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The Effect of Credit Risk on Stock Returns:

An Empirical Research on the Dutch, German and French Stock Market from Dec. 2004 to Dec. 2012.

Abstract

This research examines whether credit spread captures systematic risk which cannot be fully explained by CAPM or FF3. The dataset is based on Dutch, French and German firms between December 2004 and December 2012. The Merton (1974) model is used to create credit spread as characteristic for credit risk. In this way, it is possible to include firms without credit spread or ratings information in the analysis, consequently, this research is free of sample selection biases. This research shows no significant relationship with excess return for the market premium, size premium and credit risk premium. However, there is a significant relationship between excess return and value premium from December 2004 to December 2012 for the FF3 model and the FF3 model in combination with HSMLS.

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1. Introduction

It is important for managers and investors to know why asset values are changing in the way they do. Asset pricing theories are giving an understanding about the values of assets that generate uncertain future cash flows as the relationship between equity prices and their expected returns. Managers use asset pricing theories to calculate the appropriate cost of capital for making investment decisions and investors are using asset pricing theories to benefit on the revelation of mispriced assets. Furthermore, asset pricing theories are used to provide expected returns in respect of portfolio optimization and benchmarking. In general, asset pricing theories prescribe that riskier assets should command higher returns. Existing theories, however, leave unexplained a host of empirically documented cross-sectional patterns in stock returns, classified as anomalies.

Before going into detail about asset pricing theories, a distinction is made between two kinds of risks: systematic risk and idiosyncratic risk. Idiosyncratic risk is firm- or industry-specific risk that is inherent in each investment. This kind of risk can be diversified away by holding many different stocks in several industries. Examples of idiosyncratic risk are a new competitor, a management change or a product recall. In contrast, systematic risk is the risk related to the entire market, not just a particular firm or industry. Systematic risk is unpredictable and cannot be avoided completely since it cannot be diminished through diversification. Some examples of systematic risk are interest rate changes, inflation and economic downturns since they affect the entire market. Investors receive a premium for this systematic risk exposure on excess of the risk-free rate which is known as excess return.

The most common-used model to predict excess return is the Capital Asset Pricing Model (CAPM) of Sharpe (1964), Lintner (1965) and Black (1972). The CAPM argues that a part of the risk, systematic risk, is unavoidable. However the other part of risk, idiosyncratic risk, can be diversified away. The CAPM explains excess returns based on the stocks price's covariation with an overall market portfolio that pays a market premium. The beta-coefficient hereby measures the sensitivity of the stock price fluctuations with respect to changes in the market portfolio and is therefore the benchmark for the systematic risk involved.

Other academics (Merton, 1973; Basu, 1977, 1983; Banz, 1981; Bhandari, 1988) indicate that systematic risk is a multifactor model. Systematic risk should take state variables and firm-specific effects into consideration as well to improve the model.

Fama and French (1992) developed the Fama and French three factor model (FF3) by extending the CAPM with two complementary factors: size and value. Size is the difference in asset returns between small firms and lager firms (SMB), value is the difference in asset returns between firms with high Book-to-Market-equity (B/M-equity) ratios called value stocks and firms with low B/M-equity ratios called growth stocks (HML). The FF3 model shows that value and small cap stocks outperform markets on a regular basis. Fama and French proved to better measure market returns by adding those two additional factors to the CAPM.

Another influence on the development of stock prices and returns was discovered by Jegadeesh and Titman (1993) who revealed the Momentum-effect (MOM). Carhart (1997) added MOM as an additional factor to the model, MOM is the difference in asset returns between previous 'winners' and previous 'losers' in the way that securities that performed well over the past three till twelve months will perform well in the next three till twelve months and the other way around. Contrary to SMB and HML, MOM is an additional factor which finds its fundamentals in irrational pricing and investment behavior. However, the focus of this research is on credit spread based on rational asset pricing, the reason for this decision is explained in section two.

A measurement of alpha, R^2 and betas are used to measure the performance of an asset pricing model. An asset pricing model is perfect when: their alpha is equal to zero, R^2 is equal to one and their betas are significant unequal from zero. In this case, the variation in the stock price returns are perfectly explained by the independent variables in the way that systematic risk is completely captured by the model and no space is left for random errors.

Soentjens (2012) argues that the performance of FF3 worsens during economic downturns which might indicate that the effect of SMB and HML lessens during economic downturns or the data might contain a high degree of noise what lowers the explanatory value of FF3. Another explanation is that other explanatory variables than SMB and HML are becoming more relevant during economic downturns and therefore the relevance of SMB and HML decreases during those periods.

C. O. Kang and H. G. Kang (2009) argue that credit risk is related to the business cycle since credit risk is increasing during economic downturns. A previous study (Avramov, Chordian, Jostova & Philipov, 2012) showed that there are implications of financial distress for the profitability of anomaly-based trading strategies. However, the strategies of price momentum, earnings momentum, credit risk, dispersion, idiosyncratic volatility, and capital investments are only profitable during economic downturns. In contrast, the value anomaly is profitable during stable or improving credit conditions and the accruals anomaly is profitable during all periods of the business cycle.

In this paper is analyzed if credit risk has a premium after controlling for CAPM and FF3 in The Netherlands, Germany and France, and if so, if this premium strengthened during economic downturns. The geographical choice is established by the fact that Germany and France are two major trading partners of The Netherlands with respectively 25% and 9% of the Dutch export in 2012, besides, Germany and France are the biggest economies in the Eurozone. Also Belgium is an important country for the Dutch export with a share of 12% but it is decided to exclude Belgium from this research since its economic value within the Eurozone is negligible (CBS StatLine, 2012).

This paper has a strong connection with the paper of Soentjens (2012) who tested CAPM, FF3 and FF4 and concluded that the asset pricing models deteriorated during economic downturns. This paper has also a strong connection to C. O. Kang and H. G. Kang (2009) who concluded that credit risk exhibits a positive premiums after controlling for FF3 and FF4 in the Korean stock market.

The paper proceeds as follows. The next sections describes the current literature, section three explains the methodology used to estimate credit risk. Section 4 describes the data, section 5 presents the empirical results, and section 6 concludes with some recommendations for further research and the limitations to this research.

2. Literature

The beginning of modern asset pricing models is founded by Markowitz (1952), he presented a new perspective on portfolio selection called Modern Portfolio Theory. Markowitz argues that it is possible to reduce the total portfolio risk by adding more securities to the portfolio and as a result diversifying away idiosyncratic risk of the assets in the portfolio (Appendix 1). A fundamental item of his diversification strategy is adding assets with a low or even negative correlation across the portfolio. Consequently, the strategy in portfolio selection changed from a focus on the individual risks and returns of assets to a mean-variance optimization model. The key concept of the mean-variance optimization model is to build a portfolio with the same or even higher expected return against a lower volatility by eliminating idiosyncratic risk as far as possible using the diversification strategy. As a result, every individual asset and every combination of individual assets can be plotted in a risk-expected return region, the upper edge of this region is called the efficient frontier (Appendix 2).

Tobin (1958) added his Separation Theorem to the Modern Portfolio Theory by incorporating an asset which pays-off a risk-free rate. The risk-free rate has zero volatility in its returns and is uncorrelated with the other assets in the portfolio as well. A tangent line called the capital market line is drawn through the risk-free rate and touches the efficient frontier, the point where the tangent line touches the efficient frontier is called the tangency portfolio (Appendix 2). The combination of the risk-free asset with the tangency portfolio has a superior risk-expected return compared to the other portfolios on the efficient frontier. Using the risk-free asset, investors should make a trade-off between the risk-free asset and the tangency portfolio. The more risk-averse an investor is, the more he invests in the risk-free asset, the more risk-seeking an investor is, the more he invests in the tangency portfolio or even goes short on the risk-free asset to use the proceeds for an additional investment in the tangency portfolio.

