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International Diversification: Portfolio Optimization with Developed, Emerging and Frontier Markets

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ABSTRACT:

This study examines the benefits of international diversification especially with emerging and frontier markets. The purpose of the study is to investigate the performance of optimally constructed portfolios containing developed, emerging and frontier markets, and to test if the asset allocation to emerging and frontier enhance the performance of investment portfolio.

Six portfolios are constructed to examine the value addition of emerging and frontier markets in internationally diversified portfolios. The first portfolio (P1) is considered the benchmark portfolio, and it contains only European developed markets. The second portfolio (P2) contains the developed markets and emerging markets, whereas the third portfolio (P3) is composed of developed and frontier markets. In order to examine the optimal allocation also for regional emerging and frontier markets, portfolios four (P4) and five (P5) consist of developed markets and regional emerging and frontier markets. Portfolio six (P6) combines all the markets selected for the study. The study has been carried out using two different portfolio optimization methods. The first method aims to minimize the variance of the portfolio, while the second optimization method minimizes the semivariance of the portfolio. In addition, the performance of the constructed portfolios is evaluated by utilizing three different portfolio performance measures.

The empirical findings of this study indicate that while emerging and frontier markets offer diversification benefits in optimally constructed portfolios, there are significant differences in performance between the markets. The results show that exposure of emerging markets decreases when frontier markets are added to the portfolio, but still the performance of emerging markets, especially EM Asia index, clearly outperforms frontier markets. Therefore, despite the risk reducing effect of frontier economies, the risk-adjusted returns cannot be considered relatively attractive. Overall, in terms of the performance of both optimally constructed portfolios, the results indicate that diversification to emerging markets reduces the overall risk of the portfolio and outperforms the benchmark portfolio. This study underlines the importance of international diversification, especially to emerging markets. Furthermore, this study allows the investor to assess the attractiveness of different less developed geographical areas as an investment destination relative to developed economies.

KEYWORDS: emerging markets, frontier markets, portfolio optimization, international diversification

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TIIVISTELMÄ:

Tässä tutkimuksessa tarkastellaan kansainvälisen hajauttamisen tarjoamia hyötyjä erityisesti kehittyvien ja rajamarkkinoiden osalta. Tarkoituksena on tutkia kehittyneitä, kehittyviä ja rajamarkkinoita sisältävien optimaalisesti rakennettujen portfolioiden suorituskykyä sekä mitata, parantaako varojen allokaatio kehittyville ja rajamarkkinoille sijoitussalkun suorituskykyä.

Kehittyvien ja rajamarkkinoiden tarjoaman hajautushyödyn arvioimiseksi tässä tutkimuksessa on muodostettu yhteensä kuusi optimaalista portfoliota. Ensimmäinen vertailuporftolio (P1) sisältää ainoastaan eurooppalaisia kehittyneitä talouksia. Toinen portfolio (P2) sisältää kehittyneitä ja kehittyviä markkinoita, kun taas kolmas portfolio (P3) koostuu kehittyneistä ja rajamarkkinoista. Jotta voitaisiin arvioida optimaalisen allokaation muodostamista alueellisten kehittyvien ja rajamarkkinoiden osalta, portfoliot neljä (P4) ja viisi (P5) koostuvat kehittyneistä markkinoista sekä alueellisista kehittyvistä ja rajamarkkinoista. Portfoliossa kuusi (P6) yhdistetään kaikki tutkimukseen valitut indeksit kehittyneiden, kehittyvien ja rajamarkkinoiden osalta. Tutkimus on toteutettu hyödyntämällä kahta erilaista portfolion optimointimenetelmää. Ensimmäisessä menetelmässä tavoitteena on minimoida sijoitusportfolion varianssi, ja vastaavasti toisessa optimointimenetelmässä minimoidaan portfolion semivarianssi. Optimaalistesti muodostettujen portfolioiden suorituskykyä mitataan kolmen eri yleisesti käytetyn mittarin avulla.

Tämän tutkimuksen empiiriset tulokset osoittavat, että vaikka kehittyvät markkinat ja rajamarkkinat tarjoavat optimaalisesti muodostetuissa sijoitusportfolioissa hajautushyötyjä, näiden markkinoiden suorituskyvyssä on merkittäviä eroja. Tulokset osoittavat, että kehittyvien markkinoiden osuus optimoidussa portfoliossa vähenee kun rajamarkkinoiden painoa portfoliossa lisätään, mutta silti kehittyvien markkinoiden, erityisesti EM Asia indeksin suorituskyky on selvästi parempi kuin rajamarkkinoille sijoittavien indeksien. Rajamarkkinoiden riskiä minimoivasta vaikutuksesta huolimatta niiden tarjoamia tuottoja ei voida pitää sijoittajan näkökulmasta kovinkaan houkuttelevina. Yleisesti, molempien optimaalisesti muodostettujen portfolioiden performanssin osalta tulokset osoittavat, että hajauttaminen kehittyville markkinoille vähentää salkun varianssia sekä parantaa sijoitusportfolion riskikorjattua tuottoa. Tämän tutkimuksen tulokset alleviivaavat kehittyvien talouksien merkitystä optimaalisesti hajautetussa portfoliossa, vaikka alueellisten erojen voidaan sanoa olevan huomattava. Tämän tutkimuksen avulla sijoittaja voi arvioida erilaisten vähemmän kehittyneiden maantieteellisten alueiden houkuttelevuutta sijoituskohteena suhteessa kehittyneisiin talouksiin.

KEYWORDS: kehittyvät markkinat, rajamarkkinat, sijoitusportfolion optimointi, kansainvälinen hajauttaminen

Table of contents

LIST OF FIGURES AND TABLES

1 Introduction

In finance, both individual and institutional investors constantly evaluate the tradeoff where higher expected return is received with greater risk. In other words, investors holding portfolio with higher volatility should be rewarded with higher expected return (Berk & DeMarzo, 2011, pp. 305.). Investment advisors, portfolio managers and retail investors aim to improve their asset allocation strategy to maximize the expected return with lower risks. Term diversification is a common and widely known concept in finance, and the principles of portfolio diversification are still in everyday use today among investors. In the earliest studies of diversification, the concept of portfolio theory by Markowitz (1952) states that diversification of portfolio enables investor to lower the risk of portfolio without decreasing the expected return. Based on the following principle, investors can mitigate the risk of individual assets by adding various asset classes i.e., equities, fixed-income securities, and real estate to the portfolio. The aim is that the correlation between the assets should be low or even negative, limiting the portfolio overall risk.

Besides the more traditional method of portfolio diversification mentioned above, the popularity of international diversification has increased during the last few decades. Although academic literature has investigated international diversification and its effect to the performance of portfolios for decades, the popularity of international diversification in practice can still be described as limited. The international diversification the aim is to utilize different economical characteristics of continents, regions and nations and thereby enhance portfolio diversification. Although the possible benefits of international diversification have been recognized, most of the investors still hold a large proportion of their wealth in domestic assets (French & Poterba, 1991, pp. 222). Hence, the large weight in domestic portfolio exposures the portfolio to risks, which could be mitigated through diversification to foreign stock markets. This behavioristic puzzle in finance is known as home-country bias.

Morgan Stanley Capital International (MSCI) classifies economies into developed, emerging and frontier markets according to three criteria: i) Economic development ii) Size and liquidity requirements, and iii) Accessibility of foreign investors. (MSCI, 2012.) To qualify as a developed economy in terms of economic development, a country's GNI per capita must be 25% above the World Bank threshold for three consecutive years. Size and liquidity requirements instead set limits to the company size measured as a market cap, security size, and liquidity of security. In addition, accessibility requirements measure the openness of the market, ease of capital flows, stability of institutions, operational framework, and its efficiency and availability of investments. (MSCI Market Classification Framework, 2021). In the early 1990s emerging economies did not yet attract foreign investments due to barriers of international investments, limited liquidity, different taxation, and political instability (Bailey & Stultz, 1990). Later on, especially after the so-called Dot.com in the 2001, there was a strong sentiment that U.S. investors started to allocate more assets to so-called emerging economies. These markets provided efficient diversification benefits and excess returns due to the low correlation with developed economies and the strong GDP growth.

Digitalization has increased the opportunities for portfolio diversification to emerging markets due to a decrease in transaction costs, a wide range of investment products, and more comprehensive information. Kumar (2011) argues that these economies have become attractive for foreign investors due to the three reasons affecting the correlations between emerging and developed economies. First off, emerging economies are often in a different business cycle compared to developed economies. Secondly these economies differ from advanced economies in terms of their policy regulations, and finally, emerging economies often have different industrial structures within the economy. However, globalization has made the developed and emerging markets more cointegrated. Thus, the co-movements of the markets can lead to a decrease in diversification benefit (Han et al. 2017, pp. 5090). Because emerging markets have become more integrated with developed economies, both academic and practical

interests have increasingly shifted to the study of the possibilities of frontier markets in portfolio diversification.

