Portfolio diversification in the EMU, is it big enough?

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Executive summary

The allocation of wealth should be such that a portfolio is diversified with those stocks that yield a maximum expected return against the lowest possible variance. These are the basic principles of Markowitz' portfolio theory. Diversification benefits increase if more stocks are added to the portfolio and if these stocks are not perfectly correlated. The performance of a portfolio can be measured with the Sharpe ratio. The ratio is able to measure the excess return of a portfolio related to the portfolio risk, e.g., if there is a one percent increase in risk, with what percentage does the return increase? So the higher the Sharpe ratio, the better the performance of a portfolio.

Studies by Grubel (1968) and Levy & Sarnat (1970) have confirmed the theory of portfolio diversification. Portfolio risk can be reduced by holding more assets from different countries, because these stocks are not perfectly correlated. The correlation, however, has changed over time due to an increasing financial integration between countries, e.g. Asia and the European Monetary Union (EMU), affecting not only correlation but also volatility. Studies by Bekeart & Harvey (2000) and Bekeart, Harvey & Lumsdaine (2002) have found that there is a positive relation between integration, correlation and volatility, while Morana & Beltratti (2002) and Adjaouté & Danthine (2003) have found a similar relation for the EMU. Despite the increasing financial integration there are still diversification benefits to obtain in Asia as well as in the EMU.

A study by Haselmann & Herwartz (2008) has determined the effect for a country if it adopts the Euro. They concluded that on the short run the effects on diversification benefits are positive, while on the long run these are likely to become negative due to the increasing financial integration. In line with Haselmann & Herwartz (2008), the purpose of this thesis is to determine the diversification benefits for a European investor within the EMU and the effects of an enlargement, although the opposite perspective is taken. The economic intuition is that the introduction of the Euro increases the diversification benefits, due to the elimination of the currency risk and a reduction of political risk. If more EU members adopt the Euro, it should result in an increase in diversification benefits.

Five different portfolios have been determined by the mean-variance framework, namely an EMU, Asia, Asia A, EU15 and an EU27 portfolio. The whole sample period is from 01/93 – 12/07. This period is divided into two smaller subsamples; 01/93 – 12/98 and 01/99 – 12/07, respectively. These samples have been chosen so that the first period contains a currency risk, while for the second period this is eliminated. For the countries for which there is not a MSCI

index available, the broadest possible national indices have been chosen for each country. The Asia portfolio is determined in two ways, a restricted and an unrestricted portfolio, A-rated and ABC-rated, respectively.

Based on table 21 it can be suggested that for the whole sample period the EMU portfolio outperforms the Asia portfolio. The elimination of the currency risk, in line with the expectations, and the impact of the Asia crisis are possible explanations. However the results for the second subsample do not confirm the positive effect of the introduction of the Euro.

The results of adding political risk as a restriction to a portfolio (Asia A), neither confirm nor contradict Cosset & Suret (1995) findings.. Out of three, only one unrestricted portfolio, outperforms the restricted portfolio. The effects of enlargement of the EMU have been examined by determining the optimal portfolios for EU15 and EU27. If Denmark, Sweden and the UK joined the EMU on January 1st 1999, it would have resulted in an increase in diversification benefits.

If all 27 EU members adopted the Euro, it would have resulted in the most efficient portfolio compared to the others. This suggests increased diversification benefits for European investors, when all EU27 members adopted the Euro. However, due to the ongoing process of integration, these benefits are likely to decrease on the long run, as indicated by Haselmann & Herwartz (2008). A solution to overcome the decreasing diversification benefits is to diversify not only by country, but also by industry (Moerman, 2008).

If more member states adopted the Euro, it would be beneficial for investors, hence, there is an increase in diversification benefits.

I Introduction

"The adequacy of diversification is not thought by investors to depend solely on the number of different securities held. A portfolio with sixty different rail-way securities, for example, would not be as well diversified as the same size portfolio with some railroad, some public utility, mining, various sort of manufacturing, etc. The reason is that it is generally more likely for firms within the same industry to do poorly at the same time than for firms in dissimilar industries." (Markowitz, 1952, Portfolio Selection, pp. 89).

With the article *Portfolio Selection* (1952) Markowitz was the founder of the portfolio theory. In his article, he stated that there is a tradeoff between the return of a portfolio and the variance (risk). An investor can obtain a higher return. This, however, leads to a higher risk. Lots of researchers (see: (Grubel, 1968) (Levy & Sarnat, 1970) (Lessard, 1973) (Moerman, 2008)) took Markowitz' principle and proved that an investor can obtain diversification benefits when he or she holds a portfolio which contains international and domestic stocks. The reason that it is beneficial to diversify internationally, is that domestic and foreign stocks return are not perfectly correlated (Levy & Sarnat, 1970). These authors give for the low correlation, international trade restrictions and inefficient markets as explanation.

However, due to the increasing financial integration among many countries in the world, e.g. the European Monetary Union (EMU), the correlation and volatility have been affected. Literature indicates that there is a positive relation between integration, correlation and volatility. For the emerging markets, Bekaert & Harvey (2000) and Bekaert, Harvey, & Lumsdaine (2002) have found such a relation, while Morana & Beltratti (2002) and Adjaouté & Danthine (2003) have found similar a relation for the EMU.

Increased correlation has a negative effect on the diversification benefits. Bekaert & Harvey (2000) indicate that there are still diversification benefits for investors who want to invest in the emerging markets. Morana & Beltratti (2002) and Adjaouté & Danthine (2003) have found similar results for the EMU. They indicate that within, or due to the EMU[1], there are increasing diversification benefits. So the EMU still provides diversification benefits for investors in these countries, despite the increase of correlation. These benefits are also recognized by EMU investors, as there has been an increase in investments within the EMU after the introduction of the Euro (De Santis & Gérard, 2006). So from the perspective of an EMU investor, the

[1] On 1-1-1999 the following countries adopted the Euro: Austria, Belgium, Finland, France Germany, Ireland, Italy, Netherlands, Portugal and Spain. Greece adopted the Euro in 2001.

foundation was beneficial because of the increase in diversification possibilities. The currency risk was eliminated and the political risk was reduced.

Moerman (2008) discusses the effect of diversification with respect to country versus industry EMU portfolios. Using the mean-variance framework of Markowitz, Moerman investigates whether diversifying across EMU countries or industries results in a improvement of the efficient frontier. By optimizing the two different portfolios, Moerman finds evidence that the industry portfolio has better diversification opportunities than the country portfolio (Moerman, 2008). According to the results of Moerman (2008), a country portfolio can be significantly improved when industry indices are added to the country portfolio. A possible explanation for this is the increasing correlation between EMU countries, which suggests that investors should diversify more by industry than across country (Moerman, 2008).

A study of Haselmann & Herwartz (2008) focuses on diversification benefits for new potential EMU members. They use the method of portfolio optimization to determine the diversification benefits for entering the EMU. For each country, an optimal portfolio is constructed for three different scenarios. The optimal portfolio is optimized for four different indices, MSCI EMU, USA, Asia and a national index. Scenario 1 is the current exchange rate regime. the second scenario is that a country remains in the current exchange rate regime, however, an investor can hedge for exchange rate risk for the EMU investments. Thus, there is an elimination of the currency risk for EMU investments. The last scenario assumes that a country adopts the Euro and thereby eliminates the currency risk with respect to EMU investments. Based on Sharpe ratios their results indicate that from the perspective of a domestic investor it is beneficial for entering the EMU, due to the elimination of the currency risk. So scenario 3 is the most beneficial scenario for a domestic investor. Haselmann & Herwartz (2008) indicate, however, that the benefits could change over time due to economic integration and point out that further research is necessary to study the future effects on portfolio optimization (Haselmann & Herwartz, 2008).

The purpose of this thesis is to determine the diversification benefits for a European investor within the EMU and the effects of an enlargement.

The main contribution of this thesis is that it addresses the diversification benefits for a European investor and the effect of an enlargement of the EMU, which is the opposite perspective of Haselmann & Herwartz (2008). Five optimal portfolios are determined by the mean-variance analysis, similar as Moerman (2008), for the period 01/93 until 12/07. The five different

portfolios are: EMU, Asia, Asia A, EU15 and EU27. The portfolio performance is evaluated by the Sharpe ratio. The significance of the difference in the Sharpe ratios is tested by the Jobson & Korkie (1981) statistic. Economic theory expects that the introduction of the Euro is beneficial for investors. Although no evidence was found for the EMU and EU15 portfolios, the EU27 portfolio yields a more efficient portfolio than the others. This suggests that there are increased diversification benefits for European investors, when all EU27 members adopt the Euro. The results are in line with research likeHaselmann & Herwartz (2008), but contradict previous research like Morana & Beltratti (2002) and Adjaouté & Danthine (2003). The conclusions do support the results of Birg & Lucey (2006) and Haselmann & Herwartz (2008).

The remainder of this thesis is organized as follows: in chapter two, the theoretical framework of portfolio selection and diversification is reviewed. Chapter three reviews the empirical findings of other studies. The methodology and data are introduced in chapter four. The results are presented in chapter five, and chapter six presents the conclusion.

II Theory

In order to answer the research question, several theories are reviewed in order to obtain inside in this subject. Starting with the theory of portfolio selection.

2.1 Portfolio selection

In 1952 Markowitz was the first who wrote down the basic principles of portfolio selection. He stated in his article *Portfolio Selection* (1952) that an investor can maximizes his expected return by the expected returns-variance (E-V) rule (Markowitz, 1952). Meaning that there is a tradeoff between return and variance. If an investor requires a higher return he is able to obtain this by adding more risky assets to his portfolio, resulting in a higher variance. Markowitz assumed that there is only one source of risk, variance. Risky stocks are those assets with a high variance, hence high risk.

The allocation of wealth should be such that a portfolio is diversified with those stocks which yield a maximum expected return against the lowest possible variance. According to Markowitz the law of large numbers is the reason that the actual return will approximately be the same as the expected return of the investor. However, diversification is beneficial if the stocks are not perfectly correlated, thus adding more assets to the portfolio will only be beneficial if the covariance is lower than 1. In the article of Markowitz the example is given of a portfolio with only railway stocks of different firms, which is a poorly diversified portfolio. This portfolio would be better diversified if assets are added of different industries, because these stocks have a lower correlation than 1. If the portfolio is well diversified according to the E-V rule, then it is an efficient portfolio and no longer possible to yield a higher return without adding more variance in to the portfolio (Markowitz, 1952).

