintiles). Quintiles were used in this study primary because they offered better comparability with quantity measures used in Table 7. Regardless of the segmentation method applied, univariate regression results remain significant at the 1% significance level.

The lower part of the Table 9 classifies the alternative measures of credit quality and hence challenges ISS^{EDF}. First, opposed to *EDF*, Shumway's (2001) bankruptcy predictor is used. It seems that Shumway's model is also a strong predictor of returns. In a matter of fact it wins the horserace against ISS^{EDF}. Further, the existence of time-varying agency costs is tested on second row with the leverage. The assumption is that companies with higher leverage get debt financing easier when agency costs are low, i.e. during the economic booms. The assumption holds and results are significant in univariate regression. However, when regressed together with time-series control, leverage loses its predictive power. The third row tests the predictive power of residual's volatility from trailing 12-month market-model regression. Results suggest that CAPM-volatility can forecast future excess high yield bond returns. Results are analogical to the baseline results, even though the statistical significance deteriorates more when regressed with the time-series controls.

The fourth row in the lower part of the Table 9 tests the predictive power of dividends. The assumption is that non-dividend payers are riskier than dividend payers. The relationship between debt changes of non-dividend payers and excess bond returns is negative but significantly less significant than ISS^{EDF}. Finally the predictive power of company size and age are tested on the fifth and sixth rows. While both size and age have a negative relationship with future excess bond returns, only the age is statistically significant return predictor. It seems that even though smaller firms issue slightly more debt during credit booms, market cap weighted debt changes do not significantly improve the forecasting power of ISS^{EDF}. Thus, obtained results suggest that market cap weighting is not required when studying the issuer quality deterioration.

6.6.3. Bootstrapped Results

The accuracy of sample estimated in this thesis is tested with bootstrapping. Before the bootstrapping process, baseline results are compared with the results that are not adjusted with Newey-West (1987) standards errors. Table shows that the results remain basically unchanged for both *log(HYS)* and ISS^{EDF}. After that the regressions that are not Newey-West adjusted are bootstrapped using the resampling method and 1,000 bootstrap replications. As expected ISS^{EDF} is more unstable compared to *log(HYS)*.

Table 10 Bootstrapped p-values for quarterly measured ISSEDF and log(HYS)

This Table shows the bootstrapped univariate time-series forecasting regression of log excess returns on quarterly measured issuance quality ISS^{EDF} and *log(HYS)*. The equation used is of the form: $rx^{HY}_{t+k} = a + b \times X_{t-1} + u_{t+k}$ where rx^{HY}_{t+k} is the cumulative 1-, 2- or 3-year excess return on high yield bonds calculated with Bank of America (BoFa) Merrill Lynch European Currency High Yield Bond - Index. X_{t-1} denotes either ISS^{EDF} or *log(HYS)*. u_{t+k} is the error term. Controls include "*Rates*" (PCA-component for term spread and short-term risk-free bond yield), "*Credit*" (PCA-component for credit spread and past high yield bond returns) and "*All*" which includes both "*Credit*" and "*Rates*". *t*-statistics for k-period forecasting regressions are based on Newey-West (1987) estimator allowing for serial correlation up to k-lags.

	1-year returns: rx^{HY}_{t+1}				2-year returns: rx^{HY}_{t+2}				3-year returns: rx^{HY}_{t+3}			
Panel A: $ISS^{EDF(quarterly,annualized)}$												
[t] Newey-West (NW)	-0.11	0.03	-0.13	0.00	-0.19	0.01	-0.20	-0.05	-0.27	-0.30	-0.27	-0.24
	[-1.90]	[0.31]	[-2.17]	[0.08]	[-1.84]	[0.08]	[-2.41]	[-0.91]	[-3.14]	[-2.60]	[-3.24]	[-1.97]
Non-NW adjusted	-0.11	0.03	0.13	0.00	-0.19	0.01	-0.20	-0.05	-0.27	-0.30	-0.27	-0.24
	[-1.52]	[0.39]	[2.02]	[0.07]	[-1.95]	[0.08]	[-3.08]	[-0.81]	[-4.24]	[-3.33]	[-4.89]	[-2.98]
Bootstrapped p-value	0.015	0.730	0.014	0.930	0.021	0.937	0.016	0.324	0.003	0.012	0.006	0.066
Controls	None	Rates	Credit	All	None	Rates	Credit	All	None	Rates	Credit	All
Panel B: $log(HYS)^{(quarterly,annualized)}$												
[t] Newey-West (HAC)	-0.23	-0.19	-0.19	-0.09	-0.38	-0.24	-0.09	0.15	-0.41	-0.40	-0.45	-0.33
	[-1.76]	[-1.76]	[-1.56]	[-0.79]	[-2.39]	[-2.11]	[-0.58]	[1.24]	[-2.93]	[-3.44]	[-2.71]	[-2.30]
Non-NW adjusted	-0.23	-0.19	-0.19	-0.09	-0.38	-0.24	-0.09	0.15	-0.41	-0.40	-0.45	-0.33
	[-2.54]	[-2.44]	[-1.57]	[-0.88]	[-3.27]	[-2.40]	[-0.59]	[1.47]	[-4.18]	[-4.43]	[-3.18]	[-2.44]
Bootstrapped p-value	0.019	0.029	0.059	0.359	0.005	0.012	0.427	0.121	0.002	0.001	0.005	0.02
Controls	None	Rates	Credit	All	None	Rates	Credit	All	None	Rates	Credit	All

In general bootstrapped p-values are not significant at the 5% level at 1- and 2-year horizons but become significant at 3- and 4-years horizons. Results for a 4-year horizon are not presented in this context but are slightly more stable than the results for a 3-year horizon.

Finally the autoregressive-moving average (ARMA) nature of the univariate regressions is tested. Appendix 6 presents results for the ARMA(*p*,*q*)-model. It shows that the current value of the univariate regressions depends linearly on their own previous values plus a combination of current and previous values of a white noise error term. Both Aike's and Bayesian information criterion are used and both criteria are minimized with ARMA(2,1)-model (Burnham and Anderson, 2002). The linear dependence is natural because the most of the indicators for issuer quality are cumulative by their nature.

7 REASONS FOR THE NEGATIVE EXCESS BOND RETURNS

Chapter 6 demonstrated that deteriorating debt issuer quality forecasts low excess returns on corporate bonds. This chapter evaluates different reasons for this phenomenon. Sections 7.1 and 7.2 go through explanations suggesting that either the quantity or the price of risk varies over the credit cycle. After that Section 7.3 discusses whether the variation in intermediary balance sheet strength can forecast excess bond returns. Finally, possible "reaching for yield" and investor over-extrapolation are discussed in Sections 7.4 and 7.5.

7.1 Time Variation in the Quantity of Risk

The classic theory of finance suggests that riskier assets should have higher expected return target compared to lower risk assets. Analogically the lower quality debt issuance should be associated with a larger quantity of risk and hence, higher forecasted returns. The findings of this thesis are contrary. As sawn in Chapter 6, a shift towards lower quality issuance actually lowers the expected future returns, not the opposite as would have been expected. Therefore the explanations, that expected returns are mechanically linked to the composition of bonds in the high yield index, can be ruled out. Excess high yield bond returns cannot either be explained with equity market returns. Table 8 in Chapter 6 showed that when regressed with stock returns, neither ISS^{EDF} nor *log(HYS)* lose its forecasting power. To sum up, results of this thesis suggest that high values of ISS^{EDF} and *log(HYS)* are associated with higher, not lower, future stock market returns.