1.1 Purpose of the study

The main purpose of the paper is to examine whether international diversification to emerging and frontier markets provides diversification benefits. As mentioned in the previous chapter, the increase in investment opportunities in foreign stock markets has made both emerging and frontier markets more attractive for investors. Therefore, the capital flows to these markets have increased, and the international diversification has become a “hot topic” among investors due to the excess return expectations and decreases in the portfolio risk. This study analyses the differences between emerging, frontier, and developed markets and examines whether investors are able to benefit from the international diversification of these markets during increasing equity market integration. Moreover, the aim is to examine whether emerging markets are still a justified component of portfolio diversification or whether the focus of diversification should be headed to different markets or asset classes.

The main contribution of this thesis is to empirically evaluate whether the emerging market and frontier markets are part of an effectively optimized portfolio. Hence, the relevance and uniqueness of the research relies on the fact that it measures the diversification benefits of three different markets namely developed, emerging and frontier markets. Besides this, dividing the considered time frame also into two sub-periods enables to measure the development of the different markets during changing economic environment. For the methodology, this study combines different procedures used in previous academic literature to evaluate optimal portfolios combining developed, emerging and frontier markets, and to investigate the performance of the constructed portfolios.

1.2 Hypotheses

This thesis evaluates the optimal portfolio construction with developed, emerging, and frontier markets, and the aim is to answer the research question of whether the international diversification to emerging and frontier markets decreases the risk in minimum variance and minimum semivariance optimized portfolios. Therefore, the hypothesis for this research can be stated as:

> H1: Exposure to emerging and frontier markets decreases the risk in minimum variance and minimum semivariance optimized portfolios.

In addition, the intention is to investigate if the emerging and frontier markets increase the portfolio performance in risk-adjusted measures. The second hypothesis of this research are stated as follows:

> H2: Asset allocation to frontier and emerging markets increases the portfolio performance in risk-adjusted measures.

The aim is to answer the question of whether international diversification to emerging and frontier markets still offers diversification benefits in terms of lower portfolio risk and enhanced risk-adjusted performance measures. The use of common asset classes enables to bring information to investors on whether the recommendations for international diversification using these investment products are still beneficial or whether investors should, i.e., specify more to the individual stock or market selection based on predetermined selection methods. Therefore, the conclusions of this study allow both further academic research and practical asset allocation decisions being made.

1.3 Structure of the study

The following chapter introduces the literature review. The theoretical background, which focuses on portfolio theory, is introduced in the third chapter of the study. The fourth chapter will focus on the risks of international diversification. In chapter five, international diversification to emerging and frontier markets is discussed in more detail. This chapter also discusses home-country bias and its impact on international diversification and provides an overview of international integration development. The sixth chapter introduces the data and methodology of this research, and the empirical results are discussed in chapter seven. Conclusion is provided in chapter eight.

2 Literature review

In the earliest studies considering diversification, the results of Markowitz (1952) and Tobin (1959) showed that the investor's ability to reduce the risk of an investment portfolio depends on the correlation among the assets in the portfolio. Therefore, if the returns of assets show no correlation diversification can eliminate the risk. Further research of diversification focused on exploring new ways of investigating assets with low correlation to reduce the portfolio variance. The research of international diversification gained popularity among academics.

International portfolio diversification is a widely studied and documented topic in academic literature. The interest in the subject and the benefits highlighted by the studies have inspired researchers to explore the subject further and to develop new perspectives on the opportunities offered by international diversification. The earliest studies of asset allocation to international markets strongly recognize its benefits. Studies by Grubel (1968), Levy & Sarnat (1970), Solnik (1995) and Lessard (1974) investigating international portfolio diversification find that allocating assets to foreign stock markets can indeed increase the gains of diversification in terms of lower variability of returns. In addition, Meric & Meric (1989) find that instead of diversifying the portfolio across industries, international diversification offers better risk reduction.

In the late 1980s and early 1990s emerging markets started getting more attention from investors and academic literature. Overall, the emerging equity markets were seen as a fascinating new asset class with various propitious features such as low correlation with developed economies and high growth potential. To understand the attractiveness of emerging markets, Koepke (2019) divides the sub-areas of capital flows into emerging markets to push and pull factors. Subsequent studies of Eun & Resnick (1984), Bailey & Stultz (1990), Divecha et al. (1992), Harvey (1995) and Kohers et al. (1998) find that although emerging economies are associated generally with higher volatility, still due to their low correlation, adding them to an investment portfolio reduces the overall risk of the portfolio. Furthermore, Erb et al. (1995) examined the riskiness of developed and

emerging economies through their credit ratings. They find that the performance of highest-credit risk portfolios was significantly better measured in portfolio returns compared to low-credit risk portfolios. Unexpectedly, the riskiness of these portfolios was approximately still the same as measured by the volatility of the portfolios. Solomons & Grootveld (2003) investigate equity risk premiums and find that emerging markets offer significantly higher premiums than developed markets. In addition, Mensi et al. (2014) examine the influence of global factors to BRICS emerging markets and find that the returns of the global stock market have a positive and significant impact on the stock returns of BRICS countries.

Due to globalization and increasing integration of economies, several studies have shown that the benefits of international diversification, especially with emerging markets, have diminished (Carrieri et al. 2007; Berger et al. 2011; Christoffersen et al. 2012). Whereas Kumar (2011) argues that CBOE Volatility Index (VIX) enables more efficient diversification for US investors in terms of correlation and risk-adjusted measures compared to the emerging markets. This indicates that investors seeking diversification benefits should shift attention from emerging markets to investments or asset classes. In addition, Han et al. (2017) argue that diversification in the emerging market is no longer beneficial for a US investor.

During the last decade, the so-called sub-set of emerging economies with less accessibility and smaller size have gained increasing attraction in academic research. First studies of frontier markets identify the potential of these markets for portfolio diversification (Miles 2005; Jayasuriya & Shambora 2009; Quisenberry & Griffith 2010; Sukumaran et al. 2015). In addition, Speidell & Krohne (2007) investigated the typical characteristics of frontier economies and concluded that these market areas might offer significant gains based on their progress in economic development and differences in the business environment compared to more developed markets, and later on Speidell (2017) Also recognizes the future potential of frontier markets as the growth expectations of these economies may realize.

By utilizing three-tiered nested analytical approach to examine the financial integration of emerging and frontier markets, Cagliesi & Guidi (2021) find that although the global financial crisis has produced higher level of integration between developed and frontier markets, the degree of integration is still higher between US and emerging markets compared to the integration level of US and frontier markets.

Gao & Mei (2019) observed more substantial dependencies between US markets and Asian markets after the 2008 financial crisis. By investigating the integration of Asian frontier, emerging, and developed markets, Guntur & Velip (2021) concluded that since the integration between Asian developed and emerging markets has increased, the diversification benefits of emerging economies have mainly diminished. Still, the results indicate opportunities for investors who diversify to Asian frontier markets instead of emerging markets due to the lower level of integration of frontier markets with Asian developed economies.

Marshall et al. (2015) investigate the transaction costs of 19 frontier markets and find that portfolios that are rebalanced after three months or later do offer diversification benefits despite the relatively high transaction costs. Pätäri et al. (2019) instead examine the correlations of emerging, developed and frontier markets before and after the financial crisis, concluding that despite the increasing integration, higher exposure to frontier markets can decrease the portfolio risk. Still, Thomas et al. (2022) noticed that while the benefits of diversification are mainly greater in frontier markets, the investor must also accept a relatively higher level of risk.

Besides the increasing interest in the research of emerging economies in the beginning of the 1990s, the academic research also took a broader interest in the phenomenon known as home-county bias. Despite the benefits of international diversification, in 1989, US investors held 6.2 percentages of their equity portfolio in foreign assets, whereas

Japanese investors held only 1.9 of their equity portfolios overseas (French & Poterba, 1991, pp. 222).

Moreover, Karlsson & Norden (2007) find evidence of home-country bias among Swedish investors, whereas Oehler et al. (2008) came to the same result with investigating home country bias among German investors. The conclusion is that since the home-country bias affects the asset allocation decisions and, therefore, the investors do not utilize the benefits of international diversification, the risk-adjusted return is not optimal.

By investigating funds from 26 developed and developing economies, Chan et al. (2005) find robust evidence that the funds prefer domestic assets in their asset allocation decisions. In addition, Ke et al. (2010) argue that portfolio managers outside of the US prefer US equity investments which have activity in the home country of the fund manager. By developing measures for the home-country phenomena, Mishra (2015) uses various models to investigate the bias for 42 countries from 2001 to 2011, finding that country-specific idiosyncratic risk has a positive impact on home bias.

Since there is a broad consensus among researchers on the phenomenon's existence, one of the main objectives was to identify its causes. In the earliest studies the studies of Sercu (1980), Krugman (1981) and Stultz (1983) explain the investor's bias towards domestic assets with the willingness to hedge against home inflation. Moreover, Cooper & Kaplanis (1994) came to same conclusion that domestic assets do provide better protection against country-specific risks. Still, Uppal (1992) demonstrates that the earlier notion that home-country bias is due to inflation protection, institutional control, taxes, and parafiscal charges can only partly hold.