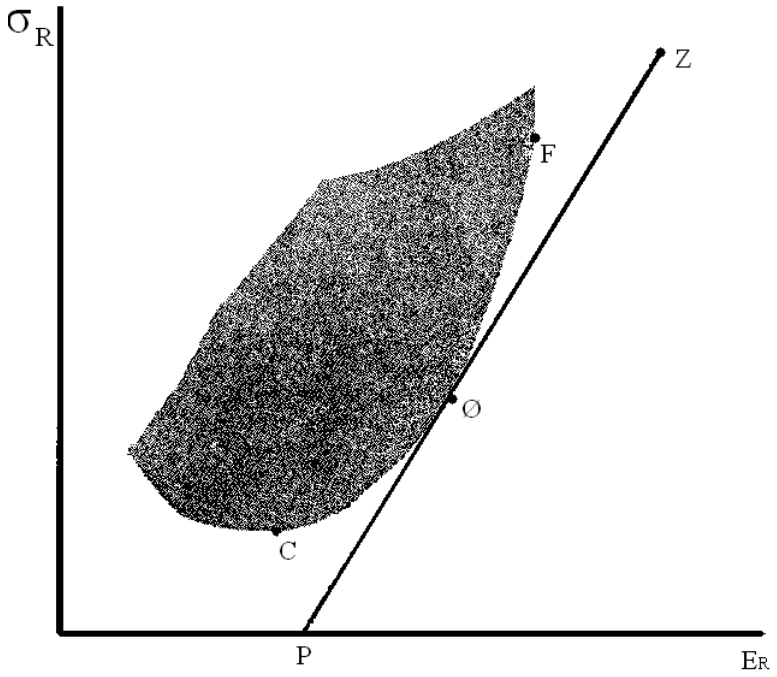
Tobin continued in 1958 with Markowitz's model and showed that an investor should follow two steps in selecting his portfolio. First, the dominant combination of risky assets (market portfolio) should be determined by the E-V rule. So that a certain combination of risky assets yields the highest possible return with the lowest variance, which is called the dominant set by Tobin. Then the amount invested in this portfolio should be determined, this will differ for each investor because of the different preferences toward risk among them. There are investors who will allocate all of there wealth in the market portfolio, while other investors will choose a combination of the market portfolio and a riskless asset (Tobin, 1958).

From the risk-return tradeoff, the CAPM with an optimal portfolio was defined by Sharpe.

2.2 Capital asset price model (CAPM)

Sharpe (1964) was the first who published a theory which described a market equilibrium for asset prices under the condition of risk. Based on the same principles as Markowitz and Tobin, Sharpe made two additional assumptions to derive a market equilibrium: every investor can lend and borrow without any restriction at the risk free rate and all investors have homogeneous preferences (Sharpe, 1964). With these additional two assumptions the following figure (1) was derived:

Figure 1: Capital asset prices model



Source: Sharpe, W. (1964). Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. The Journal of Finance, pp. 432, figure 5 (modified).

On the axes are expected return (E_R) and standard deviation (σ_R), which represent the relation risk-return tradeoff discussed earlier. The gray area represents all possible investment opportunities or investments sets as Sharpe defines them. These opportunities can be divided into two sorts of sets, inefficient and efficient sets. All efficient sets are on the line between point C and F, this CF line represents the investment opportunity curve or efficient frontier. All sets left of point C and above point F, are inefficient sets, because there is an alternative investment which yields a higher return for a lower risk (Sharpe, 1964). If the line left of point C is followed, the set is more risky and has a lower return and is therefore an inefficient set. The set

right or above point F, is more risky and has the same or less return. So an investor should hold a portfolio which is efficient and is somewhere on the line between point C and F.

Point P represents a riskless asset and point Ø is the market portfolio. Following the reasoning of portfolio selection, each investor holds the same market portfolio, only the amount allocated in the market portfolio will differ for each investor. From point P to Ø an investor will invest some of his wealth at the risk free rate and the other part will be invested in the market portfolio. On point Ø everything is invested in the market portfolio. And from point Ø to Z an investor invests everything in the market portfolio plus the part that borrowed at the risk free rate (Sharpe, 1964). As shown in figure 1, the market is in equilibrium when there is a linear relation between expected return and variance (CAPM formula):

$$\boldsymbol{E(R_i) = R_f + \beta_i\left[E(R_m) - R_f\right]} \quad (1)$$

The expected return of asset *i* $\boldsymbol{(E(R_i)}$ depends on the risk free rate and the excess return $\boldsymbol{(E(R_m) - R_f)}$ which depend on the amount of risk $\boldsymbol{(\beta_i)}$. The beta reflects the sensitivity between asset $\boldsymbol{i}$ and the market portfolio:

$$\boldsymbol{\beta_i = Cov(R_i, R_m) \Big/ Var(R_M)} \quad (2)$$

$\boldsymbol{\beta_i}$ is the risk component in Sharpe's model. Due to diversification it is possible for an investor to eliminate all asset specific risk, which can be achieved if an investor holds the market portfolio. If an investor holds the market portfolio it includes only systematic risk. However, when an investor doesn't hold the market portfolio, the portfolio contains extra risk, unsystematic risk. Thus deviating from point Ø to C or F or another point in the gray area of figure 1 results extra risk which can be avoided. This is described as asset specific risk, which can be avoided by diversification (Sharpe, 1964).

The investor should hold a portfolio somewhere along the efficient frontier in order to obtain a diversified portfolio. It was Merton (1972) who provided a mathematical solution for determining the market portfolio. Portfolio return depends on the given expected returns, covariance matrix of returns of the included risky assets and the risk the investor wants to bear (Merton, 1972). With the solutions of deriving the market portfolio Fama & MacBeth (1973) tested the CAPM with respect to three implication:

- $\boldsymbol{E(R_i) = R_f + \beta_i\left[E(R_m) - R_f\right]}$ is an linear relationship $\boldsymbol{(E(\tilde{\gamma}_{2t}) = 0)}$.
- $\boldsymbol{\beta_i}$ is the only risk measure for asset $\boldsymbol{i}$ $\boldsymbol{(E(\tilde{\gamma}_{3t}) = 0)}$.

- Investors are risk averse and therefore require a positive risk premium, $\boldsymbol{E(R_m) - R_f > 0}$ $\boldsymbol{(E(\tilde{\gamma}_{0t}) = R_{ft})}$.

They test these implications with the following OLS estimated:

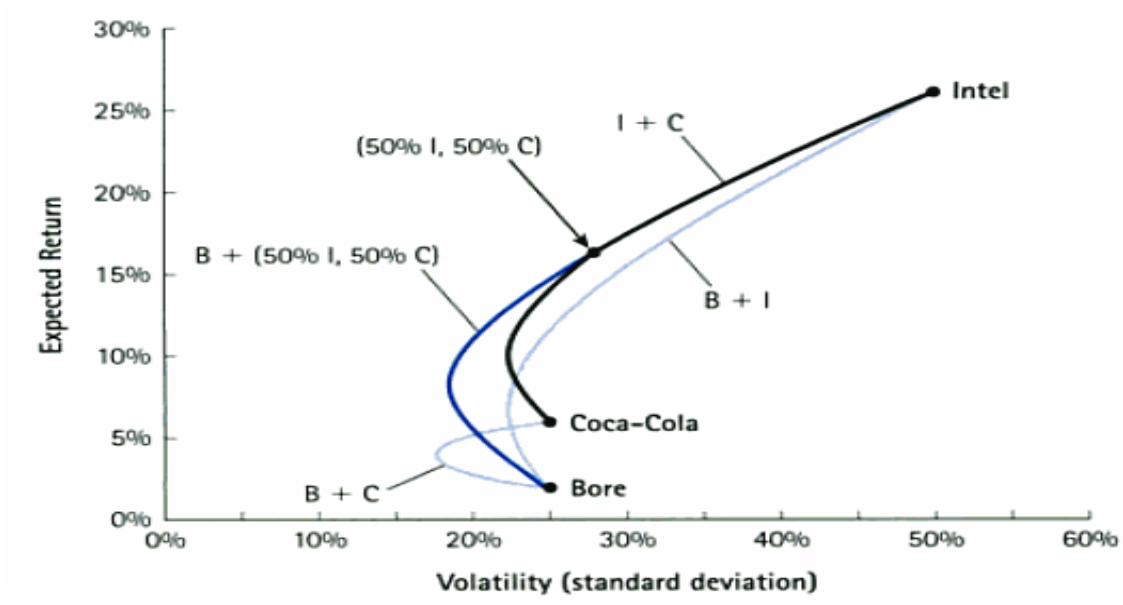
$$\widetilde{\boldsymbol{R_{it}}} = \tilde{\boldsymbol{\gamma}}_{0t} + \tilde{\boldsymbol{\gamma}}_{1t}\boldsymbol{\beta}_i + \tilde{\boldsymbol{\gamma}}_{2t}\boldsymbol{\beta}_{i^2} + \tilde{\boldsymbol{\gamma}}_{3t}\boldsymbol{s}_i + \tilde{\boldsymbol{\eta}}_{it}$$

The results indicated that there is indeed linearity ($\tilde{\boldsymbol{\gamma}}_{2t} = \boldsymbol{0}$), β_i is the only risk measure ($\tilde{\boldsymbol{\gamma}}_{3t} = \boldsymbol{0}$) and there is a positive risk premium. So the CAPM is valid according to these data (Fama & MacBeth, 1973). According to Roll (1977) however, the CAPM is not a valid model. The CAPM requires that an investor should hold the market portfolio, this however is an impossible implication. It requires that the portfolio of the investor includes all possible investable assets. In the literature this is described as Roll's critique (Solnik, 2000). Despite the critique on the CAPM, the principles about diversification benefits are not debated and are described now.

2.3 Risk diversification

Based on the CAPM the possibilities to reduces portfolio risk where further explored. The first possibility to reduce the overall risk is to add more stocks to a portfolio. When more stocks are added to the portfolio it will lead to a lower portfolio volatility, which is shown in figure 2.

Figure 2: Effect of number stocks on volatility



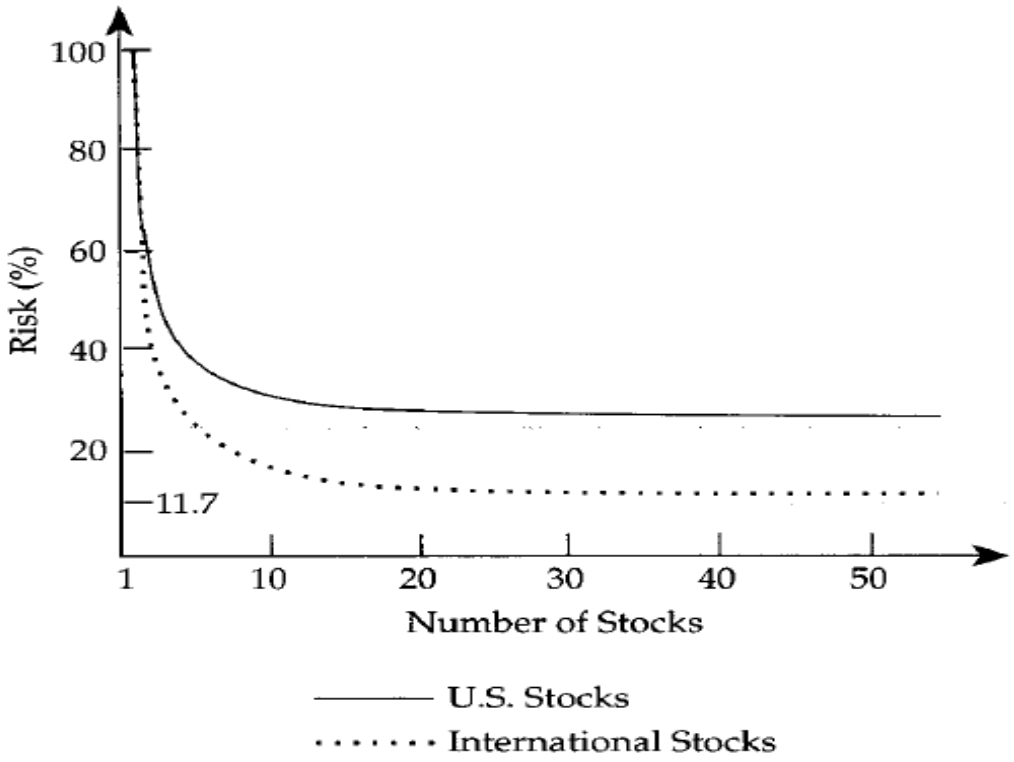
Source: Berk, J. & DeMarzo, P. (2007). Corporate Finance. Pearson International Edition, pp 343.