Sharpe (1964), Lintner (1965) and Black (1972) used the models of Markowitz (1952) and Tobin (1958) as starting point to create a capital asset-pricing model (CAPM). This model is based on two essential key assumptions. First, all investors should have the same expectations about returns, risks and distributions of each asset in the market and second, as well lending as borrowing should be available for each investor against the risk-free rate. From this view, all investors should hold the tangency portfolio disregarded their desired risk level. According to the CAPM, asset returns contain two components which is the risk-free rate and a component regarding the systematic risk the portfolio is exposed to. A component for idiosyncratic risk is excluded from the CAPM since this can be diversified away as shown in Appendix 1. The general idea of the CAPM is that investors have to be compensated for the time value of money, which is the risk-free rate (r_f), plus a risk premium as compensation for systematic risk. This risk premium is expressed by the market sensitivity (β) times the market risk premium (R_m-r_f). The market risk premium is the difference between the market return and the risk-free rate. Hence, if beta is equal to one, the expected return is equal to the expected return of the market. Or in algebraic terms:

$$E(R) = r_f + \beta * E(R_m - r_f)$$

Where, β is the covariance between the return of the asset and the return of the market divided by the variance of the return of the market:

$$\beta = \frac{cov(R_i, R_m)}{var(R_m)}$$

In conclusion, the expected return of the asset increases when the sensitivity of the asset to the market increases as well. A graph can be drawn with a security market line (SML) which presents all betas and their corresponding expected returns. A security is undervalued when it is positioned above the SML and overvalued when the security is under the SML. The theory of the CAPM and its associated SML is graphically presented in Appendix 3.

However, the CAPM neglects to show its strength in practice. To test the strength, academics base their researches on the efficient market hypothesis (EMH) of Fama (1970). The EMH includes a market where prices always fully reflect available information. If a market is efficient, it provides informative signals for investors about the value of assets. The EMH contains three degrees of relevant information subsets: (1) the weak form when prices are based on historical prices; (2) the semi-strong form when prices reflect all publicly available information; and (3) the strong form when prices contain all information also from investors or groups of investors who have monopolistic access to relevant information. The theoretical justification of the efficient market hypothesis is based on three principle ideas: (1) all investors are fully rational; (2) some investors are less than fully rational, but their effect cancels out in the aggregate; and (3) some investors are non-rational in similar, correlated ways, however, rational arbitrageurs eliminate their influences on prices. In other words, market prices are always right and the strength of a model depends on the explanatory power of the model regarding to the prices of the securities in the market. Most important criticism about the CAPM is that the underlying assumptions of the model, based on the EMH, are too simplified and unrealistic (Black, 1972). Furthermore, other academics (Merton, 1973; Basu, 1977, 1983; Banz, 1981; Bhandari, 1988) argue that the CAPM should be a multifactor model containing state variables and firm specific characteristics. Similarly, the results of Fama and MacBeth (1973), Fama and French (1992), Black, Jensen and Scholes (1972), Chan, Hamao and Lakonishok (1990) are confirming those empirical findings.

Merton (1973) was the first academic who questioned the single-dimension approach of the CAPM and argued that the CAPM is a multifactor linear model with wealth and state variables, called the ICAPM. The ICAPM takes into account that investors are hedging against shortfalls in consumption or against changes in future investment opportunity set.

Banz (1981) found that, on average, smaller firms have higher returns than larger firms which indicates a negative relationship between expected return and firm size. With this size effect, Banz confirms that the CAPM is a multifactor model. However, the effect is non-linear since the size effect is strongest for the smallest firms and fades for average and large firms. Furthermore, it is also not clear if the size effect is a proxy for systematic risk or more true unknown factors correlated with size. In addition, also other academics (Reinganum, 1981; Blume & Stambaugh, 1983; Brown, Kleidon & Marsh, 1983; Chan et al., 1991; Fama & French, 1992) are confirming the size effect. Nowadays, no conclusively explanation for the size effect is provided, Amihud and Mendelson (1986) and Liu (2006) devote the size effect to an illiquidity premium which means that smaller stocks are more illiquid and so require a higher expected return for investors. Other investors (Banz, 1981; Zhang, 2006) argue the future performance of smaller firms are harder to predict coherent with a lower supply of corporate information.

Basu (1977) finds that Price-to-Earnings ratio, due to exaggerated investor expectations, are indicators of future investment performance. The low Price-to-Earnings portfolios have, on average, higher returns than the high Price-to-Earnings portfolios. As a consequence, Basu argues that publicly available Price-to-Earnings ratios seem to have an information content since according to the efficient market hypothesis all asset prices fully reflect available information in a rapid and unbiased way. Stattman (1980) built further on the findings of Basu a found evidence for a value effect as well, however, his theory was based on the B/M-equity ratio of the firm. He concludes that high B/M-equity firms (value stocks) are realizing a higher expected return than low B/M-equity firms (growth stocks). Rosenberg, Reid and Lanstein (1985) and Chan, Hamao and Lakonishok (1991) showed similar evidence of the persistence of the value effect on respectively the US and Japanese stock markets. Other academics state that the value effect finds its origin in exogenous macroeconomic factors since value stocks are dealing worse with economic downturns or negative external shocks. As a result, including value stocks in a portfolio increases the risk of the portfolio since the performance is poorer during economic downturns in contrast to growth stocks. Because of this additional risk, the investor requires a higher expected return, the difference in expected return between value stocks and growth stocks is the value premium. (Petkova & Zhang, 2003).

Bhandari (1988) states that expected returns have a positive relation with the Debt-to-Equity ratio, also after controlling for market sensitivity and firm size. Therefore, Debt-to-Equity ratio is an additional variable to explain expected returns and no proxy for systematic risk.

Until the early 1990's, the value and size effect was only used to indicate that the market beta was not a proper benchmark to explain systematic risk. However, Fama and French (1992) combined the CAPM, size and value effect in a new model (FF3). They showed that market sensitivity seems to have no explanatory value to the average returns, while size and value capture the cross-sectional variation in average stock returns that is related to leverage. The underlying formula for the FF3 model is shown below:

$$E(R) = r_f + \beta_1 * E\left(R_m - r_f\right) + \beta_s * E(SMB) + \beta_v * E(HML)$$

Where SMB is small minus big to incorporate the size premium for the additional risk investors are taking when adding smaller firms to their portfolio over larger firms. HML is high minus low to incorporate the value premium which value stocks are receiving since they are more sensitive to economic downturns compared to growth stocks.

The relevance of the SMB and HML factors are subject of discussion. Fergusson and Shockley (2003) claim that SMB and HML serve as a proxy for default risk. According to O. Spalt (personal communication, February, 2014) who suggests that the FF3 model explains a large part of the anomalies, however it just simply defines anomalies away. In other words, it is questionable if SMB and HML are a good proxy for leverage but there is good reason to assume that small and high B/M-equity stocks defaults are correlated. If this cannot be diversified away, then it is systematic risk and commands a premium. Vassalou (2003) designed a model that includes a factor for news related to future Gross Domestic Product (GDP) growth along with the market factor. In his study he shows that he can explain the cross-section of equity returns about as well as the FF3 model can. Furthermore, SMB and HML contain mainly news related items to future GDP, when this factor is included in the FF3 model, SMB and HML lose considerable explanatory power.