7.2 Fluctuations in the Price of Risk

The next step is to consider explanations in which time-variation in required returns is due to changes in the rationally determined price of risk. This assumption is not totally new because some consumption-based models recognize countercyclical variations in the price of risk. For example Campbell and Cochrane (1999) argued that the equity risk premium is higher at business cycle troughs than it is at peaks and Bansal and Yaron (2004) showed that dividend yields predict equity returns and the volatility of returns is time-varying. In addition Chen, Collin-Dufresne and Goldstein (2009) on their turn have argued that the habit formation models can explain the low level of defaults relative to the *BBB-AAA* spread assuming that default losses are countercyclical. Under these explanations, the decline in required return during booms leads to a decline in issuer quality because the declining price of risk enables also lower quality firms undertake investment opportunities.[19] This emphasises that investors should not be systematically surprised when the low quality firms, that get debt funding during the booms, underperform later on.

Greenwood and Hanson (2011) showed that issuer quality significantly forecast negative excess returns on high yield bonds in a number of sample years. In their study ISS^{EDF} forecasted negative 3-year cumulative excess returns for the full inspection period (1962-2008), and all but once this was actually followed by negative excess returns at 95% confidence level. These findings are strongly inconsistent with consumption based models. Consumption-based models[20] can explain periods in which high yield bonds have larger or smaller risk premiums but they are not capable to generate negative risk premiums.

Finally, as shown before, issuer quality is disconnected from traditional predictors of stock market returns. Table 8 in Chapter 6 showed that the negative relationship between issuer quality and excess bond returns remained significant also once controlled with equity returns or equity volatility at 3- and 4-year horizons. Results remained unchanged also with alternative measures of quality. These findings suggest that issuer quality captures market movements that are

[19] Assuming that companies finance their projects with debt and differ only in their risk exposure, β_t. These firms starts investment I at time t in expectation $t+1$ only if the $I \leq E(CF)/E_t(rx_{t+1})$ or the risk of the project is less risky than the individual company is (Greenwood and Hanson, 2011).

[20] Such as those featuring habit formation (Campbell and Cochrane, 1999) or time-varying consumption volatility (Bansal and Yaron, 2004)

relatively specific to credit markets. In addition these results are also consistent with the study of Collin-Dufresne, Goldstein and Martin (2001) who argued that monthly credit spread changes are principally driven by local supply and demand chocks.

7.3 Intermediaries' Role in High Yield Bond Returns

This section considers the health of intermediaries' balance sheet as explanatory factor to excess high yield bond returns. As discussed in literature review, several existing papers, (Garleanu and Pedersen, 2010; Kashyap Stein and Wilcox, 1993; Shleifer and Vishny, 1992; and Holmström and Tirole, 1997) have argued that fluctuations in intermediary equity capital or balance sheet health impact risk premiums. These theories propose that ISS^{EDF} and *HYS* should be high when intermediary balance sheets are strong. However, Adrian Moench and Shin (2010) argued that the coefficient of ISS^{EDF} should vanish once the intermediary balance sheet strength is controlled. The reason for this is that, according to Adrian Moench and Shin, intermediary capital is the driver of risk premium. The last assumption is not supported by the empirical study of Greenwood and Hanson (2011). Greenwood and Hanson found that while explanations involving limited capital go in the right direction, they do not fully explain the predictive power of ISS^{EDF}.

Table 11 describes the relationship between ISS^{EDF} and the balance sheet strength of intermediaries. The left side of Table 11 examines the relationship between the intermediary health Z_t and ISS^{EDF}.

$$ISS_t^{EDF} = a + b \times Z_t + c \times \left[\left(y_{L,t}^G - y_{S,t}^G\right) + y_{S,t}^G\right] + d \times \left[\left(y_{5y,t}^{BBB} - y_{5y,t}^G\right) + rx_t^{HY}\right] + u_{t+k} \quad (15)$$

In equation (15) ISS_t^{EDF} is the difference between the average *EDF* quintile of high and low debt issuers. Z_t is the combined effect of equity to assets ratio (*E/A*) and annual asset change (*dA/A*) to different intermediaries. Term spread and short-term German Government Bond yields are grouped to one principal component denoted by $\left[\left(y_{L,t}^G - y_{S,t}^G\right) + y_{S,t}^G\right]$. Credit spread between BBB-rated and risk free bonds plus LTM excess high yield bond returns form another principal component denoted by $\left[\left(y_{5y,t}^{BBB} - y_{5y,t}^G\right) + rx_t^{HY}\right]$. Error term is denoted by u_{t+k}. Results from these regressions are shown in the first two columns of Table 11. The remaining four columns describe the relationship between intermediary balance sheet health and excess high yield bond returns. This relationship is described in Equation (16).

$$rx_{t+3}^{HY} = a + b \times ISS_{t-1}^{EDF} \times Z_{t-1} + c\left[\left(y_{L,t}^{G} - y_{S,t}^{G}\right) + y_{S,t}^{G}\right] + d \times \left[\left(y_{5y,t}^{BBB} - y_{5y,t}^{G}\right) + rx_{t}^{HY}\right] + u_{t+3} \qquad (16)$$

The financial intermediary data is collected from Thomson ONE Banker database. All companies in this exercise operate in Europe and have been publicly traded at least in some point during the last thirteen years. Only companies that end their financial period in year-end are counted in. The final sample consists of 69 insurers, 130 broker-dealers and 245 banks. To ensure the comparability of the data, balance sheet ratios are normalized.

The first section of Table 11 shows the result for European insurance companies, which together with pension funds manage assets of some $40 trillion (Praet, 2011). The drawback in this approach is that it omits European non-listed pension funds, which form an important group of investors for fixed income securities. But even with this disadvantage the results are clear and significant. The first two columns of the insurer balance sheet section show the relationship with ISS^{EDF} and balance sheet health is positive, i.e. issuer quality is poor when insurer balance sheets are strong. This finding is supported by previous papers of Adrian, Moench and Shin (2010), He and Krishnamurthy (2008) and Garleanau and Pedersen (2010). The second and the third section of Table 11 show that the results from banks' balance sheets are alike: ISS^{EDF} has been high when banks' and broker-dealers' balance sheets have been strong. However, obtained results for broker-dealers are more mixed and not statistically significant when time-series controls are added.

The remaining four columns (3)-(6) in Table 11 analyse how well intermediaries' balance sheet changes describe high yield bond returns. Especially columns (4) and (6) are in interest, because they show whether the coefficient on ISS^{EDF} attenuate once intermediary balance sheet is controlled. Obtained results suggest that the coefficient on ISS^{EDF} really decreases when banks' and insurers' balance sheets are controlled. On the other hand the broker dealers' balance sheets do not attenuate the predicting power of ISS^{EDF}.