Based on 3 different stocks, figure 2 indicates that every combination of stocks (Bore and Coca-Cola, Bore and Intel or Coca-Cola and Intel) leads to a new efficient frontier. The combination

of the three stocks (Bore, Coca-Cola and Intel) has a better return-risk tradeoff than the combination of just two stocks. So adding more stocks to a portfolio, leads to a lower volatility and improved of the efficient frontier (Berk & DeMarzo, 2008).

The second possibility to reduce the overall portfolio risk, is to invest not only in domestic stocks, but also in international stocks. By investing in more than 20 domestic stocks the portfolio has a risk of 27%. However, when the investor invest in more than 20 international stocks, the portfolio risk is just 11,7%. So by diversifying internationally and in the amount of stocks, portfolio risk is reduced. The first possibility, as described above, is also present in figure 3, adding more stocks to the portfolio results in a lower risk. This effect however decreases fast, as can been seen in figure 3. U.S. stocks are the domestic stocks in this figure.

Figure 3: International vs. domestic diversification



Source: Solnik,, B. (1974). Why Not Diversify Internationally Rather Than Domestically. Financial Analysts Journal, pp. 92

The diversification benefits have been elaborated, now a performance measure, will be discussed.

2.4 Portfolio performance

To be able to compare different portfolios with each other, a return-risk performance measure is needed. The Sharpe ratio is such a measure. Sharpe defined the ratio such that it is a reward-to-variability ratio (Amenc & Le Sourd, 2003):

$$S_p = \frac{E(R_p) - R_f}{\sigma(R_p)} \qquad (3)$$

$E(R_p) - R_f$ is the excess return, portfolio return minus the risk-free rate, divided by the standard deviation of the portfolio ($\sigma(R_p)$). The ratio is able to measure the excess return of a portfolio related to the portfolio risk. If a portfolio has a Sharpe ratio of 0,50, it means that 0,50 percent is an excess return for every 1 percent of standard deviation (Butler, 2004). By taking one more unit of risk (1 percent standard deviation), the portfolio return increases by 0,50 percent. So the higher the Sharpe ratio, the better the performance of a portfolio.

The theory of portfolio selection, the CAPM, risk diversification and a performance measure have been elaborated. The empirical results of international portfolio diversification, financial integration, risk factors and the reasons for home bias will be examined in the following chapter.

III Empirics

In the previous part the theory of portfolio selection, the CAPM, risk diversification and a performance measure were discussed. Now the empirical findings with respect to the first three subjects will be elaborated.

3.1 International portfolio diversification

The research of Grubel (1968) focuses on the benefits of portfolio diversification. In his research Grubel constructs a portfolio in which an investor can invest in either 8 or 11 different stock markets of major countries. An investor invests on January 1959 $100 and ends with a certain amount on December 1966, a period of 95 months. The monthly returns are corrected for dividend and exchange rate changes. The results of Grubel are in favor of the portfolio which invest in 11 countries, because with a 9% return the standard deviation of this portfolio is just 22% instead of 60% for the portfolio with 8 countries. So if an investors includes more countries in his portfolio, there is a reduction of risk in his portfolio while the returns are the same (Grubel, 1968).

The goal of Levy and Sarnat (1970) is to examine the potential gains generated by international portfolio diversification. They take stocks of 28 countries into account for the period 1951-1967. As opposed to Grubel they don't take dividends into account. They construct 6 different portfolio namely, all countries (28), high income countries (16), western Europe (11), common markets (5), developing countries (9) and United States (1). The results indicate that the portfolio including all countries (28) yields the highest potential gain with respect to portfolio diversification. These results are in line with Grubel (1968). Another conclusion drawn from their results is that countries which have a high correlation with the United States (home country) are not included in the optimal portfolio (Levy & Sarnat, 1970). In this study it was Canada that was not included in the optimal portfolio, which is evidence for Markowitz's argument that only those assets with a low correlation should be included in the portfolio to maximize the investors wealth.

Both studies of Grubel (1968) and Levy & Sarnat (1970) confirm the theory described in figure 3, there is an increase in diversification benefits when more international stocks are added to the portfolio.

In line with the articles of Grubel (1968) and Levy & Sarnat (1970), Lessard (1973) determines the gains of international portfolio diversification. However the focus is on developing countries

and possible benefits of investment unions (IU)[2]. The developing countries are Colombia, Chile, Argentina and Brazil. Then the performance of two portfolios, US portfolio and developing countries portfolio, are compared with each other. The results of Lessard indicate that within an investment union considerable gains can be obtained. So by investing in a single geographical area, an investment union, the gains of portfolio diversification can be substantially (Lessard, 1973).

These studies confirm the theory of international portfolio diversification. An investor can decrease the variance in his portfolio by holding more assets from different countries, because the correlation between these countries is not perfect. Assets which have a high correlation do not provide risk reduction and are therefore excluded from the optimal portfolio.

Table 1: Main conclusions international portfolio diversification

Author	Main conclusion
Grubel (1968)	Lower portfolio risk, if more assets from different countries are included.
Levy & Sarnat (1970)	Same conclusion as Grubel (1968) and countries which are highly correlated are excluded from portfolio
Lessard (1973)	Creating an Investment Union, containing development countries, results in substantially portfolio gains.

From the first empirical study of Grubel 40 years ago, the financial markets have become more integrated and with this the opportunities for portfolio diversification. Therefore the effect that integration has on correlation and volatility will be discussed.

3.2 Financial integration

Due to integration the correlation and volatility between stock markets have increased over time (Bekaert & Harvey, 1997) and in times with high volatility the correlation rises between markets

[2] Lessard definition and reason for investing the benefits for an Investment Union: *"an arrangement between countries which allows greater freedom of capital movements among the union countries than with non-union countries. The decision to deal with IU's of only developing countries is based on the consideration that only under such a structure would multinational diversification be consistent with the objective of economic sovereignty. Also, such an IU would allow efficient development of information on investment opportunities in each country, something which would not be economically feasible if a large number of geographically dispersed countries were involved". Source: Lessard, D. (1973). International Portfolio Diversification: A Multivariate Analysis for a Group of Latin. Journal of Finance, pp. 619.*

(Solnik, Boucrelle, & Le Fur, 1996). First the evidence for the emerging markets will be discussed and then for the European markets.

3.2.1 Emerging markets

To measure the increase of integration and its effect on correlation and volatility, Bekaert and Harvey (1995) provide a framework to measure the time-varying market integration. The framework allows them to test whether a policy measure directly effects the degree of market integration (Bekaert & Harvey, 1995). Bekaert & Harvey (1997) uses this model to investigate whether this relation exist for emerging markets, thus whether an increase in integration has an effect on correlation and volatility. Their findings indicate that the relation between integration and correlation is positive, while the relation between integration and volatility is stable or slightly negative (Bekaert & Harvey, 1997).

Other research of Bekaert and Harvey (2000) indicate that despite the significant increase in correlations and increase of beta, there are still diversification benefits for investors who invest in emerging markets. Their research also indicate an insignificant increase in volatility (Bekaert & Harvey, 2000). Other research indicate a different relation between liberalization and volatility for emerging markets. According to the research of Huang and Yang (2000), the relation is for some countries like South Korea and Thailand positive while for Taiwan, Malaysia and the Philippines it's negative (Huang & Yang, 2000). Due to different empirical findings, Bekaert et al. (2002) suggests a model in which they can measure the process of market integration. This model indicates that more integration results in a significant increase in correlation and volatility for emerging markets (Bekaert, Harvey, & Lumsdaine, 2002).

There is general consensus about the relation between integration and correlation for emerging markets, which is a positive one. For the relation between integration and volatility there are mixed results and is indicated in table 2.

Table 2: Main results integration with volatility and correlation.

	Relation integration with	
Author	Volatility	Correlation
Bekaert & Harvey (1997)	Stable or slightly negative	Increases*
Bekaert & Harvey (2000)	Insignificant increases	Significant increases
Huang & Yang (2000)	Increases and decreases**	Not included
Bekaert, Harvey & Lumsdaine (2002)	Significant increases	Significant increases

*not tested for significance **some values significantly increases/decreases

A possible explanation for these different results is that integration is difficult to date, there is not often an exact date for increased integration (Bekaert, Harvey, & Lumsdaine, 2002). Another possibility is the sort of measures implemented by a country and the sort data used for their research (Huang & Yang, 2000). Bekaert & Harvey (1997) use monthly data, while Huang & Yang (2000) use daily data. There are also lot of differences between various forms of integration, which makes possible effects more diverse and difficult to capture in a clear relation.

Not only for the emerging markets the financial integration has changed over time, the foundation of the EMU has lead to an increase of financial integration. The effect of this integration will be discussed in the following paragraph.

3.2.2 European markets

The last two decades the EU experienced an increase in financial integration. After years of negotiating the EU decided to form the European Monetary Union in 1992, which was founded in the Maastricht Treaty. In order to join the monetary union, a country had to fulfill several convergence criteria. The most important are: low sustainable inflation, the budget deficit must less than 3% of GDP and a public debt of less than 60% or declining. The goal of these criteria is to ensure a permanent low inflation and a positive public budget (Baldwin & Wyplosz, 2004). Due to these convergence criteria, there has been a large increase in the convergence process. Countries like Italy and Spain have decreased their inflation several points (Morana & Beltratti, 2002). Morana and Beltratti (2002) state that due to the introduction of the Euro the volatility of macroeconomic fundamentals of unstable European countries (Spain and Italy) converged to the more stable European countries, thus the convergence of the European markets decreased volatility. Due to the convergences, the markets are more integrated and therefore the sensitivity to macroeconomic events increased for these countries. In other words, the correlation has increased, which is the same relation as for the emerging markets. Morana and Beltratti indicated that there is a net benefit for European investors, the introduction of the Euro reduced volatility (Morana & Beltratti, 2002).