3 Theoretical background

The main purpose of this chapter is to present the theoretical background of risk-return relationship, portfolio diversification, and portfolio performance. This chapter will explain the theory of stock returns and the CAP-model, and later, the elements of portfolio theory and portfolio performance measures will be discussed.

3.1 The portfolio theory

The portfolio theory can be identified as a quantitative analysis of the risk management of an investment portfolio. Investors are optimizing their portfolio by evaluating the tradeoff between earning higher expected returns for a given level of risk (Bodie & Merton 2000, pp. 272-273). It needs to be noted that the principle of portfolio theory aims to mitigate the idiosyncratic risk of an investment portfolio. Idiosyncratic or "firm-specific risk" can be described as an indigenous for individual asset, whereas systematic risk affects the overall market, and therefore, is common to all asset classes. In cases where the investors are bearing idiosyncratic risk in the portfolio, they demand compensation in terms of higher expected returns. Investors are only able to decrease the idiosyncratic risk with diversification.

The modern portfolio theory, first introduced by Markowitz (1952), identifies the expected return of the investment portfolio with the mean of the distribution of expected returns and the risk with the standard deviation of returns. In modern portfolio theory the investors focus is ultimately on (1) the expected rate of return, and (2) the variance of portfolio returns (Francis & Kim 2013, pp. 122). Moreover, the theory assumes that the investors are risk-averse and therefore will choose a portfolio which minimizes the variance with given rate of return and maximize the expected return with given variance, such portfolios can be called mean-variance efficient portfolios (Fama & French 2004, pp. 26-27). Although the modern portfolio theory has been criticized over the decades, for example about the definition of risk, it has nevertheless retained its place among the most critical financial theories.

Holding period return is the total return investors earn when holding the asset over time. HPR can be divided into two terms: the dividend yield and capital gain rate. Dividend yield express the percentage return expected to be paid from owning the stock and the capital gain rate is the amount investor will earn when selling the security for a given period of time (Berk & DeMarzo 2011, pp. 253.) To determine the holding period rate of return of a security, the following equation is used (Bodie et al. 2014, pp. 128.)

$$HPR = \frac{P_1 - P_0 + D_1}{P_0} \quad (1)$$

Where:

HPR refers to the holding period return of a security

P_1 refers to the ending price of a security

P_0 refers to the beginning price of a security

D_1 refers to the cash dividend

Models of probability distributions where the mean of distribution expresses the expected return are used in the portfolio theory to identify the risk-return tradeoff of investing. The expected return of an asset by multiplying the possible outcomes with the probability of the outcome occurring and then totaling all the results. The expected return of a portfolio is the sum of the expected returns of individual assets in the portfolio multiplied with the weight of the asset in the portfolio. The total weights of the securities in the portfolio are equal to 1. Equation to calculate the expected return of the portfolio is:

$$E_{(rp)} = \sum_{i=1}^{n} W_i \, E\,(R_i) \quad (2)$$

Where:

$E_{(rp)}$ is the expected return of a portfolio

W_i is the weight of individual security

R_i refers to the expected return of individual security

n is the number of securities in the portfolio

Investment decisions are significantly influenced by the presence of risk, and therefore asset allocation decisions are largely influenced by mitigating risks. As explained above, investors confront both diversifiable and undiversifiable risks when allocating assets to securities. Since investors are able to eliminate firm-specific risks through diversification, it is essential first to define the risk of portfolio and second demonstrate how diversification is implemented in theory.

One of the measures used to describe the riskiness of an asset is its volatility, which measures the dispersion of the returns of an asset. Volatility of returns depends on the distribution of possible returns and the probability of their occurrence. The standard deviation of returns describes the dispersion of possible and expected returns, and therefore the term risk is defined as a standard deviation of rate of return. The standard deviation of returns can be calculated as follows (Bodie & Merton 2000, pp. 275-276):

$$\sigma = \sqrt{\sum_{i=1}^{n} Pi(r_i - E(r))^2} \quad (3)$$

Where:
σ is the standard deviation
Pi is the probability
r_i is the possible return
$E(r)$ is the expected return
n is the number of securities

Although we know how to define the expected return of a portfolio and the risk of individual security, it is still essential to determine the risk of an investment portfolio. Individual assets face common risks; their returns move in the same direction, and this impacts the effectiveness of portfolio diversification. Therefore, calculating the covariance and correlation of returns enables to examine the variation of two returns and the magnitude of the relationship between the returns (Berk & DeMarzo 2011, pp.

333-334.) The following equations can be used to calculate the covariance and correlation between returns *Ri* and *Rj*:

Covariance:

$$Cov(Ri, Rj) = E[Ri - E[Ri](Rj - E[Rj])] \quad (4)$$

Where:

$Cov(Ri, Rj)$ is the covariance between returns *Ri* and *Rj*

Ri is the return of security i

Rj is the return of security j

$E[Ri]$ is the expected return of security i

$E[Rj]$ is the expected return of security j

Correlation:

$$Corr(Ri, Rj) = \frac{Cov(Ri,Rj)}{\sigma(\mathrm{Ri})\sigma(\mathrm{Rj})} \quad (5)$$

Where:

$Corr(Ri, Rj)$ is the correlation between returns of *Ri* and *Rj*

$Cov(Ri, Rj)$ is the covariance between *Ri* and *Rj*

$\sigma(\mathrm{Ri})$is the standard deviation of Ri

$\sigma(\mathrm{Rj})$ is the standard deviation of Rj

In the equation, the covariance between returns *Ri* and *Rj* measures the co-movement of the stock returns. For example, if two securities move in the same direction, the covariance between these two securities is positive, and the covariance is negative if the returns of the securities move in opposite directions relative to each other. Because the covariance only determines the direction of the evolution of stock returns, the correlation determines the magnitude of the movement. In portfolio diversification based on the principles of Markowitz (1952), the portfolio risk can be decreased without sacrificing the expected return by adding low correlated securities to the portfolio.

When considering asset allocation to different equities, it is essential to consider the efficiency of portfolio diversification. Instead of only focusing on individual

characteristics of securities, Markowitz (1959) emphasizes the balance between the selected securities in efficient portfolio diversification. Since the returns of the selected stocks may move in the same direction, it is relevant for the efficiency of diversification to consider not only the performance of individual stocks but also their combined effect on the variance of the portfolio.

If the stocks in the portfolio have positive covariance, i.e., they move in the same direction, this increases the variance of the portfolio. Determining the covariance between stocks is essential for efficient portfolio diversification since it affects a portfolio's overall riskiness. In the modern portfolio theory, when the investor minimizes the covariance between securities, the portfolio's overall risk can be decreased. Therefore, the riskiness of individual security can be considered irrelevant regarding overall diversification (Francis & Kim 2013, pp. 120.) To compute the two-stock portfolio variance, Bodie et al. (2014, pp. 208.) use the following equation:

$$\sigma_p^2 = w_D^2\sigma_D^2 + w_E^2\sigma_E^2 + 2w_D W_E Cov(r_D, r_E) \quad (6)$$

Where:

σ_p^2 is the portfolio variance

w_D^2 is the weight of stock *D*

σ_D^2 is the variance of stock *D*

w_E^2 is the weight of stock *E*

σ_E^2 is the variance of stock *E*

$Cov(r_D, r_E)$ is the covariance between stocks *D* and *E*

3.2 Security selection and efficient frontier

Bodie et al. (2014, pp. 220-222) use three steps to illustrate the portfolio construction problem of two risky assets. First, possible risk-return combinations for risky securities are constructed. The minimum-variance frontier visualizes the lowest possible variance at which the potential level of return can be achieved (Bodie et al. 2014, pp. 220). The minimum-variance frontier of risky assets is illustrated in the figure 1.