Table 11 Intermediary balance sheet and issuer quality

This Table explores the relationship between ISS^{EDF} and intermediary balance sheet strength, Z_t. Columns (1)-(2) in each panel report the coefficient on Z_t without and with time-series controls: $\boldsymbol{ISS_t^{EDF} = a + b \times Z_t + c \times + u_{t+k}}$ and $\boldsymbol{ISS_t^{EDF} = a + b \times Z_t + c \times \left[\left(y_{L,t}^G - y_{S,t}^G\right) + y_{S,t}^G\right] + d \times \left[\left(y_{5y,t}^{BBB} - y_{5y,t}^G\right) + rx_t^{HY}\right] + u_{t+k}}$, respectively. Columns (3)-(6) report the coefficients on both ISS^{EDF} and Z_t with the equation of the form: $\boldsymbol{rx_{t+3}^{HY} = a + b \times ISS_{t-1}^{EDF} \times Z_{t-1} + u_{t+3}}$ and $\boldsymbol{rx_{t+3}^{HY} = a + b \times ISS_{t-1}^{EDF} \times Z_{t-1} + c\left[\left(y_{L,t}^G - y_{S,t}^G\right) + y_{S,t}^G\right] + d \times \left[\left(y_{5y,t}^{BBB} - y_{5y,t}^G\right) + rx_t^{HY}\right] + u_{t+3}}$. *E/A* denotes the change in equity and *dA/A* the change in assets. Controls include the PCA-component for term spread and short-term risk-free bond yield and the PCA-component for the lagged returns and credit spread. *t*-statistics are based on Newey-West (1987) estimator allowing for serial correlation up to k-lags.

		Dep. Var. ISS^{EDF}		Dep.Var rx^{HY}_{t+3}			
		(1)	(2)	(3)	(4)	(5)	(6)
Insurer Balance Sheet	ISS^{EDF}				-0.07		-0.07
					[-0.75]		[-0.72]
	$E/A_{insurer}$	3.34	1.75	1.85	2.29	3.35	2.76
		[1.89]	[0.78]	[1.97]	[2.50]	[2.19]	[1.96]
	$dA/A_{insurer}$	13.77	17.29	-11.17	-11.91	-8.67	-9.33
		[2.26]	[2.67]	[-3.56]	[-3.92]	[-2.80]	[-2.37]
	Controls	No	Yes	No	No	Yes	Yes
	R^2	0.41	0.53	0.61	0.73	0.72	0.76
Broker-Dealer Balance Sheet	ISS^{EDF}				-0.31		-0.19
					[-4.29]		[-2.60]
	E/A_{BD}	4.00	-2.20	-1.62	0.25	-0.15	-0.75
		[2.39]	[-0.94]	[-1.37]	[0.20]	[-0.27]	[-0.79]
	dA/A_{BD}	-65.17	107.79	-271.53	-219.36	-299.21	-249.70
		[-2.56]	[1.17]	[-2.18]	[-2.81]	[-4.27]	[-4.94]
	Controls	No	Yes	No	No	Yes	Yes
	R^2	0.21	0.42	0.32	0.70	0.78	0.83
Bank Balance Sheet	ISS^{EDF}				-0.12		-0.23
					[-1.02]		[-1.75]
	E/A_{Bank}	13.20	13.83	1.23	2.26	2.41	3.61
		[2.05]	[2.30]	[-0.22]	[0.35]	[0.67]	[1.28]
	dA/A_{Bank}	14.86	13.23	-9.09	-6.63	-12.47	-9.44
		[4.43]	[2.24]	[-2.20]	[-1.59]	[-2.70]	[-2.71]
	Controls	No	Yes	No	No	Yes	Yes
	R^2	0.51	0.57	0.44	0.47	0.66	0.74
Lagged Bank Stock Returns	ISS^{EDF}				-0.28		-0.25
					[-1.85]		[-1.75]
	$R_{bank,\ t-1,t}$	0.56	0.51	-0.14	0.01	0.03	0.05
		[4.49]	[3.60]	[-1.64]	[0.05]	[0.44]	[0.62]
	Controls	No	Yes	No	No	Yes	Yes
	R^2	0.41	0.47	0.18	0.43	0.12	0.61
Bank Loan Loss Provisions	ISS^{EDF}				-0.29		-0.22
					[-3.28]		[-2.18]
	Loan Losses	-17.86	45.00	-33.13	-59.35	-64.47	-68.38
		[-0.67]	[0.82]	[-0.82]	[-2.07]	[-1.84]	[-2.70]
	Controls	No	Yes	No	No	Yes	Yes
	R^2	0.01	0.19	0.02	0.50	0.48	0.69

In all three cases the excess bond returns and asset growth have a similar relationship while the role of equity growth is more unclear; periods of negative asset growth are followed by positive excess high yield bond returns. On the contrary periods of high equity growth are followed by positive excess high yield bond returns for banks and insurers, but not for broker-dealers. However, results for broker-dealers are not statistically significant. In practise these findings suggest that banks and insurers have higher equity ratios and their balance sheets decreases during credit busts while in during the booms the phenomenon is adverse.

Last two panels in Table 11 compare two additional set of proxies for the health of bank balance sheet: lagged bank stock returns and bank loan loss provisions. In Europe corporates have historically relayed heavily on bank financing and this relationship can at least partly explain variations in the issuer quality and bond returns. First two columns compare the correlation with quarterly measured ISS^{EDF} and columns (4)-(6) show how well lagged bank returns and loan loss provisions explain excess high yield bond returns. Loan loss provisions are measured as a percentage of total loans. Obtained results suggest that lagged bank stock returns explain the variations of ISS^{EDF} well but this does not apply for the loan loss provisions. On the other hand columns (3)-(6) shows that periods of high loan loss provisions are followed by negative high yield bond returns whereas bank stock returns do not have this kind of relationship.

The results in this section are twofold. Results show that on the contrary to Greenwood and Hanson (2011), coefficient on ISS^{EDF} attenuate once intermediary balance sheet is controlled. On the other hand these findings follow the theory proposed by Adrian, Moench and Shin (2010). Further, periods of negative asset growth seem to be associated with following positive excess high yield bond returns at a 3-year horizon. At shorter horizons this relationship becomes positive. In addition periods of negative asset growth are characterized by higher equity ratios compared to credit booms. Intuitively these findings can be explained with the length of the credit cycle which has been 6-7 years for last two times (1995-2001 and 2001-2008). For shorter periods the cycle has not yet turned and the relationship between assets and excess returns has been positive. For longer return horizons the effect is adverse.

7.4 Reaching for Yield

An alternative intermediary-related explanation is based on agency problems. Greenwood and Hanson (2011) suggested that time-varying risk premiums are not driven by institutions' ability to take risks, but rather by their willingness to take risk due to agency problems. This view is supported by Rajan (2005), who argued that the aggressive compensation structures with limited downside and high upside have made investment managers less risk averse. Rajan showed that certain institutional investors are keen on reaching the yield when riskless nominal rates are low or have recently fallen. Similarly the flat yield curve in 2009-2010 and the high yield credit boom in the first half of the year 2011 suggest that investors may have taken excessive risks. In addition, Klarman (1991) has argued that the 80's junk bond boom in U.S. was fuelled by investors who still wanted to earn same high nominal rates than in the early 1980's.