Adjaouté & Danthine (2003) reassesses the development of the euro debt and equity markets. Their research indicates that the interest rates of the euro debt markets have become significantly lower. Their results for the equity markets are more interesting, like Morana and Beltratti (2002), their findings indicate that European markets have become more integrated due to an increase in

macroeconomic fundamentals. This increase in fundamentals is a possible explanation for the convergence of country indices, which implies a loss in diversification benefits at the level of country investment opportunities. The convergence has an opposite effect on correlation for the global sector investment opportunities. The correlation on country level increased from 0.56 to 0.64, while at a global level there was a decrease from 0.79 to 0.64 (Adjaouté & Danthine, 2003). Indicating that investors can increase diversification benefits, when they invest at the global level, while these benefits have decreased at the country level. They come to the same conclusion as Morana & Beltratti (2002), there is an overall increase in diversification benefits due to financial integration. These benefits are recognized by investors in the EMU. After the introduction of the Euro, investors in these countries invest more in EMU member states compared to other well financially integrated areas. The amount invested in this area has increased after the introduction of the Euro (De Santis & Gérard, 2006).

The EMU now only consists of 12 countries, while the EU contains 27 countries. If more countries join the EMU, what will be the effect on the diversification benefits? A study of Haselmann & Herwartz (2008) focuses on what the effect is for new potential EMU members, and take countries like Poland and Czech Republic into account in their research. They determine that from the perspective of a domestic investor the diversification benefits are indeterminate. The elimination of the currency risk is beneficial for the investor on the short run, while diversification benefits possibly disappear on the long run due to the entrance to the EMU (Haselmann & Herwartz, 2008). As with the emerging markets, the new EU countries are becoming more integrated in the international and EMU equity markets. Empirics indicate that based on integration new member states can be divided into two groups: countries which become more integrated in the international and European equity markets and countries which are more segmented from the international market, but become more regional integrated. Countries that are more integrated experience decreasing diversification benefits, while countries (Latvia, Slovakia, Slovenia) which are less integrated have increased diversification benefits and are therefore interesting investment opportunities for investors (Birg & Lucey, 2006). These findings are in line with the working paper of Cappiello, Gérard, Kadareja and Manganell (2006).

Table 3: Main conclusions financial integration European markets.

Author	Main conclusion
Morana & Beltratti	Increase in correlation, decrease of volatility, increase in diversification

(2002)	benefits.
Adjaouté & Danthine (2003)	Increase in correlation on country level, decrease in correlation on global level, increase in diversification benefits.
Haselmann & Herwartz (2008)	Increase of diversification benefits for new EMU members on the short run, possible decrease of diversification benefits on the long run.
Birg & Lucey (2006)	Integrated countries experience a decrease in diversification benefits, while less integrated countries experience an increase.

3.3 Risk factors

Until now the variance of asset returns was the only risk variable, in reality there are other risk factors, such as currency and political risk (Solnik, 1974). These factor should be taken into account by an investor for determining his optimal portfolio.

3.3.1 Currency risk

Currency risk is the risk an investor bears if he invests in a foreign denominated asset and will vary for each currency. The more volatile a foreign currency is with respect to the domestic currency, the higher risk. If a Dutch investor invests only in the Euro area, there is no currency risk. If the investor adds foreign denominated assets to his portfolio, than there is an increase in risk. The currency risk is included in the assets returns, which exists of two components, the return of the asset and the return of the exchange rate. The advantage of the currency risk is that it is quantifiable (Amenc & Le Sourd, 2003). Currency risk accounts between the 10 and 15 percent of the total risk for equities. However when a portfolio is well diversified this effect will be offset by the diversification benefits. The overall risk therefore can be reduced when a well diversified portfolio is composed (Bartram & Dufey, 2001).

3.3.2 Political risk

Political risk is the risk of an unexpected political events in a foreign country which affects the value of the investment (Butler, 2004) and can be divided in the following categories; transfer-, operational- and ownership-control risks. These risks can be expressed in possible exchange controls, expropriation of assets or a change in taxing policy (Bartram & Dufey, 2001).

There are a lot of political risk indicators and each uses a different method for calculating the risk. The Coface Group use a range of A1 till D, where A1 is good and D is bad. The USA has an A2 rating (Coface Group, 2008) and is based on *"average default risk on corporate payments, and reflect local business, financial, and political outlooks" (Butler, K. (2004). Multinational*

Finance. Canada: Thomson South-Western, pp 360). As stated earlier, this risk factor is difficult to quantify, because ratings give a range.

Cosset and Suret (1995) evaluated the benefits of international portfolio diversification into countries where there is a high degree of political risk. They used the monthly ratings of Political Risk Services, which is sort of the same rating as the Coface Group. The results indicate that it is beneficial to have assets in your portfolio which are traded in high political risky countries. By investing in countries with high political, the overall portfolio risk is reduced compared to a portfolio which only has assets of low political risky countries. The reduction of portfolio risk is the result of a lower correlation between high and low political risky countries (Cosset & Suret, 1995). However, as they suggest themselves, they do not include transaction costs in their portfolio analyze and may have a large impact on these results.

3.4 Home bias

Until now the benefits of portfolio diversification and risk factors have been discussed and it should be clear that an investor should hold a worldwide diversified portfolio. Empirical studies, such as Levy and Sarnat (1970), however show different results. Their study indicates that investors have a tendency overweighing domestic assets in their portfolio, which is called home bias (Butler, 2004). In the literature there are three possible explanations for this phenomenon: international barriers, inflation hedging and trust (Chan, Covvig, & Ng, 2005) (Butler, 2004) (Guiso, Sapienza, & Zingales, 2004).

3.4.1 International barriers

Barriers make it costly to hold foreign assets, while these barriers do not apply for domestic assets which causes home bias (Stulz, 1981) An example of such a barrier are taxes. According to research of Black (1974) this is the reason that the CAPM does not hold.

Black (1974) assumes that taxes represent various kind of barriers, such as control of capital, restriction on the maximal amount of assets owned by a foreign investor. Capital control has a negative effect on international portfolio diversification, it increases the risk of foreign assets. The more restrictions imposed by a government, the more home bias (Butler, 2004). In the EMU these capital barriers are eliminated (Schoenmaker & Bosch, 2007). So this barrier is not present within the EMU, thus there should be a lower home bias in these countries compared to other countries. Schoenmaker and Bosch (2007) findings suggests that there is a decline in home bias, this decline is stronger for EMU countries than non-EMU countries.

Transaction costs is another example of a barrier, in developing markets these costs are higher, these can exceed 1%, while these cost in the United States can be less than 0.1% (Butler, 2004) (Bartram & Dufey, 2001). These higher transaction cost make it less attractive to invest in developing countries, because the return must exceed 1% to be profitable. While there are still higher transaction costs in the EMU than the domestic transaction costs, these will decline with further European integration (Schoenmaker & Bosch, 2007).

3.4.2 Inflation hedging

Home bias can also be explained by inflation risk. When domestic asset provide a hedge for domestic inflation, domestic investors overweigh domestic assets in their portfolio (Adler & Dumas, 1983). However this only applies when an investor has a very low level of risk aversion and if assets returns have a negative correlation with domestic inflation (Cooper & Kaplanis, 1994). Cooper and Kaplanis (1994) also state that hedging for domestic inflation can only be achieved when the portfolio consists of bonds.

3.4.3 Trust

A relative new explanation for home bias is cultural perspective. Guiso, Sapienza and Zingales (2004) try to determine this by investigating the relative trust EU citizens have toward other citizens of other countries, EU and non-EU countries. They find that if citizens of a country have a lower level of trust towards a country, this leads to a lower level of portfolio investments and lower foreign direct investments. So, when an investor has relative more trust towards country A than country B, his portfolio will contain more assets of country A than country B (Guiso, Sapienza, & Zingales, 2004). If the level of trust increases by one standard deviation, the level of portfolio investments for that country doubles (Guiso, Sapienza, & Zingales, 2004). This effect however will fade if the cultural perspective will become more objective, the more information available the lower the home bias. This effect will therefore have a significant impact for investors who want to invest abroad; they probably have the tendency to invest more in the EU than Asia or South-America. The reason for this is that there is a higher level of trust towards EU citizens. This higher level of trust is based on the similarity in cultural background and appearance (Guiso, Sapienza, & Zingales, 2004).

IV Methodology

The main research question that this thesis answers is whether the EMU-region provides diversification benefits for a European investor. Before discussing the methodology, the economic intuition is reviewed. The introduction of the Euro eliminated the currency risk and reduced political risk for European investors, which should increase the diversification benefits for European investors. If other EU members adopts the Euro, this would lead to an increase in diversification benefits; more assets and a lower correlation. The optimal portfolio and performance have been determined for five different portfolios; EMU, Asia, Asia A, EU15 and EU27. The Asia portfolio will be divided into a portfolio containing only A-rated countries (restricted) and a portfolio containing all rated countries (unrestricted). The intuition behind this, is that the unrestricted portfolio, a high risk portfolio, will outperform the restricted portfolio.

4.1 Model

The optimal portfolios have been determined by means of the mean-variance framework. Resulting in the following formulas for determining the optimal portfolio (Levy & Post, 2005) (Pennacchi, 2008):

Objective function: $\text{Min } \boldsymbol{\sigma_p^2} = \sum_{i=1}^{n}\sum_{s=1}^{n} \boldsymbol{\omega_i \omega_s \sigma_{i,s}} = \boldsymbol{\omega' V \omega}$ (4)

Constrains: $\boldsymbol{E(R_p)} = \sum_{i=1}^{n} \boldsymbol{\omega_i E(R_i)} = \boldsymbol{\mu}$ (5)

$\sum_{i=1}^{n} \boldsymbol{\omega_i} = \mathbf{1}$ (6)

$\boldsymbol{\omega_i} \geq \mathbf{0}$ (7)

With respect to the constrains the optimal portfolios have been determined, by minimizing the objective function (4). Formula 5 is a given expected return, 6 is that the sum of the portfolio weights must equal 1, invest everything in the portfolio. 7 is a short selling restriction. The model is used to determine the portfolio with the lowest possible variance, the minimal-variance-point (MPV) and market portfolio (MP). The minimization will be done by using the Excel Solver-function. By adjusting the required portfolio return, it is possible to make an efficient frontier (Moerman, 2008). Five different optimal portfolios will be evaluated: Asia, Asia A-rated, EMU, EU15 and EU27. In the chapter, *tables and figures*, the statistics of the five different portfolios are presented, table 5-8 (pp. 39-40).

Further the Asia portfolio will be divided into a restricted (only A-rated) and unrestricted (ABC-rated) countries. This will be done up to ABCD-ratings, which is similar to the method used by Cosset and Suret (1995).

Moerman (2008) performance a mean-variance spanning test. Testing whether adding an extra asset in an efficient portfolio, significantly improves the diversification opportunity (Moerman, 2008). This statistical test is not applicable for this thesis, because the performance of two different efficient portfolio's need to be tested. Therefore the Sharpe ratio (discussed in chapter 2) will be used in order to evaluate the relative performance of the different portfolios.