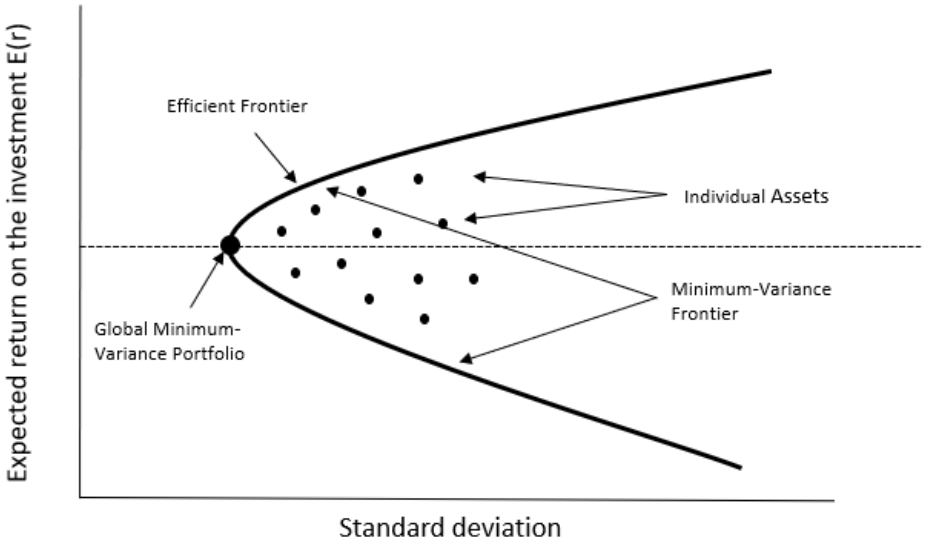


Figure 1 The minimum-variance frontier of risky assets (Bodie et al. 2014, pp. 220)

As seen from figure 1, portfolio diversification can lead to a situation where the expected return of the portfolio is higher and the risk, measured by standard deviation, is lower than allocating assets to a single security. All the portfolios that lay on the global minimum-variance frontier and upward are considered to be candidates for the optimal portfolio due to their best risk-return profile (Bodie et al. 2014, pp. 220). Furthermore, for any portfolio which lay on the frontier but below the global minimum-variance portfolio, there is a portfolio with the same standard deviation but a higher expected return and therefore, portfolios that lay on this part of the frontier are considered to be inefficient.

The Capital Allocation Line (CAL), also referred to as the risk-return trade-off line, illustrates all possible combinations between risky securities and risk-free assets, and the aim is to find the most optional point from the CAL providing the highest risk-adjusted performance measured by the Sharpe ratio. In the next step of the portfolio construction process, the weights of the risky assets with the CAL with the steepest, i.e., most optimal, risk/expected return ratio are determined. Hence, in the second step of the portfolio construction process the risk-free asset is included. In the final step of the process, the

individual investor chooses the allocation between the optimal risky portfolio and the risk-free asset (Bodie et al. 2014, pp. 221).

As mentioned in the chapter, the central idea of portfolio theory is to reduce the risk associated with an individual asset through efficient diversification. Nevertheless, the effect of diversification is limited to mitigating idiosyncratic risk, with the result that the portfolio's risk largely consists of systemic risk affecting the market and to the overall economy.

3.3 CAPM and security market line

The capital asset pricing model, or CAPM, is a pricing model used in financial theory to calculate the expected return on a security. The development of the model has been influenced by Sharpe (1964), Lintner (1965) and Mossin (1966), as well as the previously published portfolio theory by Markowitz (1952). The fundamental idea of the model is that the market awards investors for bearing risk (Bodie & Merton 2000, pp. 344). The idea of CAPM was derived based on the following question: if all of the investors would set up the portfolios optimally according to the principles of efficient diversification and they all have the exact expectations of the expected returns and risks, what would the risk premiums of securities be in an equilibrium (Bodie & Merton 2000, pp. 344). In the model, the expected return on security can be calculated by adding to the risk-free rate a market risk premium multiplied by a company-specific beta factor. The equilibrium is represented in the equation below.

$$E(r) = rf + \beta(E(r_m) - rf) \tag{7}$$

Where:

$E(r)$ is the expected return of the security

rf is the risk-free rate

β is the beta of the security

r_m is the expected return of the market portfolio

The systematic risk of a security is determined by its beta coefficient, and in the equation above, the beta of a security *i* is expressed as Greek letter β. The beta coefficient is widely used in finance to measure security's sensitivity to the market index. Beta measures how much a security return tends to increase or decrease for every 1% increase or decrease in the return on the index (Bodie et al. 2014, pp. 260). Stocks that have a beta greater than 1.0 are considered to be aggressive since these stocks tend to react more to the changes in the returns of the overall market, whereas stocks with a beta less than 1.0 are called defensive due to their lower reaction to the changes in the overall market returns.

The market portfolio can be determined as a portfolio that holds all of the assets by proportion to their market value (Bodie & Merton 2000, pp. 344). The expected excess return of the market portfolio can be calculated by dividing the risk-free rate from the expected market return $E(r_m)$. In contrast, the risk premium of an individual stock can be calculated by multiplying the expected risk premium on the market by the stock's beta. Based on the CAPM, the risk premium of the market portfolio is determined by the volatility of the market return and the risk aversion of the investors (Bodie & Merton 2000, pp. 347). The security market line (SML) describes in the graph the expected rate of return of individual security as a function of systematic risk. The SML is represented in the figure below.

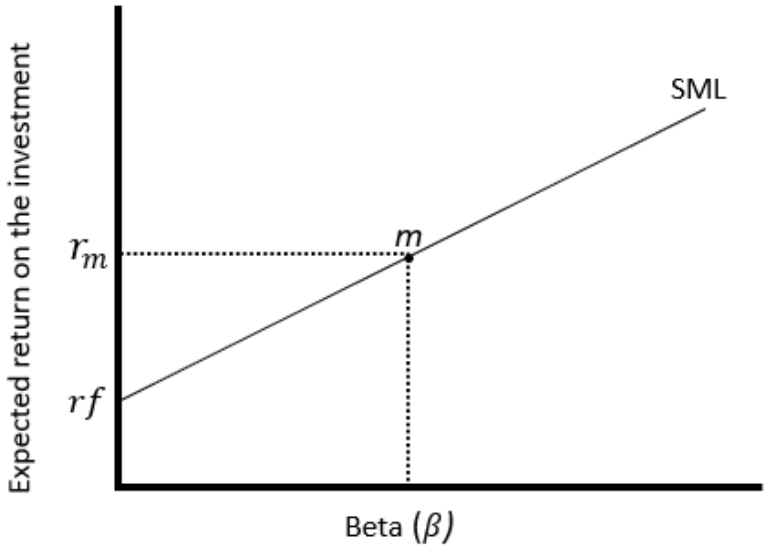


Figure 2 The security market line (SML)

While the CAP model can be considered essential in theoretical finance and in in practice, it has also faced criticism, mainly due to its poor empirical record (Fama & French, 2004) and for its unrealistic assumptions. (Bodie et al. 2014, pp. 303-304; Brealey et al. 2017, pp. 206-207; Bodie & Merton, 2000, pp. 354-355). However, CAPM is still widely used in applications such as estimating the cost of capital and evaluating the prices for risky securities.

To conclude, CAPM allows to make predictions from the relationship between the risk of an asset and its expected return. Despite the criticism, the model can be considered important in modern financial economics for two main reasons. Firstly, the model can establish a benchmark for potential investments. Secondly, it enables the prediction of a level of expected return for an asset that has not yet been publicly traded. (Bodie et al. 2014, pp. 291.).

3.4 Portfolio performance measures

When evaluating portfolio performance, a common mistake is to base the conclusion on performance solely on portfolio returns. Instead, the investor should relate the return

on the portfolio to the level of risk required. In this chapter, three portfolio performance metrics are introduced from which all of them are still widely used. In a later stage of the research, these measures will be used to assess the performance of empirically constructed portfolios.

3.4.1 Sharpe ratio

Sharpe ratio evaluates the performance of an investment, such as a portfolio or security, by adjusting for its risk. The Sharpe ratio was first introduced as the reward-to-variability ratio in 1966 in an article made by William Sharpe (1996). The ratio measures the expected return per unit of risk for a zero-investment strategy (Sharpe, 1994, pp. 57). The metric is calculated by subtracting the return of the risk-free asset from the return of the portfolio and dividing the result by the standard deviation of the portfolio. The formula is defined as:

$$Sharpe\ Ratio = \frac{(r_p - r_f)}{\sigma_p} \tag{8}$$

Where:

r_p is the return of the portfolio

r_f is the risk-free rate

σ_p is the standard deviation of the portfolio

Sharpe ratio measures how much the investor is compensated for the risk-taking. The formula gauges risk as the standard deviation of portfolio returns, and therefore the risk can be defined as the total risk which it includes both systematic and unsystematic risk. however, in some cases it is justified to explicitly measure the ratio of portfolio excess return to only systematic risk thus justifying the use of the Treynor ratio, since it defines the risk as the portfolio beta instead of standard deviation.

To conclude, the Sharpe ratio is still widely used to measure the performance of an investment portfolio. However, the Sharpe ratio has been the subject of debate, and recent literature has criticized its sufficiency as a measure of portfolio performance.

Since the use of Sharpe is based on the mean-variance theory, it can only be said to be relevant in situations where returns are normally distributed. In other words, it assumes that the distribution of returns is Gaussian. Thus, use of Share ratio can lead to wrong performance conclusions if the return distributions are skewed (Janki & Jubin, 2013, pp. 10-11). An alternative way to measure fund performance is to use a modified Sharpe developed by Favre & Galeano (2002) and Gregoriu & Gueyi (2003). The modified Sharpe ratio is determined as the ratio between the average excess return of the fund and its modified Value-at-Risk (Ardia & Boudt, 2015, pp. 97-98). In some studies, the modified Sharpe has been seen as an alternative for the traditional Sharpe ratio especially when measuring the performance of an investment with non-normal returns such as hedge funds.