Empirical evidence on the reaching for yield hypothesis is shown in Table 12 which explores the time-series determinants of issuer quality. Quarterly measured level of ISS^{EDF} is regressed with the PCA-component containing short-term risk-free bond yield and the term spread. In addition Equation (17) controls the effect of past high yield excess returns and past high yield default rates. The results of this regression show how well term spread, short-term government bond yields, LTM high yield bond returns and past default rates explain variations in ISS^{EDF}. These results are presented in Columns (1)-(5).

$$ISS_t^{EDF} = a + b \times \left[\left(y_{L,t}^G - y_{S,t}^G\right) + y_{S,t}^G\right] + c \times rx_t^{HY} + d \times DEF_t^{HY} + u_t \qquad (17)$$

In Equation (17) ISS_t^{EDF} is the difference between an average expected default probability (*EDF*) quintile of high and low net debt issuers. Term spread and short-term German Government Bond yields are grouped into one principal component denoted by $\left[\left(y_{L,t}^G - y_{S,t}^G\right) + y_{S,t}^G\right]$ and LTM excess high yield bond returns by $\mathrm{rx}_t^{\mathrm{HY}}$. $DEF^{HY}{}_t$ denotes speculative-grade default rates in Europe recorded and published by Moody's Investor Service. Error term is denoted by $\mathrm{u}_{\mathrm{t+k}}$. Also the forecasting power of changes is studied. The regression for the changes is presented in equation (18) and the subsequent results are presented in columns (6)-(15) of Table 12.

$$\Delta_k ISS_t^{EDF} = a + b \times \Delta_k\left[\left(y_{L,t}^G - y_{S,t}^G\right) + y_{S,t}^G\right] + c \times \Delta_k rx_t^{HY} + d \times \Delta_k DEF_t^{HY} + \Delta_k u_t \qquad (18)$$

In Equation (18) Δ_t denotes the k-quarter difference. Columns (6)-(10) present the results for one quarter changes and columns (11)-(15) results for two quarter changes. All results are also controlled with macroeconomic variables and lagged equity returns.

In short, the results in Table 12 are consistent with assumptions that investors are seeking higher returns when interest rates are low and yield curve almost flat. For example ISS^{EDF} and interest rates have an inverse relationship; ISS^{EDF} rises when short-term risk-free bond yield or the term spread are low. However, Column (1) shows that risk free yield for short-term German Government Bonds and the term spread between 10- and 2-year bonds capture alone only 16% of the variation in ISS^{EDF}. In addition these variables do not capture any of the variation when looking at the first difference of changes in colum (6). On the other hand default rates and past high yield bond returns capture significantly larger explaining capacity, being almost 56% when looking at the level of ISS^{EDF}. However, analogically to the terms spread and short-term bond yield, default rates and LTM high yield bond returns capture only a minimal amount of variation when looking the first difference.

Findings described above suggest that the willingness to take risks has a time-varying element but it cannot be explained by 1- and 2-quarter changes in short-term risk-free yield, term spread or past excess high yield bond returns. On the other hand the changes in default rates have a better forecasting power. The explanatory power of the changes improves when the time period is lengthened. For example term spread, short-term risk-free bond yields, last twelve month high yield bond returns and past default rates capture 18% of variation of ISS^{EDF} when looking at the fourth difference and 24% when analysing the eighth difference. Results for the fourth and eighth differences are presented in Appendix 7.

Table 12 Determinants of issuer quality

This Table shows the time series regression of issuer quality ISS^{EDF} on levels and past changes of variables of the form: $ISS_t^{EDF} = a + b \times \left[\left(y_{L,t}^G - y_{S,t}^G\right) + y_{S,t}^G\right] + c \times rx_t^{HY} + d \times DEF_t^{HY} + u_t$ or $\Delta_k ISS_t^{EDF} = a + b \times \Delta_k\left[\left(y_{L,t}^G - y_{S,t}^G\right) + y_{S,t}^G\right] + c \times \Delta_k rx_t^{HY} + d \times \Delta_k DEF_t^{HY} + \Delta_k u_t$. ISS^{EDF} is the difference between the average *EDF* quintile of high and low net debt issuers. Term spread and short-term German Government Bond yields are grouped into one principal component denoted by $\left[\left(y_{L,t}^G - y_{S,t}^G\right) + y_{S,t}^G\right]$. LTM excess high yield bond returns are denoted by rx_t^{HY}. $DEF^{HY}{}_t$ denotes speculative-grade default rates in Europe recorded and published by Moody's Investor Service. Error term is denoted by u_{t+k}. Results are tested with and without additional controls. These additional controls are lagged equity returns and the principal component of macro-economic variables. Columns (1)-(5) show the results for levels, columns (6)-(10) for the one quarter difference and columns (11)-(15) for the half year difference. *t*-statistics for k-period forecasting regressions are based on Newey-West (1987) estimator allowing for serial correlation up to k-lags.

		ISS^{EDF}					$\Delta_1 ISS^{EDF}$					$\Delta_2 ISS^{EDF}$				
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Levels:	$[y^G{}_{L,t} - y^G{}_{S,t} + y^G{}_{S,t}]$	0.13		0.06	-0.08	0.13										
		[2.97]		[1.72]	[-1.10]	[2.95]										
	$rx^{HY}{}_t$		-0.04	0.06	0.61	0.30										
			[-0.20]	[0.29]	[2.28]	[2.21]										
	DEF_t		-7.91	-7.15	-6.45	-7.58										
			[-7.19]	[-6.46]	[-5.95]	[-7.26]										
1-quarter Changes:	$\Delta_1 [y^G{}_{L,t} - y^G{}_{S,t} + y^G{}_{S,t}]$						0.01		-0.01	-0.10	0.00					
							[0.17]		[-0.13]	[-0.54]	[0.02]					
	$\Delta_1 rx^{HY}{}_t$							0.30	0.31	0.58	0.37					
								[1.05]	[0.86]	[0.98]	[1.08]					
	$\Delta_1 DEF_t$							-6.46	-6.56	-5.82	-7.00					
								[-2.21]	[-1.96]	[-2.05]	[-1.93]					
2-quarter Changes:	$\Delta_2 [y^G{}_{L,t} - y^G{}_{S,t} + y^G{}_{S,t}]$											-0.05		-0.13	-0.14	-0.12
												[-0.36]		[-0.60]	[-0.66]	[-0.54]
	$\Delta_2 rx^{HY}{}_t$												1.05	1.24	1.51	1.29
													[1.43]	[1.24]	[1.30]	[1.34]
	$\Delta_2 DEF_t$												-10.14	-10.52	-9.76	-10.22
													[-1.72]	[-1.81]	[-2.63]	[-1.71]
	Other Controls	None	None	None	Lagged Equity Returns	Economic Variables	None	None	None	Lagged Equity Returns	Economic Variables	None	None	None	Lagged Equity Returns	Economic Variables
	R^2	0.16	0.56	0.58	0.63	0.61	0.00	0.05	0.05	0.07	0.05	0.00	0.05	0.07	0.11	0.09

7.5 Investor Over-extrapolation and Mispricing

This section considers the possibility that investors' memory is short and they over-extrapolate past defaults or volatility, leading to the time-varying mispricing of corporate bonds and loans. As shown in Section 3.2, every company has its optimal leverage level measured in monetary terms. However, this balance can be changed if the credit on the markets is exceptionally cheap. Simultaneously, following period of low defaults, investors start to believe that the low credit quality firms are safer than they really are. This wrong risk analysis decrease the price of the credit and when recognizing that the credit is cheap, low quality firms will issue large amount of debt making them even more likely to default in the future. This leads to the situation where the deteriorating issuer quality forecasts negative excess corporate bond returns.