A fourth factor which is added frequently to asset pricing models is the momentum-factor of Carhart (1997). Until Carhart used the momentum effect as an additional factor in the FF3 model, the momentum effect was an individual theory (Jegadeesh and Titman, 1993) to explain stock price anomalies regarding the CAPM and FF3. By adding the momentum effect in the FF3 model, a new model called Carhart's 4-factor model (FF4) is created. In this model a factor for market sensitivity, size, value and momentum was included were momentum implies the difference between the average return on the high prior return portfolios minus the average return on the low prior return portfolios. However, since this research is examining the properties of credit spread, and the momentum effect does not include relevant information about credit spread, this factor is ignored.

Over the years, there has been a lot of criticism by other academics and analysts on both models mentioned. Kothari, Shanken and Sloan (1995) mention that past B/M-equity results using COMPUSTAT data are affected by a selection bias and provide indirect evidence. As a consequence, the relation between B/M-equity ratios and returns is weaker and less consistent as shown in Fama and French (1992). In addition, Soentjens (2012) argues that the performance of FF3 worsens during economic downturns which might indicate that the effect of SMB and HML lessens during economic downturns or might contain a high degree of noise what lowers the explanatory value of FF3. Another explanation is that other explanatory variables than SMB and HML are becoming more relevant during economic downturns and therefore the relevance of SMB and HML decreases during those periods. As a consequence, researchers are focusing on new properties for default risk to investigate if there is a link between default risk and stock returns during economic downturns. However, those researches are providing conflicting results.

Avramov et al. (2012) show that the profitability of anomaly-based trading strategies like price momentum, earnings momentum, credit risk, dispersion, idiosyncratic volatility and capital investment anomalies derives exclusively from periods of financial distress. The dynamics of anomalies can be related to a sharp fall of asset prices during times of financial distress (Hand, Holthausen & Leftwich, 1992; Dichev & Piotroski, 2001). The motivation of Avramov et al. to examine financial distress is well-founded by Fama and French (1993) who argue that the size and value factors proxy for a priced distress factor. Conversely, Campbell, Hilscher, and Szilagyi (2008) argue that distressed firms have high loadings on SMB and HML factors but generate lower returns instead of higher returns as expected. However, Daniel and Titman (1997) argue that the impact on stock returns are dedicated to the size and value characteristics, not SMB and HML factor loadings. As a consequence, Avramov et al. considered credit ratings to be a characteristic of financial distress and focused on this characteristic since it has direct consequences for a firm's future performance. For instance, financial distress may cause into loss of customers, suppliers, and key employees. Moreover, managerial time is spend on dealing with financial distress instead of focusing on value-enhancing projects. In addition, investment institutions are dealing with regulatory restrictions on the minimum ratings of firms in which they can invest in. Accordingly, financial distress is an ex ante indicator of firm's future performance.

Where credit ratings were used as proxy for financial distress (Avramov et al., 2012), credit spread of individual firms measured from the Merton (1974) model is used by C. O. Kang and H. G. Kang (2009), Vassalou and Xing (2004) and Gharghori, Howard and Robert (2009). C. O. Kang and H. G. Kang examined the effect of credit risk on the return of stocks and find that credit spread captures a systematic risk in the Korean stock market which FF3 and FF4 cannot explain completely. More specifically, they defined the credit factor as the return difference between the portfolios of stocks with high and low credit spreads. Then they tested if this factor is fully explained by FF3 and FF4 and showed that the credit factor generates a statistically significant alpha when it is regressed on FF3 and FF4 which implies that it captures a systematic risk that FF3 and FF4 cannot explain. Vassalou and Xing studied the U.S. equity market and they claim that default risk is priced in equity returns and that the FF3 model is an appropriate alternative for default risk. However, Gharghori et al. are showing contradicting results for the Australian market. And to make it even more confusing, Anginer and Yildizhan (2010) are showing unusually low returns for distressed stocks in the U.S. corporate bond market, in other words, default risk is not priced in equity returns, although distressed stock performed abnormally based on leverage, volatility and profitability. Those conflicting results are arising a new question; whether the pricing of default risk differs across equity markets.

Several studies with a different geographical focus are conducted to test the performance of CAPM and FF3. Bauer, Cosemans and Schotman (2010) argues that the explanatory power of FF3 is higher in Europe compared to the US. In addition, they confirm that the size effect which vanished in the US after its discovery, is still present in Europe. Another European oriented study is conducted by Akgul (2013), in this study is the difference between the FF3 model before and after the formation of the EMU investigated. Akgul shows that the FF3 model is significant in eleven out of thirteen countries before the formation of the EMU and seven out of ten countries get even better results after the formation of the EMU.

So far, several studies about credit risk are conducted, as well studies which tested asset-pricing models with a European dataset. However, no study can be found which used the Merton (1974) model to investigate if credit spread captures a systematic risk in the Dutch, German and French stock market which CAPM and FF3 cannot explain completely.

3. Methodologies

The price of a stock reflects the sum of all future dividends payments, discounted back to their present value (Gordon, 1962). A stock price drops to nearly zero when a firm defaults since no more dividends are paid to equity holders, just perhaps an amount which is left after all junior holders are paid. In other words, equity can be interpreted as debt with the last seniority that pays regularly dividends as coupons, hence, equities are subject to credit risk as corporate debts are.

There exist various methodologies to obtain data for credit risk related to equities. Avramov et al. (2012) used issuer credit ratings as measurement of credit risk, however, for this research there does not exist enough Dutch, German and French credit ratings to obtain reliable results. As a consequence, in this paper is chosen for the methodology of Merton (1974) which is based on the Black-Scholes-Merton model (Black & Scholes, 1973; Merton, 1973) to measure credit risk at an individual firm level. The Black-Scholes-Merton model argues that derivatives on the firm's assets is the basic approach for the valuation of stocks and corporate bonds, viewing the firm's equity as a call option on its assets because equity holders are entitled to the residual value of the firm after all its obligations are paid. Moreover, by using the credit risk of individual firms measured by the Merton model enables to include firms without credit risk or rating information in the analysis so that the analysis is free of sample selection bias. C. O. Kang and H. G. Kang (2009) used this method as well, and their interpretation of the Merton's model is used to obtain a variable for credit risk called credit spread. Credit spread is the difference in yield between securities that are comparable to each other except for quality rating.

A_t denotes the firm's asset value at time t. The firm's asset value is financed by equity (E) and zero-coupon bonds with face value D_T maturing at time T. When the firm's total asset value at maturity A_T falls below the amount of debt it has to repay (D_T), it is falling into default. Assume the asset value follows a Geometric Brownian motion:

$$\frac{dA_t}{A_t} = \mu_A dt + \sigma_A dW_t \quad (1)$$

Where μ_A is the expected continuous-compounded return, σ_A is the annualized asset volatility, and W_t is a Brownian motion. The firm's asset value and its volatility are not observable. Because equity has limited liability, the value of equity at time T can be denoted as:

$$E_T = \max[A_T - D_T, 0] \tag{2}$$

As a consequence, equity is interpreted as a call option on the firm's asset value with the exercise price equal to the face value of debt maturing at time T. Following Black and Scholes (1973) and Merton (1973), the solution of the current value of equity is:

$$E_0 = A_0 N(d_1) - D_T e^{-rT} N(d_2) \tag{3}$$

Where $d_1 = \frac{\ln\left(\frac{A_0 e^{r_f T}}{D_T}\right) + \frac{1}{2}\sigma^2 A^T}{\sigma_A \sqrt{T}}$ and $d_2 = d_1 - \sigma_A \sqrt{T}$. N is the cumulative standard normal distribution function, and r_f is the risk-free interest rate. Because E_t is a function of A_t, it follows from the Itô formula that:

$$dE_t = \left(\frac{\partial E_t}{\partial t} + \frac{\partial E_t}{\partial A_t} A_t \mu_A + \frac{1}{2}\frac{\partial^2 E_t}{\partial A_t^2}\right) dt + \frac{\partial E_t}{\partial A_t} A_t \sigma_A dW_t \tag{4}$$