4.2 Data

As Moerman (2008) the data used for the optimal portfolios are MSCI indices. For the Asia, EMU and EU15 there are MSCI indices for the period 01/93 – 12/07. Due to introduction of the Euro on January 1st 1999, the previous period contains currency risk. Therefore subsamples 01/93 till 12/98 and 01/99 till 12/07 are evaluated. Due to changing market conditions, the time series cannot be too long. Otherwise the results are not representative for future return distributions (Moerman, 2008).

MSCI indices are not available for all EU27 countries for the whole period, therefore the broadest possible national indices are chosen for each country. As Moerman (2008) Luxembourg is excluded. Returns are not adjusted for change in the exchange rate, the assumption is made that these countries are new EMU member and thereby excluding currency risk. This thesis uses the same indices as Haselmann & Herwartz (2008) and are elaborated in table 4. Another complication is that not all indices start on 01/99. There are two solutions to this problem, either the indices are not taken into account or the returns before starting date are set to zero. The last solution is preferred. Thus for the SOFIX, CSE, OMX-R and NSEL30 the returns before starting date are set to zero. Haselmann & Herwartz (2008) do not mention this complication, while they should have encountered a similar problem.

Table 4: EU27 indices

Country	Index	Time frame
Bulgaria	SOFIX**	11/00
Cyprus	CSE**	10/04
Czech Republic	PX*	01/99

Estonia	OMX-T*	01/99
Hungary	BUX**	01/99
Latvia	OMX-R**	02/00
Lithuania	NSEL30**	03/00
Maltha	MALTEX**	01/99
Poland	WIG*	01/99
Romania	BET*	01/99
Slovak Republic	SAX*	01/99
Slovenia	SVSM*	01/99

*Thomson Datastream **Bloomberg

The first subsample contains currency risk. Depreciation or appreciations of a currency effects the return of an asset. The asset returns are adjusted in the following way (Haselmann & Herwartz, 2008):

$$\boldsymbol{R_i} = \frac{\boldsymbol{P_{i\,(t)} \times E_{i\,(t)} - P_{i\,(t-1)} \times E_{i\,(t-1)}}}{\boldsymbol{P_{i\,(t-1)} \times E_{i\,(t-1)}}} \qquad (8)$$

$\boldsymbol{P_{i\,(t)}}$ = quote price of the asset at time t or t-1

$\boldsymbol{E_{i\,(t)}}$ = exchange rate of dollar at time t or t-1

Adjusting the assets returns as described in formula 8 all returns are Euro denominate and is necessary because the perspective of a European investor is taken.

Cosset and Suret (1995) uses historical ratings of the *Political Risk Services*, these however are not free available. Therefore the political ratings from the Coface Group are used, these ratings are free available. Downside is that these data are not historical.

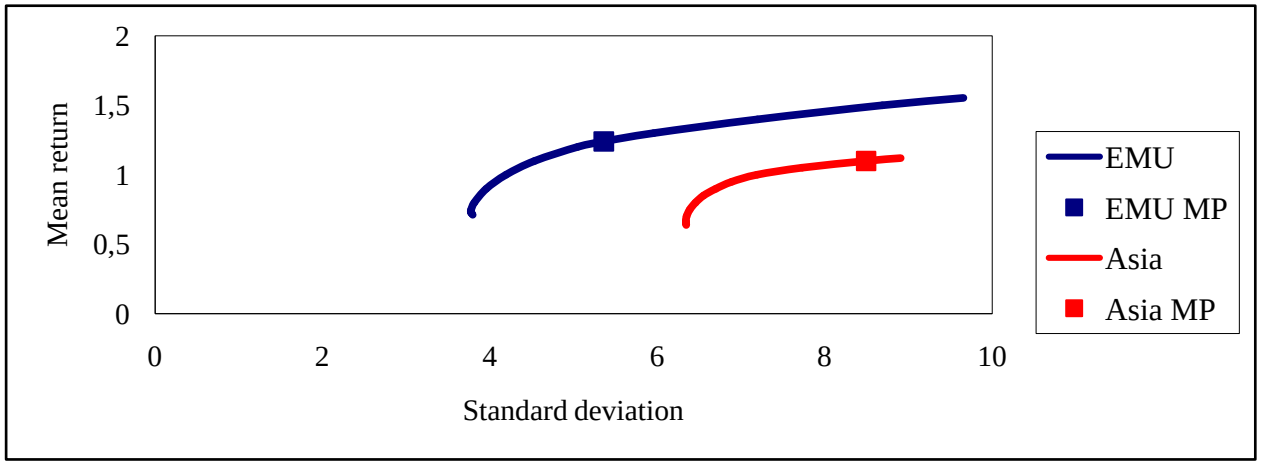
V Results

This chapter presents the results of the methodology elaborated in chapter four. In the following paragraphs all optimal portfolios will be discussed. The first two are the EMU and Asia portfolio with different time frames. Then the Asia unrestricted and restricted portfolio will be evaluated. After the performance of these two portfolios are evaluated, the EU15 portfolio and performance will be evaluated. Finally the portfolio and performance of the EU27 countries will be discussed. The descriptive statistics are in tables 5, 6, 7 and 8 (pp. 39-40).

5.1 EMU and Asia

Figure 4 represents the efficient frontiers of the EMU and Asia portfolio for the whole sample period. The Asia frontier is substantially lower than the EMU frontier, indicating that over the whole sample period an investor would have been better off by diversifying his investment over the EMU rather than Asia. The Sharp ratios, respectively 0,117 and 0,057, confirm the previous conclusion.

Figure 4: Efficient frontier EMU and Asia (01/93 – 12/07)

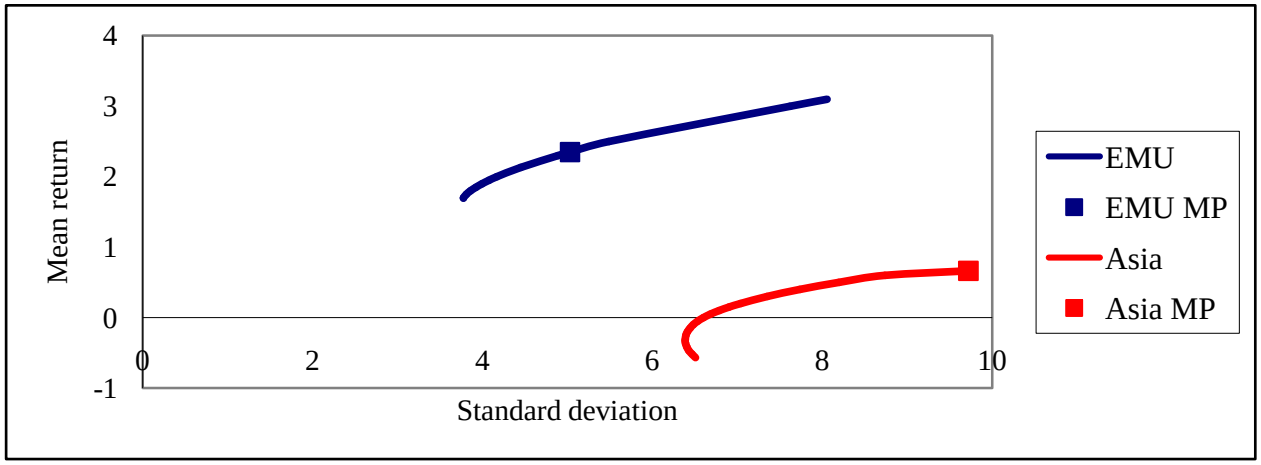


Possible explanations of the substantial difference are the Asia crisis and the elimination of the currency risk for the EMU due to the introduction of the Euro on January 1st 1999. Considering these two explanations, the first subsample should reflect the effect of the Asia crisis which should result in an even worse performance of the Asia portfolio. The second explanation, the introduction of the Euro, should improve the performance of the EMU portfolio for the second subsample.

Considering the first subsample, 01/93 – 12/98, the EMU portfolio has a currency risk, this, however, doesn't change the previous results found for the whole sample period. The difference in frontiers, compared to figure 4, is actually larger. The performance of the EMU portfolio is

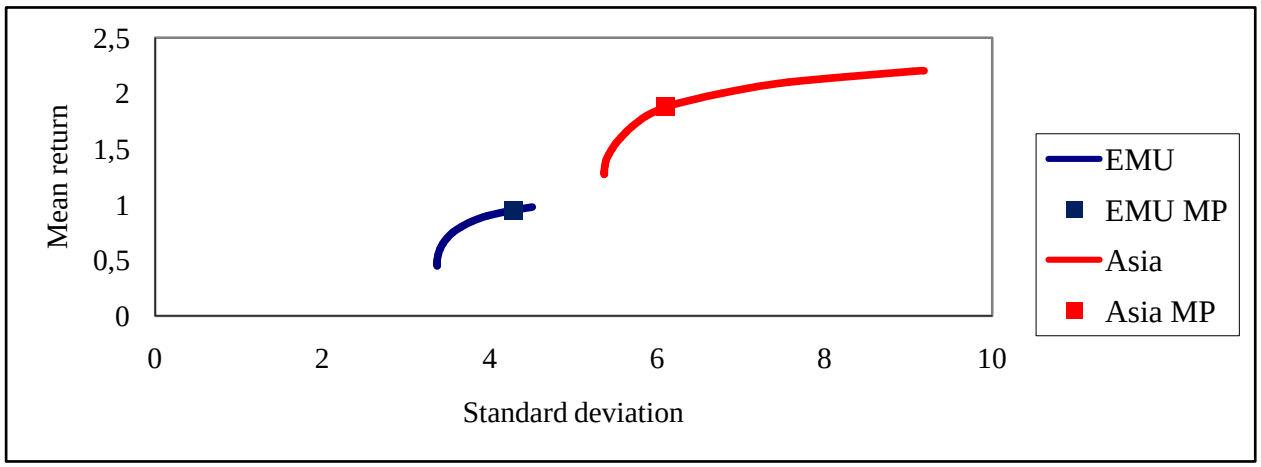
better than the performance of the Asia portfolio. This indicates that the Asia crisis has indeed had a significant impact on the portfolio performance, as can been seen in table 5 (p. 39). Out of 11 countries, only Hong Kong and Taiwan have positive returns for the period 01/93 – 12/98, respectively; 0,63% and 0,92% (monthly return). The Sharpe ratio of the MVP is negative and the ratio of the MP is almost 0. Considering the distribution of the Asia MP, an investor should have invested everything in Taiwan, see table 13 (p. 42).

Figure 5: Efficient frontier EMU and Asia (01/93 – 12/98)



While for the whole period and the first period the EMU portfolio outperforms the Asia portfolio, the results for the second period are completely different, see figure 6.