Even though extrapolative expectations are not supported by the perfect market hypothesis, there are several reasons why over-extrapolation assumptions are realistic. For example Barberis, Shleifer and Vishny (1998) argued that investors think that the economy evolves according to a more or less persistent process. Shleifer and Vishny showed that following low-default realizations investors start to believe that the business environment has fundamentally changed and the low default environment is more persistent than it truly is. This biased assumption leads to low or negative bond returns when the cycle turns. Thus, according to Shleifer and Vishny, the lower issuer quality is associated with greater over-optimism about future default rates and lower expected returns.

Table 12 shows that the assumption about low default rates and subsequent deteriorating issuer quality really takes place. 1- and 2- quarter changes in the table show that ISS^{EDF} is high following periods when default rates have been low and high yield excess returns have been high, although the coefficient of determination is low for both changes. For longer time periods, 4- and 8-quarter changes the statistical significance and the coefficient of determination rises.[21] Following the above discussion it can be suggested that the recent experience of credit market investors do play a role in formation of future return expectations but investor react slowly to the changes in market conditions.

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[21] See Appendix 7

8 CONCLUSIONS

The purpose of this study was to construct a comprehensive measure of issuer quality and use this measure to forecast excess corporate bond returns in European markets. While existing literature in corporate finance has mainly focused on identifying reasons why the quantity of credit may fluctuate over the business cycle, only little effort has been devoted to connect these credit booms and busts to investor returns. Greenwood and Hanson (2011) were the first ones who filled this research gap by proving with U.S. data that when issuer quality is low corporate bonds subsequently underperform Treasuries. This thesis contributes the existing literature by further developing the methodology of Greenwood and Hanson (2011) and by showing empirically that the variations in the issuer quality is a defining feature of the credit cycle.

The empirical part of this thesis focused on studying the European high yield corporate bonds. Bank of America Merrill Lynch European Currency High Yield Index was the first high yield bond index in Europe launched in December 31st, 1997. This index defined the geographical scope, time period and the type of companies studied in the study. The actual company sample consisted of non-financial and non-governmental companies headquartered in Europe whose market value equals or is more than 100 million euros. The time period observed in this thesis was 01/1998-09/2011.

The primary issuer quality method used in this study was a particular application of Merton's (1974) model which was developed by the proprietors of the KMV Corporation. The model compared the credit quality of firms issuing large amount of debt relative to their size to that of firms issuing or retiring debt. The comparison was based on periodical changes in debt and thus the expected difference in default frequencies between high and low net debt issuers was recalculated either annually or quarterly. This ratio was denoted by ISS^{EDF}. The second quality measure, the high yield share, was used to control the results from the ISS^{EDF} calculations. The high yield share was formed by using credit ratings assigned to new corporate bond issues. The primary source for credit ratings was Moody's (Moody's Investors Service, 2011).

8.1 Summary of the Results

The empirical results of this thesis show that when debt issuer quality among European listed companies is low or high yield share in bond issuances is high, corporate bonds subsequently underperformed German Government Bonds. Between 1998 and 2011 both issuer quality, measured with issuer characteristic spread, and the high yield share have had a striking degree of predictability and often forecast significantly negative excess bond returns at 3- and 4-year horizons. For 1- and 2-year horizons the coefficients on issuer quality measures have attenuated once term spread, credit spread, short-term risk-free bond yield and past excess bond returns were controlled.

This thesis shows that the shift towards lower quality bonds decreases, not increases, the actual investor returns. This finding rules out the possibility that high yield bond returns would be mechanically linked to the composition of bonds in the high yield index. Further, several of the empirical findings support the idea that rationally determined price of risk moves in a countercyclical fashion. Intermediary balance sheet strength offers one explanation for the time varying price of risk. For example the coefficient on ISS^{EDF} attenuates once intermediary balance sheet is controlled. The results also show that periods of low nominal interest rates, low term or credit spread and low past bond defaults have been followed by high excess returns on corporate bonds. These results are difficult to fully explain using rationally time-varying risk aversion or other drivers of countercyclical risk premium. Instead, the intermediary frictions and explanations in which investors systematically make mistakes in assessing credit quality, offer statistically significant reasons for the variation in debt issuer quality.

Table 13 on the next page presents the more detailed summary of the main results.

Table 13 Summary of the results

This Table presents the hypotheses tested in this thesis and the main empirical findings related to them.

	Hypothesis	Empirical evidence
H1	*Aggregate corporate debt growth can forecast excess bond returns. Debt growth and excess returns have a negative correlation.*	**Medium support.** Aggregate corporate debt growth negatively forecasts excess high yield bond returns at the 5% significance level, measured with the two-tailed *t*-test. However, the coefficient on aggregate credit growth is attenuated once traditional proxies for risk premium are controlled. These proxies include term spread, credit spread, short term risk-free interest rates and last twelve month bond returns.
H2	*Debt issuers quality can forecast excess bond returns. The relationship between quality and the expected returns is negative.*	**Strong support.** Quarterly measured debt issuer quality negatively forecasts excess high yield bond returns at 3- and 4-year horizons. Obtained results are significant at the 1% significance level. At 1- and 2-year horizons results are significant at the 10% level. In this study the debt issuer quality is measured primary with issuer characteristic spread between high and low net debt issuers, denoted by ISS^{EDF}. The second quality measure is the share of non-financial corporate bond issues, showed in logarithmic form and denoted by *log(HYS)*. However, results are not sensitive to the method chosen.
H3	*Issuer quality has incremental forecasting power above term and credit spread as well as short term risk-free interest yield.*	**Medium support.** Issuer quality has incremental forecasting power over and above traditional proxies for risk premium at 3- and 4-year horizons. These proxies include term spread, credit spread, short term risk-free interest rates and last twelve month bond returns. At 1- and 2-year horizons the coefficients on issuer quality attenuates once the traditional proxies for risk premium are controlled. Further, emprical results show that issuer quality is disconnected from traditional predictors of stock market returns. The negative relationship between issuer quality and excess bond returns remains significant even after controlling with equity returns and equity volatility at 3- and 4-year horizons. Findings suggest that issuer quality captures market movements that are relatively specific to credit markets.
H4	*Periods of strong balance sheet of financial intermediaries are followed by low excess returns on corporate bonds.*	**Strong support.** Results suggest that periods of negative intermediary asset growth are followed positive excess high yield bond returns at 3- and 4-year horizons. At shorter horizons this relationship becomes positive. These findings can be explained intuitively with the length of the credit cycle. Especially banks' and insurers' balance sheet growth has incremental forecasting power for corporate bond returns over and above traditional proxies for risk premium.
H5	*Past default rates and bond returns, term spread and short term risk free yield are significant determinants of the issuer characteristics spread.*	**Medium support.** Past default rates and changes in past default rates forecast the level of ISS^{EDF} at the 1% and the changes of ISS^{EDF} at the 5% significance level. On the other hand past bond returns, term spread and short term risk free yield do not forecast the level and the changes of ISS^{EDF} with statistically significant accuracy.

8.2 Suggestions for Further Research

This master's thesis filled an important gap in the existing literature by studying the possibility that time-varying investor beliefs or tastes play a role in determining the quantity and allocation of credit in Europe. Although the results were solid, the scope of the topic and still evolving high yield corporate bond markets prove that there is still ground to cover in the future.