Then, suppose that the value of equity also follows a Geometric Brownian motion:

$$\frac{dE_t}{E_t} = \mu_E dt + \sigma_E dW_t \tag{5}$$

Where σ_E is the equity volatility. Jones, Mason and Rosenfeld (1984) show that matching volatility terms in the above two equations gives:

$$\sigma_E = \frac{\delta E_t}{\delta A_t}\frac{A_t}{E_t}\sigma_A \tag{6}$$

Because the hedge ratio is $\frac{\partial E_t}{\partial A_t} = N(d_1)$, the solution for equity volatility is:

$$\sigma_E = N(d_1)\frac{A_0}{E_0}\sigma_A \tag{7}$$

By simultaneously solving equations (3) and (7), the current asset value A_0 and the asset volatility σ_A can be obtained from the observable variables E_0, σ_E, D_T and T. The current value of debt is $D_0 = D_T e^{-(r_f+s)T} = A_0 - E_0$ where s is the credit spread of the firm. Consequently, the implied credit spread is expressed by:

$$s = \frac{1}{T}\ln\left(\frac{D_T}{A_0 - E_0}\right) - r_f \tag{8}$$

Where s is denoted by credit spread in this paper. Since credit spread is a function of observable variables such as stock price, equity volatility and risk-free interest rate, firm-specific credit spreads can be calculated. In fact, credit spread should equal the probability of default times the expected loss (Pu, Wang & Wu., 2011). In other words, if the probability of default increases, the credit spread will increase ceteris paribus. The probability of default can be defined as the ability of a firm to repay its debt obligations which depends on both systematic as idiosyncratic risk factors. An example of a systematic risk factor is the overall state of the economy, in contrast to idiosyncratic risk like capital structure which is firm-specific.

4. Data

Starting from January 4th, 1999, all share prices within the Eurozone are quoted in Euro and this is one of the main reasons that the number of shares and share prices from the Dutch, German and French market are all downloaded from Compustat Global – Security Daily from that day on. Another important reason is the necessity to diminish the amount of firms in the sample because of the time-consuming creation of volatility over the last 252 trading days. However, at least 336 firms (48 portfolios times an average portfolio size of 7 firms) for each time-period is maintained, consequently, the final dataset starts at December 2004, the end of the dataset is set on the end of the Sovereign Debt Crises in 2012. Regarding to Appendix 4, the total number of firms included in the dataset is 1030 with an average of 532 firms per month. In the beginning of the sample, December 2004, there are 435 firms included in the sample. In December 2012, at the end of the sample, 630 firms are included. The minimum number of firms is 368, recorded in February 2009 and the maximum number of firms is 648, recorded in December 2011. For each time-period, The Netherlands are represented with a share varying between 1.1%-1.9%, France with a share varying between 42.3%-49.8% and Germany with a share varying between 49.0%-56.0%. Consequently, the contribution of The Netherlands is small and the contribution of France and Germany are approximately equal to each other. Furthermore, the sample contains only non-financial firms since high leverage is normal for financial firms. As a consequent, the degree of leverage between financial firms and non-financial firms cannot be compared with each other since high leverage for non-financials firms normally indicates financial distress (Fama and French, 1992).

Before performing the FF3 analysis, two main variables are generated which is the Market Value of Equity (ME) and the Book Value of Equity (BE). ME is generated by multiplying the share prices with the corresponding number of stocks outstanding and BE is generated by Total Book Value of the Firm (BF) minus Total Book Value of Liabilities (BL) plus Balance Sheet Deferred Taxes and Investment Tax Credit (BTX) minus the Book Value of Preferred Stock (BPS) (Fama and French, 1993). All missing values of the variables BTX and BPS are replaced by zero since the data is probably not missing but equal to zero. BF, BL, BTX and BPS are gathered from Compustat Global – Fundamentals Quarterly which only contains quarterly data. Since monthly data is used in this research, the assumption is made that for the variables BE and BL one third of the difference between the two quarters can be added to the next month and two third of the difference can be added to the second next month. (C. O. Kang and H. G. Kang, 2009).

To generate the variable Market Value of the Firm (MF), some important assumptions are made. The time horizon is considered to be equal to one year. The risk-free rate used is equal to the one month offer rate of EURIBOR expressed in an annual rate. The equity volatility is the daily volatility over the returns of the last 252 trading days (based on at least 100 daily returns) expressed in an annual rate. Furthermore, as an approximation, the asset volatility is assumed to be the same as the equity volatility. The current MF can be obtained by solving equation 3 or 7, according to C. O. Kang and H. G. Kang (2009), the results of the two equations are similar and confirming the validity of our approximation about volatility.

To perform the factor analysis, 18 mimicking portfolios are created by separating ME on its 50% percentile and both BE/ME and credit spread by their 30% and 70% percentiles (Fama and French, 1993). Since BE/ME has a stronger explanatory value for expected returns compared to size, the decision is made to separate BE/ME in three groups and size in two groups (Fama and French, 1992). Following another research of Avramov et al., (2012), it is decided to separate credit spread in three groups as well. In this research is chosen to create percentiles based on the dataset in contrast to Fama and French which created their percentiles based on the NYSE. The portfolios are constructed every year in July of year t to June of t+1. Then, the monthly value-weighted returns of the 18 portfolios are calculated. Afterwards, SMB is estimated for each month by subtracting the simple average return of the nine big ME portfolios form the simple average return of the nine small ME portfolios. HML and HSMLS are estimated in almost the same way. HML is constructed by subtracting the simple average return of the six lowest BE/ME portfolios from the simple average return of the six highest BE/ME portfolios. HSMLS is estimated by subtracting the simple average of the six lowest credit spread portfolios from the simple average of the six highest credit spread portfolios.

Finally, the dependent variable called excess market return is calculated by market return minus the one month offer rate of EURIBOR. For each period, the market return is based on the value-weighted contribution of three stock market returns: the Dutch, French and German stock market returns. The market return of the Netherlands is represented by the AEX All Share Index including 117 firms, France is represented by the CAC All Tradable which includes 326 firms and the CDAX General Index represents Germany with 482 firms.

Excess returns on 48 portfolios formed on ME, BE/ME and credit spread are used to explain the returns of stocks to determine if the mimicking portfolios SMB, HML and HSMLS capture a risk premium in stock returns related to size, B/M-equity and credit spread. Size, B/M-equity and credit spread are sorted on June of each year t. To sort size, ME is measured at the end of June. For the B/M-equity sort, ME is calculated at the end of December of year t-1 and BE is taken form the fiscal year ending in year t-1. Credit spread is also taken from the end of December of year t-1. From July of year t to June of year t+1, 48 portfolios are constructed on three equal percentiles for size and B/M-equity and on two percentiles for credit spread, 30% and 70%.

To analyze if the HSMLS premium strengthened during economic downturns, two timespans are formed which are: (1) December 2004 to December 2012 and (2) July 2008 to December 2012. Where the first timespan is the whole final dataset, the second timespan is based on the start of the Subprime Mortgage Crises in July 2008 till the end of the Sovereign Debt Crises in December 2012. Officially, the Subprime Mortgage Crises started a bit earlier but portfolios are always reallocated in June.