Figure 6: Efficient frontier EMU and Asia (01/99 – 12/07)



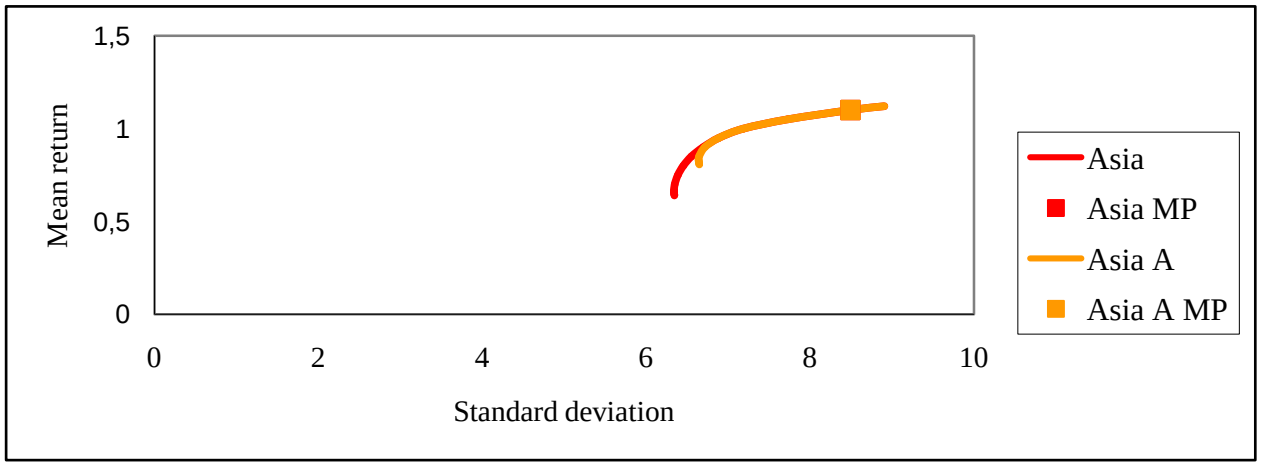
Based on the Sharpe ratios, the Asia portfolio outperforms the EMU portfolio. The expectation was that the elimination of the currency risk would result in a improvement of the EMU portfolio, although the results indicate the opposite effect. The elimination of the currency risk does not result in an improvement of the performance, hence a better efficient frontier, compared to the previous period. Both portfolios consist of 11 countries, however, the MVP of the EMU

contains just 5 and the Asia portfolio 6 countries. The MP even consists of less countries namely, 2 and 4 countries, respectively. Thus despite the elimination of the currency risk , the Asia portfolio outperforms the EMU portfolio in the second period.

5.2 Asia and Asia A-rated

If political ratings are taken into account, as can be seen in figure 7, the results confirm Cosset & Suret (1995) argument. They argue that by investing in countries with a high political risk, the overall portfolio risk is reduced in comparison to a countries portfolio with (only) a low political risk. Thus the Sharpe ratio of the high political risk portfolio (unrestricted) should be higher than the low political portfolio (restricted). The Asia (unrestricted) efficient frontier is above the Asia A (restricted) frontier, which consists of only A rated Asia countries, see figures 7 and table 15 (pp. 42-43). Thus by investing in high political risk countries, the overall portfolio risk is reduced. This seems contradictory, since high political risky countries are also more volatile reduces the overall portfolio risk. A reason for this is the low correlation between countries with high and low political risks (Cosset & Suret, 1995). Although, looking at the Sharp ratio for the whole sample period, there is no difference, which is obvious because the MPs of both portfolios are the same. Thus, for the whole sample period, the results neither confirm or contradict the findings of Cosset & Suret (1995).

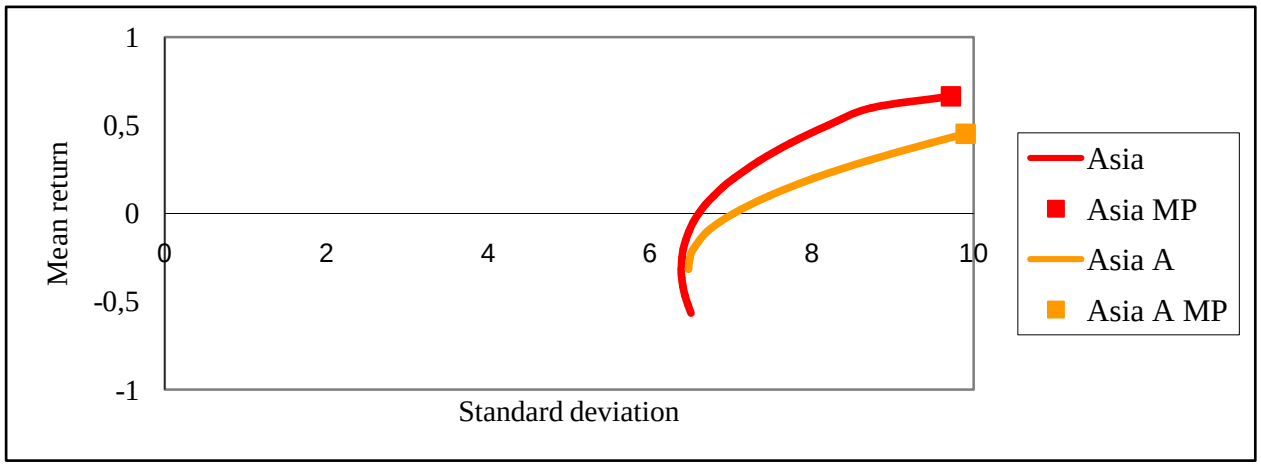
Figure 7: Efficient frontier Asia and Asia A (01/93 – 12/07)



Although the results for the whole period do not confirm the findings of Cosset & Suret (1995), the results for the first subsample are in line with the findings of Cosset & Suret (1995). The overall portfolio risk is reduced when high political risk countries are added to the portfolio and the unrestricted portfolios outperform the restricted portfolios (figure 8). A striking fact is that the Sharp ratio of the restricted portfolio is negative, while the unrestricted Sharpe ratio is positive (tables 16 & 13, pp. 43 & 42). The same tables show the distribution of the MP: both

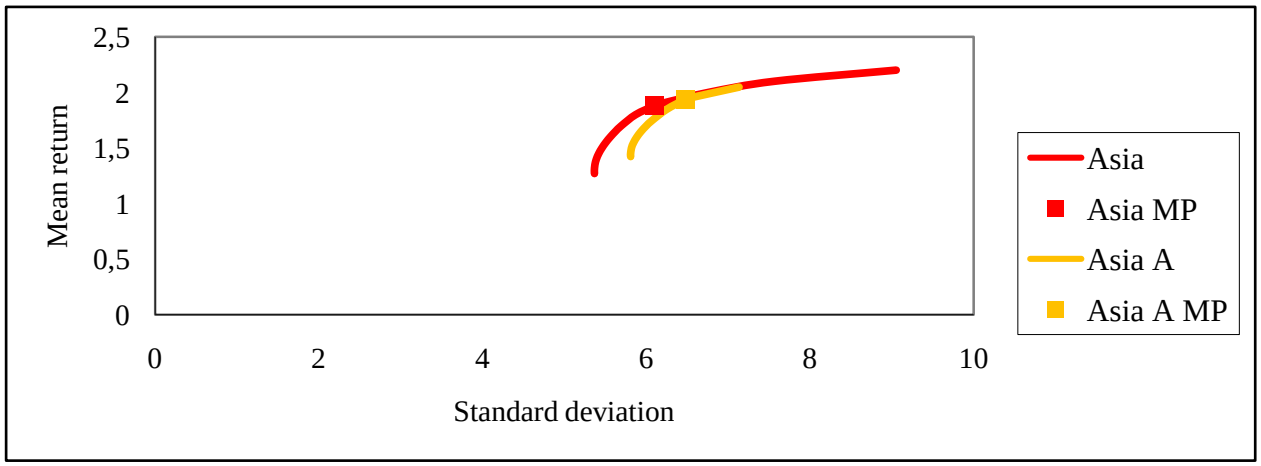
invest 100% in either Hong Kong (restricted) or Taiwan (unrestricted). Taiwan is B rated and is therefore excluded from the restricted Asia portfolio, which is evidence for Cosset & Suret (1995) findings that it is beneficial to add countries with high a political risk to reduce the overall portfolio risk and increase the performance of the portfolio.

Figure 8: Efficient frontier Asia and Asia A (01/93 – 12/98)



The results for the second subsample differ from the results of the previous period (figure 9). The difference in Sharpe ratios for portfolios are actually very small, 0,265 (unrestricted) and 0,264 (restricted). Thus the results of the second subsample contradict the findings of Cosset & Suret (1995). The difference in distribution among the portfolio countries, is that Pakistan (C rated) is not included in the restricted portfolio. India, Korea and Malaysia are both in the unrestricted and restricted MP.

Figure 9: Efficient frontier Asia and Asia A (01/99 – 12/07)



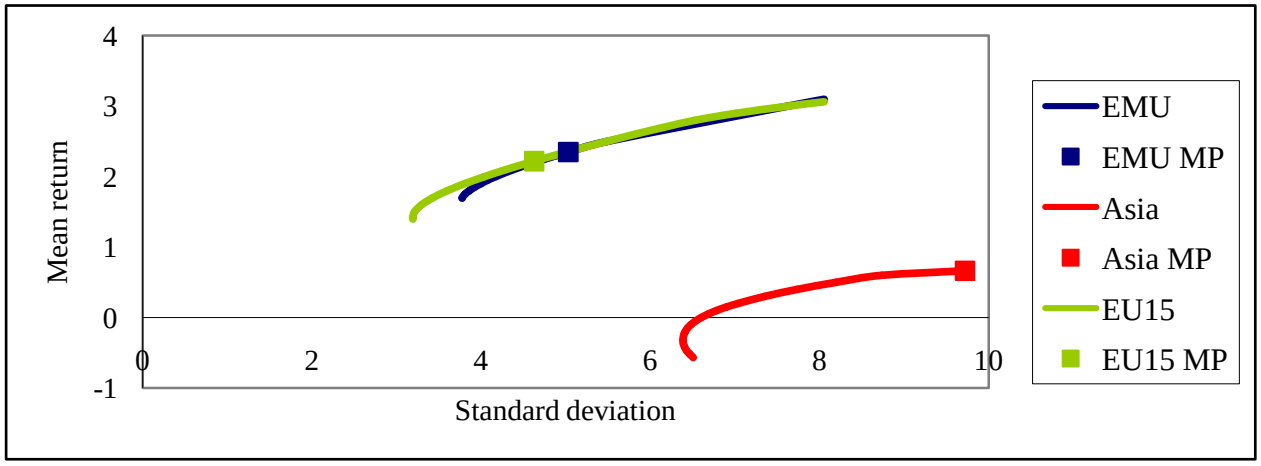
So based on these results, the results of Cosset & Suret (1995) cannot be confirmed. The overall portfolio risk is reduced when countries with a high political risk are added to the portfolio only for the first subsample. The results for the whole sample period neither confirm or contradict the

results of Cosset & Suret (1995), because both portfolios have the same MP. The overall portfolio risk is not reduced in comparison to the portfolio with only countries with low political risk for the second subsample. An explanation for these different results can be that they used historical ratings instead of the present ratings. These historical ratings were not available.