Probably the most interesting topic for further research arising from this thesis would be the intermediaries' role in credit cycles. Growing literature argues that fluctuations in intermediary equity capital or balance sheet health impact risk premium (Gromb and Vayanos, 2002; He and Krishnamurthy, 2010; Garleanu and Pedersen, 2010; Duffie, 2010). The findings of this thesis supported this argument. Unlisted pension insurance companies were excluded from this study because of their ownership structure but the importance of these companies to the high yield bond markets is significant and might bring some new insight into the matter. Other types of control variables could also be investigated, such as country-specific controls. Replicating the study with Asian data could also prove to be interesting, although the available data is likely to set some limitations, especially in countries with less developed reporting standards. Finally, more advanced studies concentrating to time-varying investors' beliefs and expectations could offer additional insight or simply further verify the results found in this study. However, these undoubtedly interesting issues are left for the future research.

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APPENDICES

Appendix 1 Time-series forecasting regressions of excess bond returns

The reduced-form model described in Chapter 3 suggests that the both coefficients of quality and quantity will be negative as long as the variance is bigger than zero. However, the quality becomes more important explanatory factor when the variance of non-firm specific variables of optimal capital structure grows large or the variance of firm specific determinants approach to zero. In order to prove this argument, the assumption that all random variables are independent has to be done. And in line with the previous assumption, the exposure of type θ firm to the market wide pricing of credit risk (β_θ), is expected to be 1 so that $s_t = h_t + E(R_t)$ and $E[rx_{t+1}] = E(R_t)$. Expected excess return is a multiplication of expected return on credit assets $E(R_t)$. Expected credit losses h_t and returns $E(R_t)$ are time-varying variables. From $E[rx_{t+1}] = E(R_t)$ trivially follows that the magnitude of regression coefficients will be larger for high default-risk firms than for low default-risk firms, since $E\left[rx_{\theta,t+1}\right] = \beta_\theta E(R_t)$ and $\beta_L < \beta_H$.

The coefficient b from univariate forecasting regression of rx_{t+1} on quality (d_H-d_L) is:

$$b_{d_H-d_L} = -\frac{\frac{\beta_H-\beta_L}{y}\times\sigma^2_{E(R)}}{2\sigma_c^2+\frac{\beta_H-\beta_L}{y}\sigma^2_{E(R)}} < 0 \qquad \text{(E.1)}$$

In this model the target capital structure has two independent components: a_t is a common capital structure component for all firms and $c_{\theta,t}$ is a firm specific component for all firms θ. And for the quantity the same coefficient can be presented as follows:

$$b_{d_H+d_L} = -\frac{\frac{\beta_H+\beta_L}{y}\times\sigma^2_{E(R)}}{4\sigma_a^2+2\sigma_c^2+\frac{\beta_H+\beta_L}{y}\sigma^2_{E(R)}} < 0 \qquad \text{(E.2)}$$

When equations E.1 and E.2 are regressed together in a multivariate regression the following matrix equation is achieved:

$$\begin{bmatrix} b_{d_H-d_L} \\ b_{d_H+d_L} \end{bmatrix} = \frac{\frac{\sigma^2_{E(R)}}{y}}{2\sigma_c^2\left(4\sigma_a^2+2\sigma_c^2+\left(\frac{\beta_H+\beta_L}{y}\right)\sigma^2_{E(R)}\right)+\left(\frac{\beta_H-\beta_L}{y}\right)^2\sigma^2_{E(R)}\left(4\sigma_a^2+2\sigma_c^2\right)}\begin{bmatrix}(4\sigma_a^2+2\sigma_c^2)(\beta_H-\beta_L) \\ 2\sigma_c^2(\beta_H+\beta_L)\end{bmatrix} \qquad \text{(E.3)}$$

As the variance of the common variable for all companies grows large (σ^2_a) or the firm-specific component σ_c^2 falls, the aggregate debt issuance becomes less informative and the relative issuance (i.e., issuer quality) grows its importance as a forecasting variable. The same can be derived for the credit spread. The coefficient *b* in a univariate and multivariate forecasting regression of rx_{t+1} on spreads s_t is given by

$$b_s = \frac{\sigma_{E(R)}^2}{2\sigma_h^2+\sigma_a^2} > 0 \quad \text{(E.4)}$$

$$\begin{bmatrix} b_{d_H-d_L} \\ b_s \end{bmatrix} = \frac{\sigma_{E(R)}^2}{\det(V)} \begin{bmatrix} -\frac{\sigma_h^2(\beta_H-\beta_L)}{y} \\ 2\sigma_c^2 \end{bmatrix} \quad \text{(E.5)}$$

Where $det[V]>0$ is the determinant of the variance-covariance matrix of d_H-d_L and spreads s_t.

And analogically to the equation (E.3), when the time-varying expected default probability σ^2_h grows or σ_c^2 falls in equation (E.5). Credit spread become less and quality more informative about excess returns.

Appendix 2 Number of firms and observations classified by countries in the final sample

This Table shows the number of companies and quarterly firm observations in the final sample. Individual Company is included into the final sample if there has been sufficient data to calculate expected default probability following Bharath and Shumway (2008). When calculated with quarterly data, 4 continuous quarters of continuous data are required.

Country	Number of firms	Quarterly observations
Germany	223	4,168
Italy	148	2,699
Sweden	117	2,443
Turkey	112	1,944
Poland	105	1,674
Greece	84	1,425
Spain	75	1,532
Finland	72	1,864
Norway	70	1,502
Russia	52	425
Denmark	47	1,029
Netherlands	40	812
Austria	31	677
France	29	500
Portugal	28	706
Switzerland	25	509
United Kingdom	19	406
Belgium	13	308
Luxembourg	13	285
Hungary	11	241
Czech Republic	7	146
Ireland	4	77
Lithuania	4	60
Iceland	3	71
Slovakia	1	12
Cyprus	1	21
Slovenia	1	14
Malta	1	17
	1,336	25,567

Appendix 3 Compilation of univariate regressions

This Table shows different variations for ISS^{EDF} and *log(HYS)*. $ISS^{EDF(\text{annual, not lagged})}$ is the normal annual issuer quality forecasting regression without lagging, $ISS^{EDF(\text{annual})}$ describes the same data but is lagged by one year, $ISS^{EDF(\text{quarterly, not lagged})}$ is the not lagged quarterly issuer quality regression, $ISS^{EDF(\text{quarterly, not lagged, dummy})}$ is the quarterly regression function which accounts possible quarter specific variations, $ISS^{EDF(\text{quarterly})}$ is the quarterly regression lagged by one quarter, $ISS^{EDF(\text{quarterly, annualized debt change, not lagged})}$ is one quarter not lagged regression with rolling 12-month debt change and $ISS^{EDF(\text{quarterly, annualized debt change})}$ is one quarter lagged regression with rolling 12-month debt change. $log(HYS)^{(\text{annual, not lagged})}$ is the annual not lagged high yield bond share of total issuance, $log(HYS)^{(\text{annual})}$ is the annual high yield share lagged by one year, $log(HYS)^{(\text{quarterly, not lagged})}$ is the quarterly high yield share, $log(HYS)^{(\text{quarterly, not lagged dummy})}$ is the quarterly high yield share accounting for the quarter specific factors, $log(HYS)^{(\text{quarterly})}$ is the one quarter lagged function, $log(HYS)^{(\text{quarterly, not lagged, annualized debt change})}$ is the 12-month average high yield share of total issues and finally, $log(HYS)^{(\text{quarterly, annualized debt change})}$ is the lagged 12-month average high yield share of total issues. *t*-statistics are based on Newey-West (1987) autocorrelation up to k-lags.