5. Empirical Results

In this section, the statistics and empirical tests regarding to the extension of the FF3 model with credit spread is described. As pronounced before, the purpose of this research is to investigate whether credit spread has a premium and if this premium becomes more relevant during economic downturns. To investigate this, the Fama and MacBeth (1973) regression procedure is used. However, at first the data between December 2004 and December 2012 is described in Table 1, 2 and 3.

Table 1: Descriptive statistics of the magnitude of the dataset for 48 stock portfolios formed on size, B/M-equity ratio and credit spread between December 2004 and December 2012.

Average market value per portfolio (in percent)						**Average number of firms per portfolio**					
Low credit spread					40.88	**Low credit spread**					30.67
		B/M						B/M			
		1	2	3	4			1	2	3	4
	1	0.01	0.01	0.01	0.01		1	6.3	7.3	7.4	3.6
Size	2	0.11	0.11	0.05	0.02	Size	2	21.8	17.7	9.8	4.4
	3	0.69	0.56	0.40	0.08		3	29.4	21.1	14.5	3.6
	4	19.17	13.53	6.31	0.57		4	37.0	25.0	11.9	1.7
Medium credit spread					46.16	**Medium credit spread**					39.92
		B/M						B/M			
		1	2	3	4			1	2	3	4
	1	0.02	0.02	0.04	0.03		1	11.8	11.8	19.4	15.5
Size	2	0.09	0.10	0.17	0.12	Size	2	14.4	15.8	23.4	19.2
	3	0.32	0.65	0.66	0.36		3	12.9	22.3	26.7	15.2
	4	6.93	14.90	13.74	8.87		4	14.2	29.0	21.6	16.4
High credit spread					12.97	**High credit spread**					29.41
		B/M						B/M			
		1	2	3	4			1	2	3	4
	1	0.03	0.02	0.03	0.07		1	18.2	13.2	19.1	42.4
Size	2	0.04	0.05	0.07	0.17	Size	2	8.0	7.4	13.0	27.9
	3	0.11	0.12	0.25	0.44		3	5.0	5.7	8.6	17.3
	4	1.93	2.41	4.23	3.24		4	2.0	4.7	10.6	10.3

Table 1 shows that most firms with a lower credit spread have a big size and a low B/M-equity ratio. Firms with a medium credit spread have a medium size and B/M-equity ratio while most firms with a high credit spread are allocated to small size percentile and high B/M-equity percentile. Those results are in line with the expectations since it is proven before that bigger (smaller) firms with a higher (lower) B/M-equity ratio are more (less) risky. And if size and B/M-equity ratio are indeed an approximation for default risk, than most firms should be allocated to the big size and low B/M-equity ratio for low credit spread and to the small size and high B/M-equity ratio for high credit spread.

Table 1 also shows that the average market value per portfolio is lowest for the small size portfolio and highest for the big size portfolios. Which is remarkable is that the portfolios with the highest credit spread account for just 12.97% of the dataset while the total number of firms for those portfolios is 29.41% of the dataset. This confirms again the expectation that if size is an approximation for default risk, size has to be small for high credit spread. In addition, also the value-weighted share of high B/M-equity ratios is increasing when credit spread becomes higher.

Table 2 shows the descriptive statics of the independent variables constructed by size, B/M-equity ratio and credit spread. Since size is divided in four percentiles, the first percentile has the lowest average firm size and the fourth percentile has the highest firm size. The same works for B/M-equity ratio. Credit spread is divided into three percentiles, consequently, the first percentile contains the lowest credit spread and the third percentiles contains the highest credit spreads. Looking to this summary, it can be concluded that the higher credit spread, the smaller the size except for the lowest B/M-equity percentile. In addition, the higher credit spread, the higher B/M-equity. And especially for the highest credit spreads: the higher B/M-equity, the higher credit spread.

Table 2: Descriptive statistics of the independent variables (size, B/M-equity ratio and credit spread) for 48 stock portfolios formed on size, B/M-equity ratio and credit spread between December 2004 and December 2012.

Average firm size per portfolio						**Average B/M-equity ratio per portfolio**						**Average credit spread per portfolio**					
Low credit spread						**Low credit spread**						**Low credit spread**					
		B/M						B/M						B/M			
		1	2	3	4			1	2	3	4			1	2	3	4
	1	20	23	20	22		1	0.33	0.69	0.95	1.24		1	0.006	0.011	0.007	0.007
Size	2	62	62	56	52	Size	2	0.36	0.61	0.81	1.33	Size	2	0.007	0.006	0.002	0.008
	3	231	244	263	245		3	0.32	0.58	0.82	1.07		3	0.002	0.003	0.008	0.002
	4	4535	4808	4920	1643		4	0.32	0.54	0.77	1.07		4	0.003	0.003	0.005	0.002
Medium credit spread						**Medium credit spread**						**Medium credit spread**					
		B/M						B/M						B/M			
		1	2	3	4			1	2	3	4			1	2	3	4
	1	18	22	20	17		1	0.34	0.61	0.86	1.53		1	0.036	0.028	0.033	0.042
Size	2	62	62	63	56	Size	2	0.32	0.57	0.89	1.40	Size	2	0.019	0.018	0.024	0.026
	3	248	255	231	209		3	0.37	0.62	0.92	1.31		3	0.019	0.018	0.026	0.026
	4	4033	4751	5333	4500		4	0.37	0.62	0.84	1.27		4	0.016	0.024	0.022	0.020
High credit spread						**High credit spread**						**High credit spread**					
		B/M						B/M						B/M			
		1	2	3	4			1	2	3	4			1	2	3	4
	1	18	18	19	18		1	0.25	0.53	0.90	1.58		1	0.166	0.127	0.122	0.168
Size	2	63	59	57	56	Size	2	0.31	0.63	0.93	1.66	Size	2	0.066	0.094	0.107	0.122
	3	230	272	274	246		3	0.28	0.62	0.79	1.68		3	0.050	0.098	0.094	0.107
	4	6041	5189	4202	2962		4	0.32	0.62	1.04	1.89		4	0.056	0.074	0.137	0.113

Table 3 presents the means, volatilities and t-statistics for means of the dependent variable, which are the excess returns of the portfolios between December 2004 and December 2012. Regarding to the t-statistics, the means are not convincingly confirming the relationship as seen in Table 1 and 2. In summary, the means of portfolios 6, 8, 13, 14, 16, 23, 24, 25, 26, 28, 29, 35, 37, 44, 45 and 48 are positively and significantly different from zero at the 10% level. The means of portfolios 11, 12, 19, 20, 27, 32, 38, 40, 42 and 46 are positive and significantly different from zero at the 5%. At the 1% level are the means of portfolios 22 and 36 positively and significantly different from zero. Overall, the data is Table 3 are not convincing enough to draw any conclusions about the relationship between size, B/M-equity ratio, credit spread and excess returns.

Table 3: Descriptive statistics of the dependent variable (excess return) for 48 stock portfolios formed on size, B/M-equity ratio and credit spread between December 2004 and December 2012. T-statistics with a *, ** and *** are respectively significant at the 10%, 5% and 1% level. The t-tests are based on 96 degrees of freedom.