3.4.2 Jensen's alpha

To test whether the fund managers are able to generate excess returns by predicting the security prices and therefore outperform the passive buy-the-market-and-hold policy, Michael C. Jensen (1968) generated a model, which is now a widely recognized measure of portfolio performance known as Jensen's alpha. Jensen's alpha can be used to measure whether the return on a portfolio exceeds the return calculated by the CAP model. The formula to calculate the Jense's alpha can be expressed as follows:

$$Jensen\ alpha = \quad r_p - [r_f + \beta_p(r_m - r_f) \tag{9}$$

Where:

r_p is the return of the portfolio

rf is the risk-free rate

β is the beta of the security

r_m is the expected return of the market portfolio

The ratio also takes into consideration the risk level of the investment, and therefore it is a widely used performance measure. Furthermore, if the portfolio has exceeded the

risk-adjusted return using the cap model, the portfolio has then been able to generate positive alpha and vice versa. Stocks with a positive alpha are commonly referred to as undervalued because their return is higher than the risk-adjusted return calculated using the capital asset pricing model.

3.4.3 Treynor ratio

Treynor ratio, also referred to as the risk-to-volatility ratio, is a performance metric that determines the excess return generated for each level of risk taken. Whereas the Sharpe ratio compares the excess return of an investment, such as a portfolio of stocks, against the standard deviation, the Treynor ratio compares the excess return against the systematic risk of a portfolio measured by the portfolio beta. The formula of Treynor ratio is expressed as follows:

$$Treynor\ Ratio = \frac{(R_p - R_f)}{\beta_p} \quad (10)$$

Where,

R_p is the portfolio return

R_f is the risk-free rate

β_p is the beta of the portfolio

This study exploits three different portfolio metrics for three main reasons. First, all the selected metrics evaluate the portfolio performance from a slightly different perspective. Secondly, the use of multiple metrics enables the comparability of the results. Thirdly, the robustness of the results can be tested more efficiently. It still needs to be noted that there are some drawbacks related to the use of these three performance metrics. Although the metrics provide valuable information about the performance of the constructed portfolios, these do not consider important factors affecting the performance. These factors include i.e. liquidity, transaction costs and different behavioral biases. In addition, all of the use metrics are based on certain assumptions which may not be accurate in the real scenarios. Nevertheless, the use of Sharpe ratio,

Jensen’s alpha and Treynor ratio can be considered justified and allow comparison of portfolios from different perspectives.

4 Risks of international diversification

Global foreign direct investment flows have almost tripled in the last 20 years, reaching 1.58 trillion in 2021 (UNCTAD, 2022). Globalization, digitalization, and lower barriers to investment flows and international trade are linking international financial markets. For investors, this provides opportunities to enhance portfolio diversification and improve the risk-return tradeoffs of the investment portfolio. Although it is undisputed that international diversification provides opportunities, the aim to utilize the international financial markets through diversification still contains risks that are inherent in foreign investments. In this chapter, the risks associated with international finance are discussed in more detail. The chapter is divided into three parts according to the most relevant risk components: political risk and exchange rate risk.

4.1 Political risk

Political risk can be defined as a risk where political decisions, changes, or instabilities have a negative impact on the return on the investment. Political risk refers to the risk that government action will negatively affect the company's cash flows, and it is one of the most important challenges when conducting foreign direct investment decisions (Bekaert et al., 2014, pp. 2). In addition, according to Bekaert et al. (2014), companies are exposed to political risk factories from which most significant are expropriation or nationalization, contract repudiation, taxes and regulation, exchange controls, corruption and legal inefficiency and ethnic violence, political unrest, and terrorism.

The definition of political risk can also be approached through the lens of political uncertainty. Pástor & Veronesi (2013) define political risk as uncertainty about policy decisions that could negatively affect investors and companies due to reduced profitability. By examining the effects of political uncertainty on stock prices, empirical evidence shows that political uncertainty increases volatility and correlation especially during weak periods in the economy. The uncertainty is examined through the lens of a general equilibrium model of government policy choice, and the empirical evidence

shows that the magnitude of risk premium is higher during weak periods of the economy (Pástor & Veronesi, 2013.)

As foreign investment flows have increased, so has research on political risk and its implications. Previous studies support the view that the ability of the political risk factor to explain equity returns can be considered robust suggesting that the decrease in the political risk factor is associated with an increase in the stock returns (Diamonte et al. 1996; Perotti & Oijen, 2001; Dimic et al. 2015; Lehkonen & Heimonen, 2015; Kirikkaleli, 2020; Smales, 2021; Ghozzi & Chaibi, 2021).

Bodie et al (2014, pp. 883) point out that differences in the degree of political risk can generally be considered to exist between certain economies, and thus financial markets in emerging markets entail a higher risk of political stability compared to advanced economies. By investigating the indirect effect of privatization on stock market development in emerging markets, Perotti & Oijen (2001) find that privatization reduces political uncertainty in emerging markets. Furthermore, they concluded that their findings that a reduction in political risk increases stock returns align with previous research of Diamonte et al. (1996).

By examining 49 emerging markets from 2000 to 2012, Lehkonen & Heimonen (2015) found that democracy and political risk have an effect on stock returns. They suggest that the relationship between political risk and democracy is parabolic and that the decrease in political risk will increase the stock market returns (Lehkonen & Heimonen, 2015, pp. 77-78). By adding the frontier markets as a separate market category to the traditional developed-emerging market comparison, Dimic et al. (2015) investigates how the different risk factors affect the stock returns in all three market categories. They find evidence that the composite political risk is priced in all three markets, although the impact of individual component variates when comparing different market categories.

Studies show that political risk also impacts dividend payout policies and companies' investment decisions. Huang et al. (2015) find that during periods of more political crises, companies are more reluctant to pay dividends. In addition, they concluded that in countries with more stable political systems and better legal protection the payout policies are less sensitive to political uncertainty. By examining the investment decisions of firms during uncertain political periods, Banerjee & Dutta (2022) argue that firms are less likely to make irreversible capital investments and are more likely to reorient their investment strategy toward short-term operational investments when experiencing higher political risk.

4.2 Exchange rate risk

Exchange rate risk can be classified as a financial risk, which impacts on companies and investors operating or investing in countries with a different currency from their home country. Exchange rate risk refers to a potential loss due to a change in the exchange rates between two currencies and it can be considered material for all entities that make or receive payments in foreign currency, generally including companies, investors, and individuals. The exchange risk for international investors can be defined as a potential fluctuation of the value of an investment due to changes in the exchange rates (Sirr et al. 2011, pp. 1750).

In practice, the realization of exchange rate risk can be illustrated by an example where the return on investment is 10%, but the home currency has depreciated by 10% against the currency of the country where invested. This leads to a situation where the return on the investment is completely offset by the depreciation of the home currency. The domestic currency return of a foreign investment can be considered to consist of three components, which are the return of the foreign equity in domestic terms, the return from the depreciation or appreciation of the exchange rate and the return of the foreign equity depending on the depreciation or appreciation of the exchange rate (Sirr et al. 2011, pp. 1751).

Historically, the theoretical impact of exchange rates on stock returns has been the subject of several studies, such as Shapiro (1975), Dumas (1978), and Hodder (1982), with a focus on the impact of exchange rate changes on expected cash flows and the exchange rate exposure of companies especially in developed countries. More recently, the focus of research has increasingly shifted to studying the impact of foreign exchange risk on emerging markets, as these economies are considered to be relatively vulnerable to economic changes due to their less developed economic systems and more politically unstable environment.

By examining the pricing of exchange rate risk in emerging markets, Carrieri & Majerbi (2006) find that exchange rate risk represents an essential component of equity returns in emerging markets. When investigating the role of exchange rate risk in sovereign bond yields instead of equity returns, Gadanecz et al. (2018) find that the sovereign bond yields are indeed influenced by the exchange rate risk in terms of volatility and possible depreciation of the exchange rate.

By examining the exchange rate exposure of emerging market companies during the sub-periods from 1999 to 2001, Chue & Cook (2008) find that the majority of emerging market companies were negatively affected by exchange rate depreciations. Hence, exchange rate fluctuations had a negative impact on emerging markets stock returns. Interestingly, when examining the more recent period from 2002 to 2006, the results indicate that the negative impact of exchange rate depreciation on emerging market stock returns has largely vanished and even reversed.

Although many studies indicate that international investments provide efficient diversification for investors, the exposure to foreign exchange rate risk may have a negative impact on the attractiveness of an investment. Gupta & Donleavy (2009) conclude that although emerging markets offer diversification benefits, the investor is still exposed to various risks, of which exchange rate risk and political risk are considered the most important. Carrieri & Majerbi (2006) consider currency risk as one of the most

important dimensions of international investing and international asset pricing since the benefits of international diversification may decrease due to the exchange rate volatility.