	LTM High Yield Returns			*1-year High Yield Returns*			*2-year High Yield Returns*			*3-year High Yield Returns*			*4-year High Yield Returns*		
	b	[t]	R^2	b	[t]	R^2	b	[t]	R^2	b	[t]	R^2	b	[t]	R^2
$X_t = ISS^{EDF\ (\text{annual, not lagged})}$	-0.16	[-0.77]	0.06	-0.30	[-3.95]	0.20	-0.62	[-3.99]	0.47	-0.50	[-6.68]	0.48	-0.10	[-0.44]	0.02
$X_{t-1} = ISS^{EDF\ (\text{annual})}$	-0.30	[-4.32]	0.21	-0.22	[-1.66]	0.08	-0.18	[-1.86]	0.04	0.14	[0.75]	0.04	0.10	[0.97]	0.02
$X_t = ISS^{EDF\ (\text{quarterly, not lagged})}$	0.04	[0.53]	0.00	-0.06	[-0.96]	0.02	-0.15	[-1.61]	0.06	-0.04	[-0.58]	0.01	-0.04	[-0.49]	0.01
$X_t = ISS^{EDF\ (\text{quarterly, not lagged, dummy})}$	0.06	[0.76]	0.01	-0.07	[-0.85]	0.02	-0.17	[-1.27]	0.29	-0.06	[-1.12]	0.04	-0.07	[-0.82	0.03
$X_{t-1} = ISS^{EDF\ (\text{quarterly})}$	-0.08	[-1.42]	0.02	-0.07	[-1.08]	0.01	-0.12	[-0.95]	0.04	-0.02	[-0.37]	0.00	0.04	[0.46]	0.01
$X_t = ISS^{EDF\ (\text{quarterly, annualized debt change, not lagged})}$	-0.04	[-0.44]	0.01	-0.12	[-1.86]	0.07	-0.17	[-1.66]	0.10	-0.23	[-3.29]	0.32	-0.21	[-4.09]	0.25
$X_{t-1} = ISS^{EDF\ (\text{quarterly, annualized debt change})}$	-0.11	[-1.08]	0.05	-0.11	[-1.90]	0.07	-0.19	[-1.84]	0.12	-0.27	[-3.14]	0.43	-0.20	[-3.45]	0.23
$X_t = log(HYS)^{(\text{annual, not lagged})}$	0.40	[3.08]	0.46	-0.07	[-0.32]	0.01	-0.37	[-1.48]	0.14	-0.52	[-5.65]	0.36	-0.66	[-5.17]	0.61
$X_{t-1} = log(HYS)^{(\text{annual})}$	-0.07	[-0.32]	0.07	-0.29	[-3.09]	0.13	-0.74	[-3.03]	0.43	-0.78	[-7.64]	0.78	-0.49	[-3.40]	0.38
$X_t = log(HYS)^{(\text{quarterly, not lagged})}$	0.23	[4.22]	0.49	0.04	[0.38]	0.01	-0.14	[-1.73]	0.11	-0.11	[-1.96]	0.11	-0.12	[-1.53]	0.09
$X_t = log(HYS)^{(\text{quarterly, not lagged, dummy})}$	0.24	[3.96]	0.50	0.04	[0.39]	0.01	-0.15	[-1.69]	0.12	-0.12	[-1.88]	0.14	-0.12	[-1.34]	0.12
$X_{t-1} = log(HYS)^{(\text{quarterly})}$	0.22	[4.49]	0.42	0.00	[-0.03]	0.00	-0.14	[-1.60]	0.11	-0.12	[-1.70]	0.12	-0.16	[-1.98]	0.16
$X_t = log(HYS)^{(\text{quarterly, not lagged, annualized debt change})}$	0.41	[6.64]	0.49	-0.13	[-0.96]	0.05	-0.32	[-1.91]	0.18	-0.33	[-2.21]	0.27	-0.50	[-3.54]	0.51
$X_{t-1} = log(HYS)^{(\text{quarterly, annualized debt change})}$	0.29	[3.44]	0.24	-0.23	[-1.76]	0.15	-0.38	[-2.37]	0.25	-0.41	[-2.92]	0.38	-0.56	[-4.87]	0.64

Appendix 4 Robustness check for the time period used in the study

This Table shows the univariate regressions for the log(HYS) of the form: $rx_{t+k}^{HY} = a + b \times X_{t-1} + u_{t+k}$ where the dependent variable rx_{t+k}^{HY} is the cumulative 3-year excess return on high yield bonds calculated with Bank of America (BoFa) Merrill Lynch European Currency High Yield Bond - Index. In Panel B and C, the dependent variable is the cumulative 3-year excess return on BBB- and AAA- rated corporate bonds calculated with BoFa Merrill Lynch Emu Corporate non-financial BBB- and AAA- rated bond indexes, respectively. *X* denotes *log(HYS*) and u_{t+k} is the error term. The left side of the table presents the high-yield share calculated for 01/2001-09/2011.This time period is the maximum length for ISS^{EDF} calculations. The right side of the table presents the result for the hold time period the high yield index data has been available (01/1998-09/2011). *t*-statistics are based on Newey-West (1987) autocorrelation up to k-lags.

	X_{t-1}=log(HYS) $^{(quarterly, annualized\ debt\ change)}$ 2001-2011				X_{t-1}=log(HYS) $^{(quarterly, annualized\ debt\ change)}$ 1998-2011			
	1-year	2-year	3-year	4-year	1-year	2-year	3-year	4-year
Panel A: High Yield Excess Returns (rx^{HY})								
b	-0.23	-0.38	-0.41	-0.56	-0.28	-0.45	-0.39	-0.52
[t]	[-1.76]	[-2.36]	[-2.93]	[-4.87]	[-2.29]	[-2.81]	[-3.20]	[-5.33]
R^2	0.15	0.25	0.38	0.62	0.22	0.29	0.26	0.52
Panel B: BBB Excess Returns (rx^{BBB})								
b	-0.07	-0.10	-0.09	-0.10	-0.05	-0.07	-0.05	-0.07
[t]	[-1.94]	[-2.60]	[-2.97]	[-2.85]	[-1.67]	[-2.21]	[-1.42]	[-1.43]
R^2	0.19	0.26	0.32	0.40	0.11	0.16	0.09	0.11
Panel C: AAA Excess Returns (rx^{AAA})								
b	-0.01	-0.01	-0.01	-0.03	-0.01	-0.01	0.00	-0.02
[t]	[-0.97]	[-0.70]	[-0.40]	[-3.37]	[-1.11]	[-0.75]	[-0.30]	[-2.98]
R^2	0.04	0.03	0.01	0.38	0.05	0.01	0.00	0.29