		Means (in percent)						**Volatilities (in percent)**						**T-statistics for means**			
Low credit spread						**Low credit spread**						**Low credit spread**					
		B/M						B/M						B/M			
		1	2	3	4			1	2	3	4			1	2	3	4
	1	-0.18	0.37	0.41	0.59		1	5.3	6.8	6.7	8.8		1	-0.33	0.53	0.60	0.61
Size	2	0.61	0.87	0.75	1.03	Size	2	5.0	5.3	5.9	6.5	Size	2	1.20	1.62*	1.26	1.56*
	3	0.34	0.44	0.95	1.49		3	5.1	5.1	5.2	7.9		3	0.67	0.83	1.81**	1.85**
	4	0.62	0.60	0.42	1.22		4	4.3	4.5	6.1	8.2		4	1.40*	1.32*	0.68	1.43*
Medium credit spread						**Medium credit spread**						**Medium credit spread**					
		B/M						B/M						B/M			
		1	2	3	4			1	2	3	4			1	2	3	4
	1	-0.59	0.64	1.05	1.44		1	7.7	6.2	5.6	6.2		1	-0.75	1.02	1.84**	2.27**
Size	2	0.52	1.48	0.79	0.86	Size	2	5.8	5.6	4.8	5.6	Size	2	0.89	2.58***	1.63*	1.52*
	3	0.93	1.03	1.04	0.75		3	6.4	6.1	5.6	5.7		3	1.43*	1.64*	1.83**	1.30*
	4	0.76	0.70	0.60	1.27		4	5.7	5.9	6.1	5.5		4	1.30*	1.17	0.97	2.29**
High credit spread						**High credit spread**						**High credit spread**					
		B/M						B/M						B/M			
		1	2	3	4			1	2	3	4			1	2	3	4
	1	0.69	0.73	0.77	1.60		1	5.9	5.8	5.8	5.1		1	1.17	1.24	1.31*	3.09***
Size	2	1.36	1.20	0.50	1.34	Size	2	8.7	6.3	6.4	5.7	Size	2	1.51*	1.87**	0.77	2.33**
	3	0.43	2.25	0.86	1.11		3	8.8	10.3	8.1	6.8		3	0.46	2.16**	1.04	1.59*
	4	1.67	2.09	0.19	1.09		4	8.7	11.1	9.4	7.9		4	1.30*	1.73**	0.19	1.35*

However, when comparing the means of big size/low credit spread to small size/high credit spread, it can be seen that the means for small size/high credit spread are higher. In addition the means of high credit spread/high B/M-equity ratio are higher compared to the ones of low credit spread/low B/M-equity ratio.

The methodology of Fama and Macbeth (1973) is used to measure the impact of the market premium, SMB, HML and HSMLS against the excess portfolio returns. In the first pass, each portfolio receives a beta value for those factors by using the following time series regression:

$$r_{it} - r_{ft} = \alpha_i + \beta_1(r_m - r_f) + \beta_s * SMB_t + \beta_v * HML_t + \beta_c * HSMLS_t + \varepsilon_i$$

Where r_i-r_f is the excess return of portfolio i in month t, r_m-r_f is the market risk premium. Then, β_1 is the sensitivity of the portfolios excess return to the market risk premium, β_s is the sensitivity of the portfolio's excess return to the factor SMB, β_v is the sensitivity of the portfolio's excess return to the factor HML and β_c is the sensitivity of the portfolio's excess return to the factor HSMLS. α is a constant term and ε is an error term.

In the second pass, the beta values gathered are used to run t cross sectional regressions:

$$r_{i,t} - r_{f,t} = \lambda_0 + \lambda_1\hat{\beta}_{1,i} + \lambda_1\hat{\beta}_{s,i} + \lambda_1\hat{\beta}_{v,i} + \lambda_1\hat{\beta}_{c,i} + \varepsilon_{it}$$

Then the average of each lambda is calculated by $\hat{\lambda}_i = \frac{1}{T}\sum_{t=1}^{T}\hat{\lambda}_{it}$. To test whether the lambdas are significant, the respective t-statistics for each lambda is conducted with a t-test (one-sample mean-comparison test with a hypothesized mean of 0).

Table 4: Fama and MacBeth (1973) analysis of the dependent variable (excess return) for 48 stock portfolios formed on size, B/M-equity ratio and credit spread. Three models are chosen to examine if adding SMB, HML and HSMLS improves calculation of excess returns. Three datasets are chosen to investigate if the results differ in time; (1) December 2004 to December 2012, and (2) July 2008 to December 2012. T-statistics with a * and ** are respectively significant at the 10% and 5% level. The t-tests are based on 96 degrees of freedom for the first dataset and 53 degrees of freedom for the second dataset.

	Alpha (in percent)	**Market Premium (in percent)**	**SMB (in percent)**	**HML (in percent)**	**HSMLS (in percent)**
Dec. 2004-Dec. 2012	0.67	0.24			
CAPM	1.49*	0.37			
Dec. 2004-Dec. 2012	0.32	0.53	0.12	0.48	
FF3	0.82	0.79	0.41	1.92**	
Dec. 2004-Dec. 2012	0.70	0.00	0.05	0.53	0.15
FF3+HSMLS	1.67**	0.00	0.17	2.06**	0.42
July 2008-Dec. 2012	0.79	-0.04			
CAPM	1.73**	-0.04			
July 2008-Dec. 2012	0.54	0.17	0.18	0.36	
FF3	1.45*	0.19	0.41	1.01	
July 2008-Dec. 2012	0.73	-0.14	0.14	0.45	-0.09
FF3+HSMLS	1.74**	-0.16	0.33	1.25	-0.18

Regarding to Table 4, three models are investigated, the CAPM model, FF3 and FF3 in combinations with a credit spread premium to investigate if adding SMB, HML and HSMLS improves the models. Besides, two time periods are used to examine if models differ across time.

Looking to the premiums, it can be concluded that there is no significant effect for the market premium, size premium and the credit risk premium. The value premiums have a positive and significant effect at the 5% level during December 2004 to December 2012 for the FF3 model and FF3 in combination with HSMLS. The value premiums are respectively equal to 0.48% and 0.53%. In other words, firms with high B/M equity ratios are more risky (positive premium) and hence their discount rates will be higher which results in a lower value (price) today. Investors who are bearing higher risks by holding high B/M equity ratios, want to be compensated for it and require higher expected returns.

Alpha is a good measurement to investigate the performance of the three models and time periods used. The closer alpha is to zero, the better the performance of the model. The alphas of the

CAPM, FF3 and FF3 in combination with the credit spread premium are respectively equal to 0.67%, 0.32% and 0.70% for December 2004 to December 2012. Consequently, the FF3 model has the best performance. Furthermore, the alpha of the FF3 model is not significantly different from zero. For the period July 2008 to December 2012, the alphas of the CAPM, FF3 and FF3 in combination with the credit spread premium are respectively equal to 0.79%, 0.54% and 0.73%. In other words, the FF3 model has again the best performance. Looking to the time-periods, the alphas of the models based on December 2004 to December 2012 are outperforming the alphas of the same models in the period July 2008 to December 2012. In conclusion, the FF3 model in the period December 2004 to December 2012 has the best performance.

6. Conclusion

In this research is investigated whether credit spread captures systematic risk which cannot be fully explained by CAPM or FF3. In addition, it is investigated if this premium changes in time. All Dutch, French and German firms listed on respectively the AEX All Share Index, CAC All Tradable and CDAX General Index between December 2004 and December 2012 are included in the dataset. The Fama and Macbeth (1973) analysis is used for the regressions, based on 48 portfolios formed by size, book-to-market-equity ratio and credit spread. The Merton (1974) model is used to create credit spread as characteristic for credit risk.

In this research is not proven that credit spread captures systematic risk which cannot be explained by CAPM or FF3. This is not in line with the findings of Avramov et al. (2012), C. O. Kang and H. G. Kang (2009) and Vassalou and Xing (2004) who are showing a positive relationship between excess returns and credit risk. Even more, this research did not prove a stronger credit risk premium during economic downturns. In conclusion, in this research is no significant relationship between credit risk and excess returns.