Since exchange rate fluctuations can have a material impact on the return on an investment or the value of cash flows, it is essential to consider which factors influence exchange rates. In general, the exchange rates are influenced by various factors such as interest rates, inflation, economic growth, and political stability. When the interest rates are high in one country, profit-seeking investors generally prefer investing in this country, which leads to an appreciation of the local currency. In addition, when inflation is comparatively higher in one country compared to its trading partners, it can lead to the depreciation of the currency. Strong economic growth and political stability positively affect the demand for the currency due to increased investment appetite, which usually strengthens the currency's value.

Overall, the exchange rate risk can be considered a significant risk for companies and investors with foreign currency-based operations and investments. Therefore, it is not surprising that the hedging of exchange rate risk is nowadays more common, and the use of hedging products and solutions has increased. Various products have been used to manage this additional risk factor, such as currency swaps, forward contracts, futures, and options. Although hedging has become more common, and the range of products has increased, exchange rate risk is still material, and the challenges of choosing the right products for the level of hedging increase the risk associated with selection and costs of optimal hedging.

5 International Diversification to Emerging and Frontier Markets

The international diversification to emerging markets has been a subject of interest to academics and investors for decades. However, interest has not been limited to the study of international diversification alone but has also increasingly focused on other phenomena that are strongly linked to international diversification. This chapter will focus more specifically on international diversification to emerging and frontier markets, as well as phenomena such as home-country bias and world market integration. The aim is to provide a broad overview of international diversification as a whole and with a more in-depth analysis focusing on the attractiveness of both emerging and frontier markets as an investment opportunity.

The chapter is divided as follows. The first section focuses on phenomena that can be linked to international diversification. The later part of the chapter focuses on international diversification and on emerging and frontier markets as investment opportunities in an internationally diversified portfolio.

5.1 Home-country bias

Although there is a large body of academic research on the benefits of international diversification, investors' allocation decisions are still influenced by the so-called "home-country bias". Home-country bias refers to a phenomenon where investors tend to allocate a disproportionate share of the investment to securities and assets in their home country. In addition, it is essential to note that the phenomenon can be mainly considered global and ubiquitous, having a similar effect on investor behavior across developed and developing countries.

The first scientific evidence of home-country bias in equity markets was documented by French & Poterba (1991) and later Tesar and Werner (1995). Coval & Moskowitz (1999)

conclude that home-country bias is not only limited to an allocation in which domestic stocks are overweight relative to foreign stocks, but that investment managers also favor companies that are headquartered geographically nearby. Besides the investment flows, McCallum (1995) highlights that the home-country bias is also an influential factor in international trade.

By investigating mutual fund equity holdings data of 48 countries worldwide from 1999-2000, Chan et al. (2005) find existence of home-country bias from every country examined. This indicates that the phenomenon is not local but has broadly similar manifestations in different countries. Other related studies, such as Karlsson & Norden (2007), Oehler et al. (2008), and French & Poterba (1991), obtained similar results on the impact of the phenomenon on investors' allocation decisions.

Given the benefits of adequate diversification, it is essential to consider why portfolios are notably biased towards domestic securities. Therefore, many previous studies have focused primarily on the causes of the phenomenon. A behavioral explanation has been offered for this phenomenon, as Strong & Xu (2003) find that the fund managers from the US, UK, Japan, and Europe are significantly more optimistic towards the home market than foreign markets. In general, investors may prefer the home markets due to the familiarity and comfort of the companies operating in the home markets. Massa & Simonov (2006) conclude that due to the geographical proximity, investors tend to concentrate on stocks located nearby which leads to an allocation where the overall portfolio is skewed toward familiar stocks.

Besides the behavioral factors, one of the explanatory factors for the existence of the phenomenon has been the characteristics of individuals. Results indicate that characteristics such as household wealth, experience and competence, education, and trading activity have an impact on an individual's willingness to invest outside their own country's borders and, hence, on the strength of the home-county bias. Graham et al (2005) find that investors assess their competence, which affects the likelihood that an

individual will diversify abroad. Furthermore, trading activity and domestic experience can be considered vital factors when investors start to trade with foreign securities. By examining the trading activity of individual investors from 1997 to 2006 Abreu et al. (2011) found that investors who are active in the domestic market tend to start to invest in the foreign market earlier, compared to a more passive investor. In other words, it seems that it is important to gain experience in the domestic market before starting to invest abroad. The findings of the study complement Graham's (2005) theory that investors are willing to make investments to foreign securities after finding themselves competent enough about the risks and possibilities associated with foreign investments.

Based on the evidence, it can be stated that investors do not act rationally in terms of risk and return when local securities and assets are favored at the expense of foreign securities. Hence, the phenomenon appears to have an impact on an investor's risk appetite. By investigating the investment behavior of 206 investment professionals, Kiymaz et al. (2016) find that investors tend to take higher risks in the form of allocating assets to equities when investing in their home country and investing in firms which are headquartered in their hometowns. Overall, comparatively large weight in the local securities instead of global markets has been studied to lead to sub-optimal diversification and, therefore, higher exposure to country-specific risk factors.

To investigate the effect of home bias on international asset pricing, Wallmeier & Iseli (2022) extend the core-satellite model of Treynor & Black (1973), where the overall portfolio contains two parts, the well-diversified passive core portfolio and the active part containing the equities which are perceived as mispriced, referred as satellites. In the study of Wallmeier & Iseli (2022), the investment allocation contains an internationally well-diversified portfolio (core) and home securities (satellite), which enables the extension of the model and investigation of the home premium in expected returns.

The results of Wallmeier & Iseli (2022) indicate that although the effect of home bias on investment decisions has decreased over time, it is still substantial. In addition, when the strength of home bias is tested, the results show that when the home bias is dominant in one country the expected return of country assets is lower. Overall, the study concludes that although the evidence of home-bias is unconditional, the premium in expected returns is neglectable. Interestingly, the observations indicate that those investors from countries with the highest country-specific risk and which would therefore benefit comparatively more from international diversification, show strong home bias towards domestic assets.

The concentration of investment in the domestic market is influenced by various psychological, economical, and regulatory factors. Although there are possibilities to effectively diversify internationally due to the increased selection of investment products, the home-country bias is still a substantial factor in investment decisions. Overall, the home-country bias can lead to an unbalanced portfolio, increased country-risk and decreased the expected returns.

5.2 International financial markets integration

The integration of international financial markets has been one of the most significant phenomena affecting the global financial markets during the last few decades. Especially in developing markets, technological development, liberalization, and economic reforms have played an essential role in the integration of emerging economies. Therefore, the investor appetite for these economies has increased, contributing to the development of integration.

International financial markets integration refers to a process in which international, disparate financial markets begin to merge to form an interconnected and interdependent entirety, with no barriers to the capital flows, investments, or information between countries. Integration has led to developments such as regulatory harmonization, the removal of barriers to capital flows and the development of

investment platforms with features that enable low-threshold cross-border investment. Altogether, financial market integration has facilitated the allocation of capital from domestic to foreign assets.

Research attention has focused primarily on whether and how international financial integration and financial openness create growth and increase welfare. Based on the conventional theory, international financial integration contributes growth due to better governance and macroeconomic policies, improvement in risk sharing, increasing financial development and efficient allocation (Obstfeld, 1998; Schmukler, 2004). Although it has been widely argued that financial integration promotes a country's economic growth rate through a number of channels, the results on the benefits of integration, especially in emerging economies, are still not conclusive.

As a result of integration, countries' financial systems are more strongly interconnected, and the impact of crises and economic shocks, in particular on countries and their economic development, has therefore been widely studied. By conducting a welfare analysis of 31 countries, Tang & Yao (2022) conclude that financial integration leads to welfare losses during crises, and gains outside crises periods. As developing economies can be seen as having more fragile financial systems, the resilience of these economies to crises has been a concern for investors diversifying to these vulnerable and less transparent markets.

5.2.1 Integration and crisis resilience of developing economies

The motivation of international diversification is to reduce portfolio volatility by investing broadly across different geographical regions, or to benefit from fast-growing economies by gaining higher returns. During the era of increasingly interconnected economies, resilience to the crisis in times of economic downturn is a particular concern. During the 2008 financial crisis, emerging economies were relatively as affected by the crisis as advanced economies in terms of changes in economic growth rates. However, interestingly these more vulnerable economies with less developed financial systems

started their recovery from the financial crisis earlier than their more developed peers (Didier et al. 2012, pp. 2075-2076). Notably, the crisis emanating from the financial markets and the economically leading country hit emerging countries as hard as developed ones, but in terms of economic growth and from an ex-post perspective, emerging markets performed better (Didier et al. 2012).

The financial crisis of 2008 can be seen as a significant point in the history of integration research, as it provides an opportune moment for research. The the period can be historically seen as crucial for the development of integration in emerging economies. The integration development of emerging and frontier markets with the US equity markets has changed after the global financial crisis. The correlation between EM and FM with the US increased during the financial crisis, but afterwards, the correlation of the pair US/FM did not revert to the pre-crisis level, which in contrast reverted for the pair US/EM (Cagliesi & Guidi 2021). Altogether, the results suggest that frontier and US markets became more integrated compared to the pre-crisis period. By investigating the interlinkages between frontier and emerging markets with the developed economies, Pätäri et al. (2019) came to a similar conclusion about the integration development of the crisis periods for the economies concerned.