5.3 EU15 and Asia

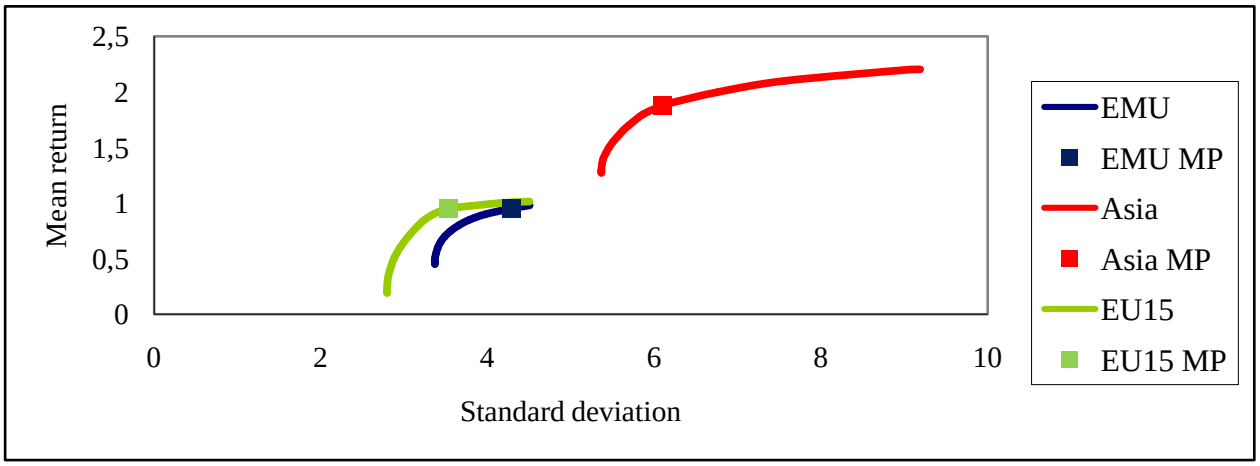
Adding more countries (Denmark, Sweden, UK) to the EMU portfolio should lead to a shift of the efficient frontier and MP. As can been seen in figure 10, a part of the frontier and the MP indeed shifts (EU15). Thus, adding more countries to the portfolio reduces the overall portfolio risk, which is in line with other empirical findings (Grubel, 1968) and (Levy & Sarnat, 1970). Although the difference in performance can be neglected, 0,3% in favor of the EU15 portfolio. Of the three added countries, the EU15 MP invests 11,79% in Denmark and 0% in Sweden and the UK. Of these three countries Denmark has the lowest covariance with respect to all other countries which explains why the other two countries are not included in the EU15 MP.

Figure 10: Efficient frontier EMU, Asia and EU15 (01/93 – 12/98)



The results for the second period are similar to those for the portfolio EMU and Asia (01/99 – 12/07) (figure 6). As can be seen in figure 11, there is a shift in the efficient frontier of the EMU portfolio. This improvement, however, is not sufficient to outperform the Asia portfolio. The Sharpe ratios are 0,194 and 0,265, respectively. Adding Denmark, Sweden and the UK to the EMU portfolio, improves the efficient frontier and performance. The EU15 MP invest 35,22% in Denmark and the Sharpe ratio is 0,194 instead of 0,160 (EMU MP). Thus, if these three countries joined the EMU on January 1st 1999 (no currency risk), a European investor experienced an increase in diversification benefits. Nevertheless, the investor was still better off by investing in the Asia portfolio: as can be seen in tables 14 & 19 (pp. 42 & 44) the Asia MP has a higher Sharpe ratio than the EU15.

Figure 11: Efficient frontier EMU, Asia and EU15 (01/99 – 12/07)

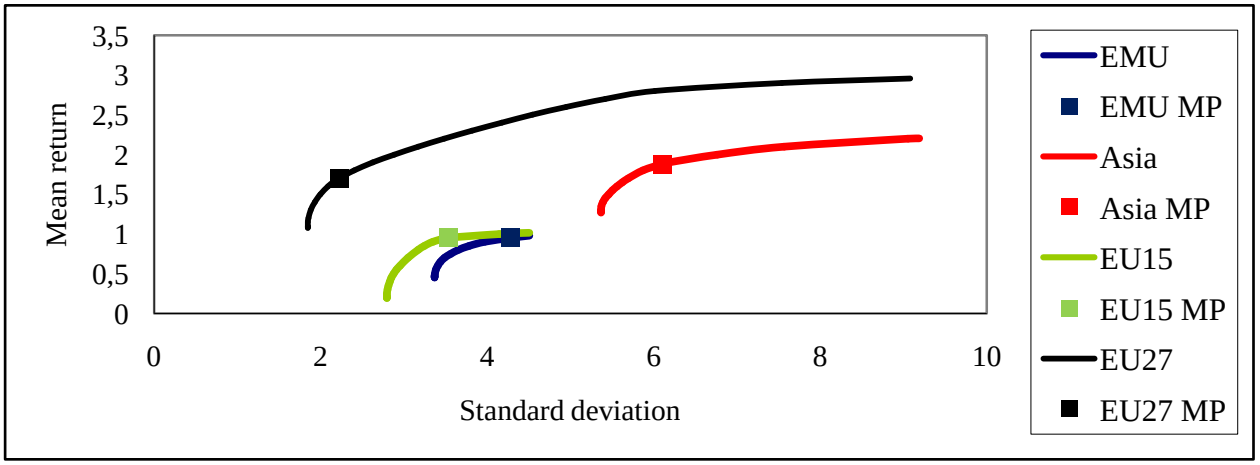


Based on the results for the first and second subsamples, investors experience an increase of diversification benefits. The increase of benefits for the first subsample is positive but very small. The results for the second subsample are also positive, although the increase is larger. Thus, the adoption of the Euro by Denmark, Sweden and the UK would result in an increase of diversification benefits, although the diversification benefits to be obtained by investing in the Asia MP are higher. The elimination of the currency risk results in an increase of diversification benefits, however, the EU15 portfolio is still outperformed by the Asia portfolio.

5.4 EU27 and Asia

The previous results indicated that adding more countries to the EMU portfolio resulted in an increase of diversification benefits, although the portfolios still underperformed compared to the Asia portfolio with respect to the second subsample. Adding even more countries to the EMU portfolio (no currency risk), results in a substantially higher efficient frontier, see figure 12.

Figure 12: Efficient frontier EMU, Asia, EU15 and EU27 (01/99 – 12/07)



As can be seen in figure 12, the EU27 portfolio outperforms all other portfolios. The Sharpe ratio of the EU27 is 0,646 (table 20) while the EMU, Asia and EU15 respectively have 0,160, 0,265 and 0,194. Thus, adding even more countries to the EMU portfolio results in an improved performance. The distribution of the EU27 portfolio is interesting which contains 12 countries. There is only 1 EMU country (Austria) while the other 11 are new member states (table 20, pp. 44-45). A study by Birg & Lucey (2006) concluded that of the new member states, Latvia, Slovak Republic and Slovenia provide more diversification benefits for international investors than any other new member states. The EU27 MP invests 46,3% in these three countries and thereby confirms their findings. Haselmann & Herwartz (2008) concluded that for all new member states, domestic investors experience an increase in diversification benefits. Changing the perspective of investors (discussed in Methodology), the results indicate that the benefits are visa versa. If the new member states had adopted the Euro on the 1st January 1999, European investors would have experienced an increase in diversification benefits.

VI Conclusion

The main contribution of this thesis is that it addresses the diversification benefits for a European investor and the effect of an enlargement of the EMU, presenting a perspective that is opposite to Haselmann & Herwartz (2008). To do so, optimal portfolios have been constructed and the performance of each portfolio was evaluated. The five different optimal portfolios have been determined by means of the mean-variance framework. Based on the Sharpe ratios, the performance was measured (table 21, p. 45).

The Sharpe ratios, shown in table 21 (p. 45), suggest that for the whole sample period the EMU portfolio outperforms the Asia portfolio. As indicated, the elimination of the currency risk, in line with the economic theory, and the impact of the Asia crisis are possible explanations. However the results for the second subsample do not confirm the positive effect of introduction of the Euro.

The results of adding political risk as a restriction to a portfolio (Asia A), neither confirm nor contradict Cosset & Suret's (1995) findings. Out of three, only one unrestricted portfolio, outperforms the restricted portfolio. Therefore, further research with historical political ratings is necessary to determine whether the findings of Cosset & Suret are consistent.

The effects of enlargement of the EMU have been examined by determining the optimal portfolios for EU15 and EU27. The theory of diversification suggests that adding more countries to a portfolio (no currency risk) results in a lower overall portfolio risk if the correlation is not perfect. If Denmark, Sweden and the UK had joined the EMU on January 1st 1999, it would have resulted in an increase in diversification benefits. Yet, the EU15 portfolio underperformed compared to the Asia portfolio. So despite the elimination of the currency risk, the EU15 underperformed. On the other hand, these results confirm the theory of portfolio diversification. Adding more stocks to the portfolio, leads to a lower volatility and improved efficient frontier (Berk & DeMarzo, 2008).

If all 27 EU members had adopted the Euro, it would have resulted in the most efficient portfolio compared to the others. This suggests increased diversification benefits for European investors, if all EU27 members had adopted the Euro. The results are in line with research by Haselmann & Herwartz (2008), but contradict previous research by Morana & Beltratti (2002) and Adjaouté & Danthine (2003). The conclusions do support the results of Birg & Lucey (2006) and Haselmann

& Herwartz (2008). However, due to the ongoing process of integration, these benefits are likely to decrease on the long run, as indicated by Haselmann & Herwartz (2008). A solution to overcome the decreasing diversification benefits is to diversify not only by country, but also by industry (Moerman, 2008).

If more member states had adopted the Euro, it would have been beneficial for investors, as there would be an increase in diversification benefits. In this thesis the currency and political risk are the explanatory variables for diversification benefits, although in reality other variables are important, like transaction cost and trading barriers. For a more realistic de scription, these variables must be taken into account, although this thesis does indicate that an enlargement of the Euro zone is beneficial for European investors.