Looking to the other premiums, it can be concluded that the market premium and size premium have also no significant explanatory value to the excess returns which is contrary to the research of Fama and French (1992). However, this result is in line with Cosemans and Schotman (2010) who argue that the size effect vanished in the US after its discovery although the showed that the size effect is still present in Europe. The value premium is present in the FF3 model and the FF3 model in combination with the credit spread premium from December 2004 to December 2012 and is significant at the 5% level.

At last has to be mentioned that this research is based on some limitations and assumptions. One important limitation is the necessity to diminish the amount of firms in the sample because of the time-consuming creation of volatility over the lasts 252 trading days. As a consequence, too few firms are allocated to the portfolios, and hence, the diversification is not enough to avoid a high degree of noise. As a consequence, the results in Table 3 and 4 have low explanatory value. Second, The Netherlands is represented with a share varying between 1.1%-1.9% each period which is very low compared to the shares of France (42.3%-48.9%) and Germany (49.8%-56.0%). However, the results of this research is still representative for The Netherlands since the economy of the Netherland depends heavily on the French and German economies. And third, some important assumptions are made to generate the market value of the firm since the time horizon is set equal to one year, the risk-free rate used is equal to the one month offer rate of EURIBOR and the equity volatility is assumed to be equal to the asset volatility.

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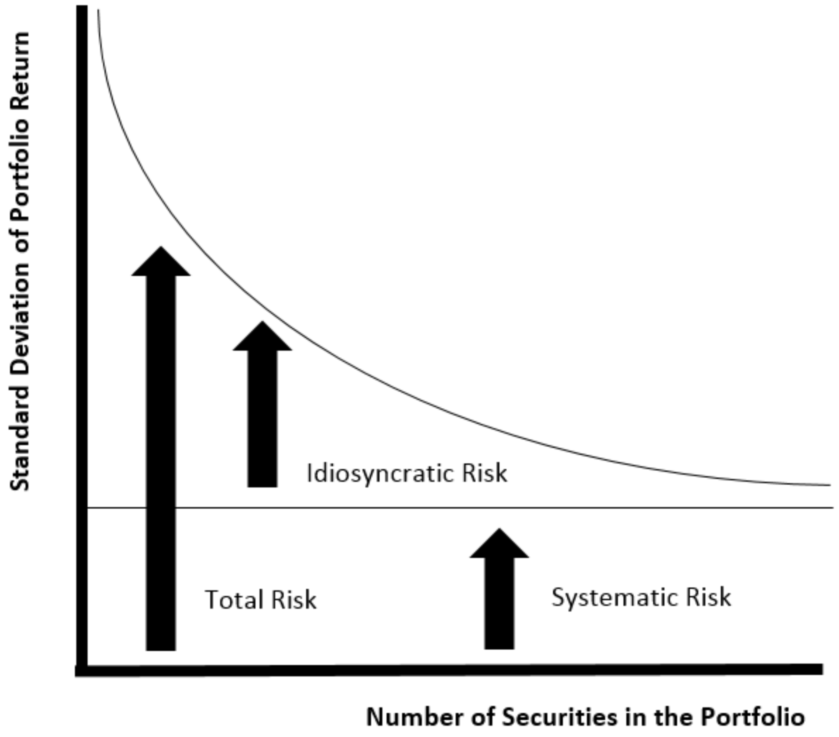
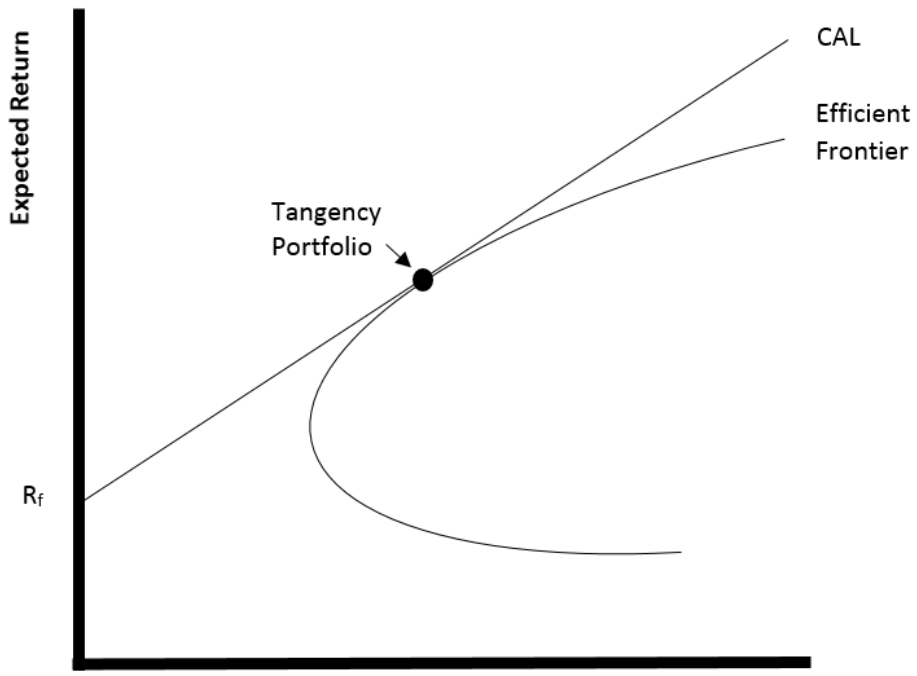
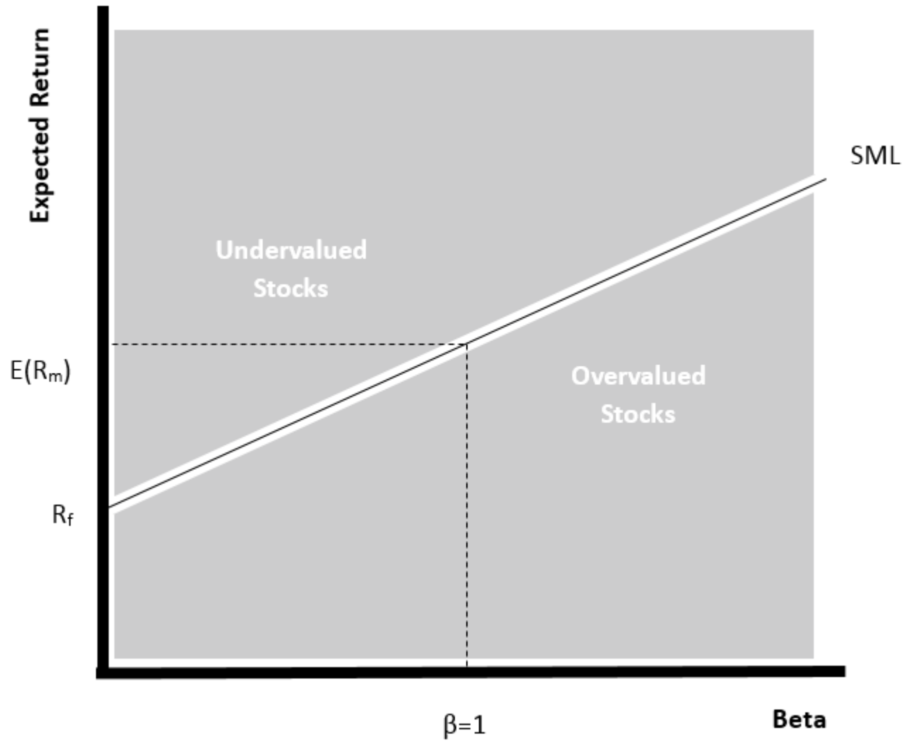
Appendix 1: Systematic vs. Idiosyncratic Risk