Overall, the financial markets have become more integrated, and financial systems are increasingly interconnected, which has been a positive driver for the development of many economies. Still, when the countries become more integrated it can lead to adverse shock spillovers between different markets through contagion effects (Karadam & Öcal 2020, pp. 2327). Investor interest in emerging markets has been underlined by the relatively low correlation with developed markets and, hence, the diversification benefits of allocating to these markets.

5.3 Emerging and frontier markets in international portfolio diversification

Emerging and frontier markets have gained much interest from academics and investors during the last few decades. Investors and researchers have been particularly interested not only in the performance of economies but also in their risk and return profiles and the correlation of stock markets with developed economies (see, e.g., Brooks & Del Negro, 2004; Bekaert & Harvey, 2000; Valls & Chuliá, 2012; Speidell & Krohne, 2007). Due to the increasing integration and correlation development, frontier economies have attracted widespread interest, and research has increasingly focused on these markets from an international diversification perspective.

Both emerging and frontier markets can be classified as developing economies, but the main differences still relate to market accessibility, risk and return profile, and overall economic development. The market definition and classification are explained in more detail in the introduction section. In general, the role of both emerging and frontier has increased as a component in efficient portfolio diversification during the last few decades, but still the results on the benefits of diversification into emerging and frontier markets are not consistent. This chapter aims to highlight the benefits and challenges of international diversification in relation to previous studies and to lay the groundwork for the empirical research to be presented later in the thesis.

5.3.1 International diversification to emerging markets

Although both emerging and frontier economies are considered developing economies, emerging markets can be considered more advanced in terms of economic development when compared to frontier markets. A study of McKinsey Global Institute (2018) examined the long-term growth patterns of emerging economies in more detail. Although the study describes emerging economies as the engine of global economic growth, there are still differences between the performance of individual economies. The study of McKinsey (2018) shows that of the 71 economies studied, eighteen

outperformed the global benchmark and their peers in terms of GDP growth. These high-growth economies achieved more than 3.5 GDP percent per capita growth over 50 years or 5 percent growth over 20 years (McKinsey Global Institute, 2018). Based on the results, the main drivers of outperformance can be divided into pro-growth policies and performance of large enterprises. The first one of these two is mainly speeding up the income growth, productivity, and demand in these economies, whereas the performance of large enterprises generally boosts economic growth and contributes to the economic performance of the economy. (McKinsey Global Institute, 2018, pp. 8-9.)

Based on the Morgan Stanley's study (2021), the importance of emerging economies, both in investors' allocation choices and as a share of international GDP, has grown significantly. When measuring the nonresident cumulative portfolio flows to emerging markets, debt and equity inflows have increased steadily from 2009 to 2020, reaching a total value of approximately 3.5 trillion USD in 2020 (International Monetary Fund, 2020, pp. 50.).

The EM's share of the global GDP has grown steadily since 2005, reaching a share of 39.1% in 2020. Despite the increasing role of emerging economies in global growth and portfolio diversification, the share of allocation to EMs in global portfolios is calculated to be only 6-8% based on the Morgan Stanleys (2021) estimates. The study shows that although the share of emerging markets is approximately 39.1% of the global GDP, emerging markets represent only 26% of the global market cap. Still, the share of EM allocation of the global MSCI index has increased over the long term, illustrated in the chart below.

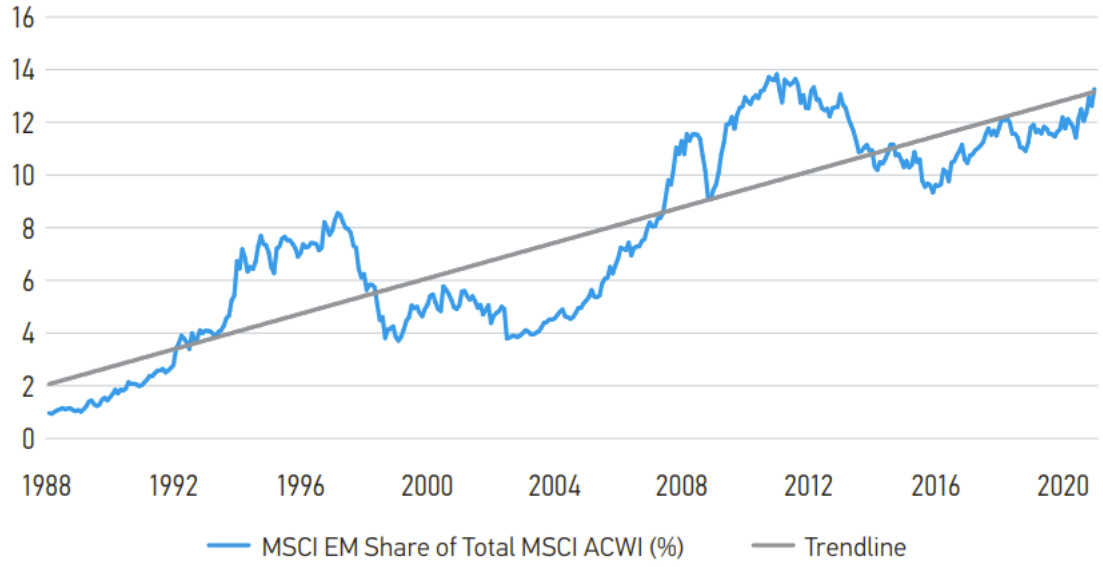


Figure 3 The EM allocation in global index over the long term (Morgan Stanley, 2021, pp. 3)

By examining three different allocation strategies including GDP weighting, market share approach, and mean variance strategy, the Study of Morgan Stanley (2021) concludes that despite the method of measurement, the weight of allocation to emerging markets are still lower than desired, and therefore, measured at the global level, the allocation to emerging markets cannot be considered efficient due to its low level.

Although the economic fundamentals of emerging economies support the view of the potential of emerging markets as investment destinations, the correlation performance of these economies has become a focus of research, particularly in terms of how they offer diversification benefits when correlation performance has been unfavorable from a diversification perspective. Especially with the current globalization trend, markets have become increasingly integrated, affecting the attractiveness of the markets under consideration.

In general, the benefits of international diversification are examined by investing both in the correlation development of these markets with an advanced economy and comparing the risk-adjusted returns of emerging and advanced economies. Overall, studies have examined correlation trends by using models like Pearson‘s correlation,

which simplifies the co-movements by assuming that the co-movements are constant over time, which can be considered not valid (Gupta et al. 2017, pp. 135). During more recent years, more advanced models have been used to investigate the correlation trends. For example, the Asymmetric DCC GARCH model is utilized to examine the time-varying correlations, since the model takes into account that the correlations vary over time.

By utilizing the Asymmetric Dynamic Conditional Correlation GARCH model to investigate the time-varying correlations, Gupta & Donleavy (2009) find that the correlations of emerging equity markets and Australian equity markets have changed and increased during the period from 1988 to 2005. As mentioned above, this, of course, has an impact on the attractiveness of emerging markets in terms of efficient allocation. Still, despite the increasing correlations, Australian investors benefitted from international diversification to emerging markets due to relatively low correlations and better risk-adjusted returns obtained by allocating assets to developing markets from a developed country.

The 2008 financial crisis can be considered one of the most significant financial market crises since the Great Depression. The crisis originating in the United States affected financial markets at the global level, but its impact on emerging markets can still be considered mixed. When dividing the crisis period into three different sections: i) pre-crises, ii) contagion, and iii) herding, Hwang et al. (2013) find different patterns of spillover during the financial crises among 10 emerging economies in the US. By examining the dynamic conditional correlations, it seems that the emerging economies experience increasing correlations referred to as the contagions from all of the countries examined. Since the increase in the volatility index in US, foreign institutional investments and exchange market volatility index increased the conditional correlations among the US and EM's, these can be identified as the channels of contagion (Hwang et al. 2013, pp. 345-346.).

Different patterns of crisis spillover can be found among the emerging economies. Still, as the major emerging economies have become increasingly important especially in commodity consumption and production and investment flows, it is essential to consider how influential global factors affect stock prices in the major emerging economies. The evidence suggests that the major emerging stock markets (BRICS) are dependent on the oil and gold markets and the global stock market, which in this case refers to the S&P index (Mensi et al. 2014).

Although the evidence suggests increasing correlations between US and emerging economies, Mensi et al. (2014) imply that the major emerging stock markets referred to as the BRICS (Brazil, Russia, India, China, and South Africa) are still helpful for investors in terms of downside risk management especially during the bearish market condition, since the following countries only co-move with the US equities during the bullish market periods. Although the time-varying dependence of EMs and DMs is trending upward, the EMs still offer diversification benefits for investors especially during market downturns since the equity market crises in emerging markets are more or less country-specific (Christoffersen et al. 2012). In addition, skewness-based Investment strategies in emerging markets tend to outperform the investments made in developed markets during different time horizons but especially during crisis periods (Hadhri & Ftiti, 2019).