Appendix 5 Quantity, quality and future return to credit

This Table shows the forecasting power of quantity and quality to future returns on credit. Quarterly measured trailing 12-month univariate regression is of the form: $\boldsymbol{rx_{t+k}^{HY} = a + b \times X_{t-1} + u_{t+k}}$ and time-series controlled multivariate regressions is of the form: $\boldsymbol{rx_{t+3}^{HY} = a + b \times X_{t-1} + c \times \left[\left(y_{L,t}^{G} - y_{S,t}^{G}\right) + y_{S,t}^{G}\right] + d \times \left[\left(y_{5y,t}^{BBB} - y_{5y,t}^{G}\right) + rx_{t}^{HY}\right] + u_{t+3}}$. $\boldsymbol{rx_{t+3}^{HY}}$ denotes the cumulative 3-year excess return on high yield bonds and X_{t-1} stands for quarterly measured *log(HYS)*. Term spread and short-term German Government Bond yields are grouped into one principal component denoted by $\left[\left(y_{L,t}^{G} - y_{S,t}^{G}\right) + y_{S,t}^{G}\right]$. Credit spread and LTM excess high yield bond returns form another principal component denoted by $\left[\left(y_{5y,t}^{BBB} - y_{5y,t}^{G}\right) + rx_{t}^{HY}\right]$. $\boldsymbol{u_{t+k}}$ is the error term. $\Delta D_{Agg}/D_{Agg}$ is the annual percentage change in total debt for companies and $\Delta D_k/D_k$ denotes the aggregate debt growth of quintiles. Panel A shows regressions without and Panel B with principal component controls. *t*-statistics are based on Newey-West (1987) autocorrelation up to k-lags.

		Panel A: Univariate										
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Issuer Quality	*log(HYS)* *(quarterly)*	-0.39		-0.32								
		[-3.20]		[-3.24]								
Agg. Debt growth	$\Delta D_{Agg}/D_{Agg}$		-0.10	-0.06								
			[-2.18]	[-1.47]								
Low EDF	$\Delta D_1/D_1$				-0.09					-0.02		-0.11
					[-2.31]					[0.02]		[-2.51]
2	$\Delta D_2/D_2$					-0.12						
						[-2.26]						
3	$\Delta D_3/D_3$						-0.10					
							[-2.52]					
4	$\Delta D_4/D_4$							-0.10				
								[-1.83]				
High EDF	$\Delta D_5/D_5$								-0.11	-0.11		
									[-2.59]	[-1.58]		
High-Low	$\Delta D_5/D_5 - \Delta D_1/D_1$										-0.06	-0.11
											[-1.00]	[-1.58]
	R^2	0.26	0.24	0.43	0.18	0.33	0.22	0.24	0.29	0.29	0.04	0.29
		Panel B: Multivariate										
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Issuer Quality	*log(HYS)* *(quarterly)*	-0.36		-0.36								
		[-3.53]		[-4.21]								
Agg. Debt growth	$\Delta D_{Agg}/D_{Agg}$		-0.09	-0.02								
			[-1.70]	[-0.69]								
Low EDF	$\Delta D_1/D_1$				-0.07					0.00		-0.11
					[-1.54]					[-0.00]		[-2.21]
2	$\Delta D_2/D_2$					-0.14						
						[-2.04]						
3	$\Delta D_3/D_3$						-0.09					
							[-2.08]					
4	$\Delta D_4/D_4$							-0.11				
								[-1.50]				
High EDF	$\Delta D_5/D_5$								-0.11	-0.11		
									[-2.17]	[-1.47]		
High-Low	$\Delta D_5/D_5 - \Delta D_1/D_1$										-0.05	-0.11
											[-0.83]	[-1.47]
	R^2	0.37	0.24	0.48	0.19	0.34	0.23	0.25	0.29	0.29	0.14	0.29

Appendix 6 ARMA-models for the univariate regressions

This Table presents Aike's and Bayesian information criteria (Burnham and Anderson, 2002) for log excess returns on speculative-grade bonds on debt issuer quality ISS^{EDF} and *log(HYS)* of the form: $rx_{t+k}^{HY} = a + b \times X_{t-1} + u_{t+k}$. The dependent variable rx_{t+k}^{HY} is the cumulative 3-year excess return on high yield bonds calculated with Bank of America (BoFa) Merrill Lynch European Currency High Yield Bond - Index. u_{t+k} is the error term. In the upper part of the table X denotes ISS^{EDF} and in the lower part *log(HYS)*.

$ISS^{EDF(quarterly,\ annual\ debt\ change)}$

	AIC			SBIC		
	1	2	3	1	2	3
1	0.36	0.56	0.49	0.49	0.69	0.62
2	**-0.27**	0.40	0.41	**-0.14**	0.53	0.54
3	0.12	0.51	0.57	0.25	0.64	0.70

$log(HYS)^{(quarterly,\ annnual\ debt\ change)}$

	AIC			SBIC		
	1	2	3	1	2	3
1	-0.39	-0.44	-0.40	-0.28	-0.33	-0.29
2	**-0.46**	0.14	0.17	**-0.35**	0.25	0.28
3	0.04	0.12	0.29	0.15	0.23	0.40

Appendix 7 Determinants of the issuer quality

This Table shows past changes of past returns, term spread, short-term interest rates and default rates of the form: $\Delta_k ISS_t^{EDF} = a + b \times \Delta_k\left[\left(y_{L,t}^G - y_{S,t}^G\right) + y_{S,t}^G\right] + c \times \Delta_k rx_t^{HY} + d \times \Delta_k DEF_t^{HY} + \Delta_k u_t$. ISS^{EDF} is the difference between the average EDF quintile of high and low debt issuers. Term spread and short-term German Government Bond yields are grouped into one principal component denoted by $\left[\left(y_{L,t}^G - y_{S,t}^G\right) + y_{S,t}^G\right]$ and LTM excess high yield bond returns by rx_t^{HY}. $DEF^{HY}{}_t$ denotes speculative-grade default rates in Europe recorded and published by Moody's Investor Service. Error term is denoted by u_{t+k}. Results are tested with and without controls. Both lagged equity returns and the principal component of macro-economic variables are used to control the results. Columns (17)-(21) show the results for one year (4 quarters) difference and columns (22)-(26) for the two years difference (8 quarters). *t*-statistics for k-period forecasting regressions are based on Newey-West (1987) estimator allowing for serial correlation up to k-lags.

		$\Delta_4 ISS^{EDF}$					$\Delta_8 ISS^{EDF}$				
		(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
4-quarter Changes:	$\Delta_4 [y^G{}_{L,t} - y^G{}_{S,t} + y^G{}_{S,t}]$	0.05		-0.03	-0.02	0.00					
		[0.61]		[-0.22]	[-0.12]	[-0.03]					
	$\Delta_4 rx^{HY}{}_t$		1.79	1.84	1.67	1.66					
			[1.67]	[1.50]	[1.44]	[1.32]					
	$\Delta_4 DEF_t$		-25.49	-26.13	-25.35	-24.77					
			[-2.62]	[-2.21]	[-2.25]	[-2.44]					
8-quarter Changes:	$\Delta_8 [y^G{}_{L,t} - y^G{}_{S,t} + y^G{}_{S,t}]$						0.10		0.10	0.10	0.12
							[1.33]		[0.99]	[1.00]	[1.26]
	$\Delta_8 rx^{HY}{}_t$							1.34	1.17	1.32	1.08
								[2.15]	[1.67]	[1.62]	[1.47]
	$\Delta_8 DEF_t$							-19.50	-15.41	-15.49	-15.93
								[-4.39]	[-2.40]	[-2.33]	[-2.42]
	Other Controls	None	None	None	Lagged Equity Returns	Economic Variables	None	None	None	Lagged Equity Returns	Economic Variables
	R^2	0.01	0.18	0.18	0.19	0.24	0.05	0.19	0.24	0.25	0.26