Appendix 2: Modern Portfolio Theory and Separation Theorem



Appendix 3: Capital Asset Pricing Model



Appendix 4: Number of firms in each time-period

Month	The Netherlands		France		Germany		Total
December, 2004	8	1,8%	198	45,5%	229	52,6%	435
January, 2005	7	1,8%	172	43,9%	213	54,3%	392
February, 2005	7	1,8%	176	44,0%	217	54,3%	400
March, 2005	7	1,6%	199	46,6%	221	51,8%	427
April, 2005	7	1,9%	180	47,9%	189	50,3%	376
May, 2005	7	1,9%	173	46,8%	190	51,4%	370
June, 2005	8	1,8%	211	47,2%	228	51,0%	447
July, 2005	8	1,6%	211	43,1%	271	55,3%	490
August, 2005	8	1,7%	209	43,4%	265	55,0%	482
September, 2005	8	1,7%	206	43,0%	265	55,3%	479
October, 2005	8	1,7%	210	43,8%	261	54,5%	479
November, 2005	8	1,6%	214	43,9%	266	54,5%	488
December, 2005	8	1,6%	230	45,5%	268	53,0%	506
January, 2006	8	1,7%	207	43,3%	263	55,0%	478
February, 2006	8	1,7%	205	43,4%	259	54,9%	472
March, 2006	8	1,7%	200	42,3%	265	56,0%	473
April, 2006	8	1,8%	191	44,0%	235	54,1%	434
May, 2006	7	1,6%	192	43,6%	241	54,8%	440
June, 2006	8	1,7%	206	43,6%	258	54,7%	472
July, 2006	8	1,5%	255	47,0%	279	51,5%	542
August, 2006	8	1,5%	258	47,5%	277	51,0%	543
September, 2006	7	1,4%	235	48,5%	243	50,1%	485
October, 2006	7	1,5%	230	47,8%	244	50,7%	481
November, 2006	8	1,5%	255	47,5%	274	51,0%	537
December, 2006	8	1,5%	259	47,8%	275	50,7%	542
January, 2007	8	1,5%	250	47,1%	273	51,4%	531
February, 2007	8	1,5%	256	47,9%	270	50,6%	534
March, 2007	8	1,7%	228	47,7%	242	50,6%	478
April, 2007	7	1,5%	224	48,5%	231	50,0%	462
May, 2007	8	1,6%	244	47,7%	259	50,7%	511
June, 2007	7	1,4%	238	48,6%	245	50,0%	490
July, 2007	7	1,2%	278	48,9%	283	49,8%	568
August, 2007	7	1,2%	276	48,5%	286	50,3%	569
September, 2007	7	1,3%	266	48,4%	277	50,4%	550
October, 2007	7	1,3%	267	48,3%	279	50,5%	553
November, 2007	7	1,3%	267	48,3%	279	50,5%	553
December, 2007	7	1,3%	271	48,5%	281	50,3%	559

Month	The Netherlands		France		Germany		Total
January, 2008	7	1,3%	249	47,8%	265	50,9%	521
February, 2008	7	1,3%	254	48,4%	264	50,3%	525
March, 2008	7	1,3%	254	48,8%	260	49,9%	521
April, 2008	7	1,4%	239	47,2%	260	51,4%	506
May, 2008	6	1,3%	203	45,4%	238	53,2%	447
June, 2008	7	1,5%	206	45,1%	244	53,4%	457
July, 2008	7	1,3%	248	45,0%	296	53,7%	551
August, 2008	7	1,3%	237	44,1%	293	54,6%	537
September, 2008	7	1,4%	225	44,9%	269	53,7%	501
October, 2008	5	1,1%	210	46,6%	236	52,3%	451
November, 2008	7	1,4%	222	45,0%	264	53,5%	493
December, 2008	7	1,4%	234	46,1%	267	52,6%	508
January, 2009	7	1,7%	183	43,8%	228	54,5%	418
February, 2009	7	1,9%	157	42,7%	204	55,4%	368
March, 2009	7	1,7%	181	43,4%	229	54,9%	417
April, 2009	6	1,4%	199	45,4%	233	53,2%	438
May, 2009	6	1,2%	220	45,2%	261	53,6%	487
June, 2009	7	1,4%	219	44,2%	270	54,4%	496
July, 2009	8	1,4%	264	47,4%	285	51,2%	557
August, 2009	8	1,5%	257	47,5%	276	51,0%	541
September, 2009	8	1,4%	261	46,4%	293	52,1%	562
October, 2009	8	1,6%	239	46,5%	267	51,9%	514
November, 2009	8	1,6%	240	47,0%	263	51,5%	511
December, 2009	7	1,2%	276	47,6%	297	51,2%	580
January, 2010	7	1,3%	254	46,5%	285	52,2%	546
February, 2010	8	1,5%	247	46,3%	279	52,2%	534
March, 2010	7	1,3%	257	47,1%	282	51,6%	546
April, 2010	6	1,1%	254	46,6%	285	52,3%	545
May, 2010	7	1,3%	252	45,9%	290	52,8%	549
June, 2010	7	1,2%	259	46,1%	296	52,7%	562
July, 2010	7	1,3%	257	46,8%	285	51,9%	549
August, 2010	7	1,3%	256	47,2%	279	51,5%	542
September, 2010	7	1,1%	299	48,1%	316	50,8%	622
October, 2010	7	1,2%	282	47,1%	310	51,8%	599
November, 2010	7	1,2%	278	47,3%	303	51,5%	588
December, 2010	7	1,1%	303	48,2%	319	50,7%	629

Month	The Netherlands		France		Germany		Total
January, 2011	7	1,2%	293	48,3%	307	50,6%	607
February, 2011	7	1,1%	293	48,0%	310	50,8%	610
March, 2011	7	1,1%	294	48,3%	308	50,6%	609
April, 2011	7	1,2%	288	48,6%	298	50,3%	593
May, 2011	7	1,2%	288	49,0%	293	49,8%	588
June, 2011	7	1,1%	298	48,2%	313	50,6%	618
July, 2011	7	1,1%	318	49,1%	322	49,8%	647
August, 2011	7	1,1%	318	49,4%	319	49,5%	644
September, 2011	7	1,1%	310	49,0%	316	49,9%	633
October, 2011	7	1,1%	310	48,8%	318	50,1%	635
November, 2011	7	1,1%	303	48,2%	318	50,6%	628
December, 2011	7	1,1%	314	48,5%	327	50,5%	648
January, 2012	7	1,1%	297	48,1%	314	50,8%	618
February, 2012	7	1,1%	301	48,5%	312	50,3%	620
March, 2012	7	1,1%	299	48,9%	306	50,0%	612
April, 2012	7	1,2%	289	48,7%	297	50,1%	593
May, 2012	7	1,2%	292	48,0%	309	50,8%	608
June, 2012	7	1,1%	297	48,6%	307	50,2%	611
July, 2012	7	1,1%	313	48,6%	324	50,3%	644
August, 2012	7	1,1%	307	48,9%	314	50,0%	628
September, 2012	7	1,1%	309	48,6%	320	50,3%	636
October, 2012	7	1,1%	310	49,8%	305	49,0%	622
November, 2012	7	1,1%	307	49,4%	307	49,4%	621
December, 2012	7	1,1%	314	49,8%	309	49,0%	630