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Tables

Table 5: Asia summary statistics

Country	Mean	Std. dev.	Min.	Max.	Skewness	Kurtosis	Rating	Mean 93-98	Mean 99-07
China	0,024	10,646	-26,929	40,580	0,129	0,913	A3	-1,717	1,169
Hong Kong	0,799	8,142	-26,539	28,220	0,099	1,282	A2	0,452	1,027
India	1,123	8,933	-26,806	21,521	-0,223	0,076	A3	-0,521	2,204
Indonesia	0,515	13,777	-52,440	46,569	-0,439	2,807	B	-1,528	1,858
Korea	0,839	11,347	-43,575	46,252	-0,045	2,822	A2	-1,030	2,067
Malaysia	0,459	9,856	-42,649	40,625	-0,566	3,982	A2	-1,394	1,676
Pakistan	0,444	11,312	-63,401	31,032	-0,785	5,355	C	-1,330	1,610
Philippines	0,190	9,521	-34,860	39,302	0,099	2,204	B	-0,284	0,502
Singapore	0,665	7,612	-24,491	27,649	-0,224	1,895	A1	-0,146	1,199
Taiwan	0,472	9,107	-22,361	34,218	0,272	0,696	A2	0,665	0,345
Thailand	-0,027	12,449	-40,549	46,068	0,103	2,243	A3	-1,804	1,140

Table 6: EMU summary statistics

Country	Mean	Std. dev.	Min.	Max.	Skewness	Kurtosis	Rating	Mean 93-98	Mean 99-07
Austria	0,688	5,101	-20,390	11,197	-0,696	1,277	A1	0,247	0,978
Belgium	0,592	4,719	-18,920	13,913	-1,085	2,870	A1	1,543	-0,033
Finland	1,555	9,683	-37,111	27,755	-0,535	1,868	A1	3,064	0,562
France	0,711	5,261	-17,415	12,211	-0,522	0,663	A1	1,249	0,358
Germany	0,765	6,175	-28,674	17,956	-0,985	3,342	A1	1,458	0,310
Greece	1,063	7,974	-26,557	34,583	0,323	2,235	A2	1,982	0,460
Ireland	0,643	5,298	-15,747	14,490	-0,624	0,673	A2	1,855	-0,153
Italy	0,708	5,959	-16,043	19,715	0,121	0,425	A2	1,620	0,108
Netherlands	0,709	5,254	-20,387	13,109	-1,036	2,133	A1	1,688	0,066
Portugal	0,795	5,802	-22,279	14,917	-0,278	1,272	A2	1,805	0,130
Spain	1,101	5,892	-25,370	14,320	-0,723	2,355	A2	2,009	0,503

Table 7: EU15 summary statistics

	Mean	Std. dev.	Min.	Max.	Skewness	Kurtosis	Rating	Mean 93-98	Mean 99-07
UK	0,424	3,836	-14,912	6,348	-1,163	1,786	A2	0,940	0,080
Sweden	1,029	7,425	-18,577	18,480	-0,240	0,298	A1	1,762	0,541
Denmark	0,976	5,174	-18,256	12,270	-0,769	1,248	A1	1,144	0,863

Table 8: EU27 summary statistics

Country	Mean	Std. dev.	Min.	Max.	Skewness	Kurtosis	Rating
Bulgaria	2,684	7,370	-15,590	35,039	1,072	3,344	A4
Cyprus	1,470	4,581	-8,544	23,073	2,164	6,018	A2
Czech Republic	1,402	6,570	-18,454	19,604	-0,246	0,729	A2
Estonia	1,924	6,695	-15,445	22,812	0,169	0,510	A3
Hungary	1,303	6,618	-16,917	17,007	-0,392	0,210	A3
Latvia	1,667	6,414	-27,077	29,236	-0,042	6,419	A4
Lithuania	1,522	4,703	-10,186	13,400	0,114	-0,254	A3
Maltha	1,308	6,078	-10,580	22,678	1,049	1,738	A2
Poland	1,456	6,559	-18,187	19,332	-0,084	0,436	A3
Romania	2,956	9,122	-18,540	36,228	0,696	1,666	A4
Slovak Republic	1,449	6,019	-10,149	31,038	1,413	4,758	A3
Slovenia	1,536	4,568	-8,389	13,635	0,596	-0,007	A1

Table 9: EMU 01/93 – 12/07

	MVP	MP		MVP	MP
Return	0,738	1,240			
SD	3,771	5,360			
Sharp	0,033	0,117			
Austria	21,74%	0,00%			
Belgium	26,73%	0,00%	Ireland	16,78%	0,00%
Finland	0,00%	33,19%	Italy	8,98%	0,00%
France	0,00%	0,00%	Netherlands	0,00%	0,00%

Germany	0,00%	0,00%	Portugal	5,65%	0,00%
Greece	20,12%	30,24%	Spain	0,00%	36,57%

Table 10: EMU 01/93 – 12/98

	MVP	MP		MVP	MP
Return	1,697	2,350			
SD	3,774	5,030			
Sharp	0,287	0,345			
Austria	0,08%	0,00%			
Belgium	55,96%	12,32%	Ireland	26,99%	20,06%
Finland	0,00%	41,32%	Italy	0,68%	0,00%
France	0,00%	0,00%	Netherlands	0,00%	0,00%
Germany	0,14%	0,00%	Portugal	0,19%	0,00%
Greece	15,97%	24,12%	Spain	0,00%	2,17%

Table 11: EMU 01/99 – 12/07

	MVP	MP		MVP	MP
Return	0,475	0,950			
St. dev.	3,369	4,282			
Sharp	0,061	0,160			
Austria	36,22%	94,34%			
Belgium	0,00%	0,00%	Ireland	8,98%	0,00%
Finland	0,00%	0,91%	Italy	15,02%	0,00%
France	0,00%	0,00%	Netherlands	0,00%	0,00%
Germany	0,00%	0,00%	Portugal	19,81%	0,00%
Greece	19,97%	4,75%	Spain	0,00%	0,00%

Table 12: Asia 01/93 – 12/07

	MVP	MP		MVP	MP
Return	0,664	1,100			
St. dev.	6,341	8,494			
Sharp	0,008	0,057			

China	0,00%	0,00%			
Hong Kong	15,47%	7,09%	Pakistan	13,74%	0,00%
India	21,47%	92,91%	Philippines	11,80%	0,00%
Indonesia	0,00%	0,00%	Singapore	20,48%	0,00%
Korea	0,00%	0,00%	Taiwan	14,57%	0,00%
Malaysia	2,48%	0,00%	Thailand	0,00%	0,00%

Table 13: Asia 01/93 – 12/98

	MVP	MP		MVP	MP
Return	-0,316	0,665			
St. dev.	6,385	9,719			
Sharp	-0,145	0,005			
China	0,00%	0,00%			
Hong Kong	5,55%	0,00%	Pakistan	7,39%	0,00%
India	39,96%	0,00%	Philippines	1,13%	0,00%
Indonesia	0,00%	0,00%	Singapore	32,66%	0,00%
Korea	4,22%	0,00%	Taiwan	9,09%	100,00%
Malaysia	0,00%	0,00%	Thailand	0,00%	0,00%

Table 14: Asia 01/99 – 12/07

	MVP	MP		MVP	MP
Return	1,296	1,880			
St. dev.	5,366	6,101			
Sharp	0,192	0,265			
China	4,49%	0,00%			
Hong Kong	22,05%	0,00%	Pakistan	17,27%	13,42%
India	1,84%	28,90%	Philippines	18,15%	0,00%
Indonesia	0,00%	0,00%	Singapore	0,00%	0,00%
Korea	0,00%	15,37%	Taiwan	0,00%	0,00%
Malaysia	36,19%	42,31%	Thailand	0,00%	0,00%

Table 15: Asia A 01/93 – 12/07

	MVP	MP		MVP	MP
Return	0,832	1,100			

St. dev.	6,640	8,494			
Sharp	0,033	0,057			
China	0,00%	0,00%			
Hong Kong	26,05%	7,09%	Malaysia	8,32%	0,00%
India	31,57%	92,91%	Singapore	31,64%	0,00%
Korea	2,42%	0,00%	Thailand	0,00%	0,00%

Table 16: Asia A 01/93 – 12/98

	MVP	MP		MVP	MP
Return	-0,314	0,452			
St. dev.	6,475	9,901			
Sharp	-0,143	-0,016			
China	0,00%	0,00%			
Hong Kong	9,64%	100,00%	Malaysia	0,00%	0,00%
India	47,43%	0,00%	Singapore	37,52%	0,00%
Korea	5,41%	0,00%	Thailand	0,00%	0,00%

Table 17: Asia A 01/99 – 12/07

	MVP	MP		MVP	MP
Return	1,445	1,940			
St. dev.	5,809	6,478			
Sharp	0,203	0,264			
China	3,29%	0,00%			
Hong Kong	34,77%	0,00%	Malaysia	39,70%	47,59%
India	11,61%	35,72%	Singapore	10,63%	0,00%
Korea	0,00%	16,68%	Thailand	0,00%	0,00%

Table 18: EU15 01/93 – 12/98

	MPV	MP		MVP	MP
Return	1,423	2,220			
St. dev.	3,191	4,625			
Sharp	0,254	0,348			

Austria	0,00%	0,00%	Italy	0,00%	0,00%
Belgium	16,47%	6,37%	Netherlands	0,00%	0,00%
Finland	0,00%	36,25%	Portugal	0,00%	0,00%
France	0,00%	0,00%	Spain	0,00%	0,00%
Germany	0,00%	0,00%	UK	25,02%	0,00%
Greece	19,06%	24,06%	Sweden	0,00%	0,00%
Ireland	14,75%	21,53%	Denmark	24,71%	11,79%

Table 19.: EU15 01/99 – 12/07

	MPV	MP		MVP	MP
Return	0,216	0,950			
St. dev.	2,794	3,535			
Sharp	-0,017	0,194			
Austria	13,51%	62,72%	Italy	19,65%	0,00%
Belgium	0,00%	0,00%	Netherlands	0,00%	0,00%
Finland	0,00%	2,06%	Portugal	6,65%	0,00%
France	1,00%	0,00%	Spain	0,38%	0,00%
Germany	0,00%	0,00%	UK	46,84%	0,00%
Greece	2,31%	0,00%	Sweden	0,00%	0,00%
Ireland	8,04%	0,00%	Denmark	1,62%	35,22%

Table 20: EU27 01/99 – 12/07

	MVP	MP		MVP	MP
Return	1,100	1,700			
St. dev.	1,846	2,307			
Sharpe	0,453	0,646			
Austria	3,50%	3,20%	Denmark	0,00%	0,00%
Belgium	0,00%	0,00%	Bulgaria	0,00%	5,83%
Finland	0,11%	0,00%	Cyprus	6,66%	8,42%
France	12,02%	0,00%	Czech Republic	0,00%	0,00%
Germany	0,00%	0,00%	Estonia	0,00%	3,42%
Greece	0,00%	0,00%	Hungary	0,59%	2,98%
Ireland	4,06%	0,00%	Latvia	1,69%	6,51%
Italy	0,00%	0,00%	Lithuania	2,97%	2,17%

Netherlands	0,00%	0,00%	Maltha	7,65%	9,20%
Portugal	0,00%	0,00%	Poland	2,26%	8,26%
Spain	0,00%	0,00%	Romania	4,49%	10,22%
UK	15,48%	0,00%	Slovak Republic	14,81%	14,61%
Sweden	0,00%	0,00%	Slovenia	23,72%	25,18%

Table 21: Performance based on Sharpe ratios

01/93 - 12/07	01/93 - 12/98	01/99 - 12/07
EMU > Asia	EMU > Asia	EMU < Asia
(0.117) (0.057)	(.345) (0.005)	(0.160) (0.265)
Asia A = Asia	Asia A < Asia	Asia A < Asia
(0.057) (0.057)	(-0.016) (0.005)	(0.264) (0.265)
	EU15 > Asia	EU15 < Asia
	(0.348) (0.005)	(0.194) (0.265)
		EU27 > Asia
		(0.646) (0.265)

(< worse, = equal and > better performance)