Still, in example Han et al. (2017) conclude that the returns of emerging markets tend to be more sensitive to returns of the US when the returns are decreasing rather than increasing, which, unlike the previous ones, takes the opposite view of the diversification benefits offered by EMs.

For emerging markets, however, there are widespread views on whether the diversification benefits of investing in these markets are being eroded by rising correlations and whether the risk premium for investing in these markets is high enough from an investor's perspective to be considered relevant for portfolio diversification. In the case of emerging markets, while economic growth has undoubtedly outpaced that

of developed markets, these markets are also riskier for the investor, so the study has also focused on comparing the risk-adjusted returns of different economies in order to compare the different economic areas by comparing their returns with the risk borne by the investor.

It is well documented that from a global perspective, the equity returns are more correlated during negative downturns. (Longin & Solnik, 2001; Ang and Bekaert, 2002). Still, crises such as the techno-bubble of the 2000s led to widespread debate on the importance of international diversification and the role of emerging markets in an effectively diversified portfolio. Later on, the increasing globalization and world market integration have led to a growing number of conclusions that the benefits of international diversification have mainly been lost or completely diminished. (Carrieri et al. 2007; Pukthuanthong & Roll, 2009; Berger et al. 2011). Based on the evidence of Chen (2018) the increasing stock market interdependence of emerging and developed markets can indeed be explained by the level of economic integration. Therefore, as the integration development continues, the investors willing to benefit from the international diversification may face challenges in the future, and therefore, the exploration of alternative solutions to minimize asset class correlations in the equity portfolio becomes even more important.

As a result of the above trends, it is relevant to ask whether emerging markets are still an essential part of an effectively diversified portfolio or whether investors should consider other diversification options. Pätäri et al. (2019) suggest that due to the integration development of emerging economies after the global financial crises the benefits of international diversification to emerging markets have decreased. Based on the evidence of Pätäri et al. (2019), emerging economies do not provide the same effect in terms of risk management as what these economies offered for the investors before the global financial crisis.

Due to the exchange rate moves and unexpected political risks, the benefits of allocating assets to emerging markets from the perspective of a US investor can be considered questionable (Han et al. 2017). From a sample of thirteen emerging equity markets, only Mexico outperformed the US equity market in terms of dollar-denominated returns during the sample period from 1995 to 2013. By analyzing the investment opportunity of emerging markets by the risk-adjusted returns, only one of the EM's offered higher Sharpe ratio compared to the US equity markets.

Overall, emerging economies have increasingly attracted financial flows due to growth prospects, investment return opportunities and potential diversification benefits in terms of efficient diversification. Nevertheless, the size of the allocation to emerging markets remains a controversial issue since the attractiveness of these specific markets can be said to have declined over the last decades due to increasing integration with developed markets. As a result, interest has widely shifted towards frontier markets, as these economies can offer investors the benefits that can be seen partly diminished in emerging markets.

5.3.2 International diversification to frontier markets

Often referred to as emerging markets of emerging markets, frontier markets have gained widespread attention among investors and academics as an attractive alternative investment opportunity to emerging markets in particular, whose attractiveness from a diversification perspective has been questioned mainly because of the increasing correlation with the developed world. Due to their earlier stage of development compared to emerging markets, frontier markets offer an exciting investment avenue for risk tolerant investors, seeking to gain from the high growth prospects, higher risk and return profile and lower correlation with the developed world. Therefore, the frontier markets, often described as the least developed of the investible markets, have gained investor interest during the recent decade.

Overall, the role of frontier markets in portfolio diversification is less examined compared to emerging equity markets. From an investor's perspective, the frontier markets offer an interesting but also risky allocation opportunity. Although these economies are generally characterized by poor physical infrastructure, weak macroeconomic positions and unstable political stability, frontier markets have untaken many economic reforms during the recent decades, and this has increased the confidence of investors towards these markets (Thomas et al. 2022, pp. 95-96).

Foreign participation in frontier markets has grown significantly during the last ten years. Especially in the debt markets, the higher level of participation of foreign investors has made the frontier markets increasingly exposed to global financial conditions, and the changes in the behavior of foreign investors often have a relatively strong impact on the frontier markets, which can increase the volatility and risks of these economies. The portfolio and cross-border loan liabilities of emerging and frontier markets during 2008 and 2018 are illustrated in the figure below. In addition, the amount of government debt has increased significantly in many frontier markets from 2010 to 2019. (International Monetary Fund, 2020)

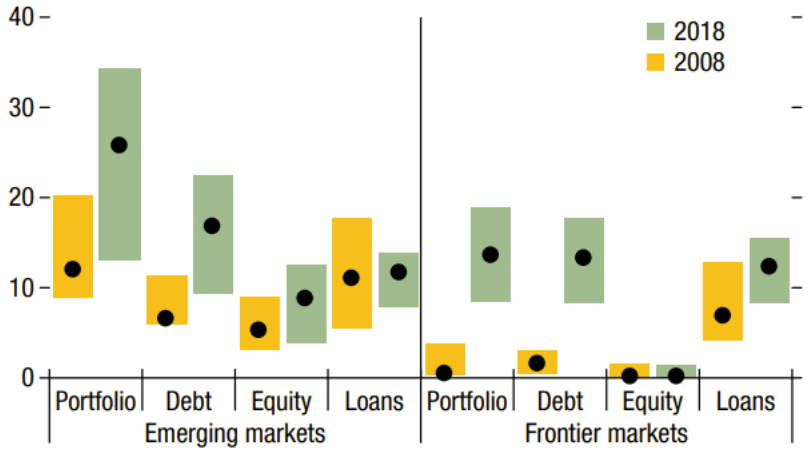


Figure 4. Portfolio and Cross-border loan liabilities (Percent of GDP, interquartile range, median) (International Monetary Fund, 2020)

In general, the domestic investor base in frontier markets can be described relatively more fragile compared to more advanced economies, and this makes them dependent on foreign debt and investments. It can be stated that frontier economies in general are dependent on foreign investment flows. However, question is that do foreign investors in example in developed economies need the exposure of frontier markets in the investment portfolio?

Compared to emerging markets, frontier markets are characterized by their lower level of market accessibility and economic development. In addition, the frontier markets may offer a higher expected return, although the risk profile is higher for these economies compared to emerging and developed economies. However, for the risk-tolerant investor, the frontier market offers many opportunities. Especially for frontier markets, growth prospects are vital in terms of future, and therefore, these markets can offer relatively attractive returns to the investor (East Capital Outlook 2024, 2023).

The 2008 financial crisis can be seen as a turning point in which the crisis spread globally and was followed by a significant increase in correlations between countries (Bekaert, 2011. Interestingly, Pätäri et al. (2019) note that while the emerging economies became more integrated with the developed markets of Europe and the US already before the global financial crises, frontier markets instead became more integrated with developed economies after the crises, which of course, changed their role as a standalone equity market with a relatively low correlation with the developed world.

When examining period before the global financial crises, it can be stated that investors who decided to invest in frontier markets were rewarded with higher returns compared to emerging and developed economies and lower correlation, which highlights the investment potential of these countries (Speidell and Krohne, 2007). In addition, Berger et al. (2011) concluded that frontier markets exhibit low levels of integration and that, unlike emerging and developed markets, frontier markets do not offer an indication of increasing integration through time.

Despite the increase in the co-movement with developed countries after the financial crises, Pätäri et al. (2019, pp. 18-19) concluded that frontier markets still offer diversification benefits compared to emerging markets, and therefore, investor willing to benefit from the international diversification might want to increase the weight of frontier markets in the equity portfolio.

By investing the performance of international portfolio of developed, emerging and frontier markets in Asia-Pacific and European regions, Thomas et al. (2022) conclude that by analyzing all portfolio performance measures together, the frontier equity markets offer better diversification opportunities in both regions when compared to emerging markets. This highlights the importance of frontier equity markets in portfolio diversification. Especially in Europe, substantial allocation frontier equity markets indeed offered better risk-adjusted returns and lower levels of correlation with the developed markets. Still, according to Thomas et al. (2022) the global Covid-19 pandemic has negatively affected the performance of frontier markets in particular, according to the study.

However, for frontier markets, it is essential to consider the risk borne by the investor. When examining the Sortino ratio, which compares the portfolio return to its downside risk often referred as adverse risk, the portfolios which contained frontier markets resulted lower ratios when compares to portfolios containing only developed markets or developed markets and emerging markets (Thomas et al. 2022). Therefore, frontier markets as a part of an internationally diversified portfolio are mainly relevant for risk tolerant investors.

Frontier markets are generally perceived as risky investments precisely because of their high volatility. Still Speidell & Krohne (2007, pp. 17-18) noted that although the volatility of individual frontier markets is high, the low correlation between individual frontier markets yields a relatively low overall volatility of 11% for the composite of frontier

markets, whereas the volatility for emerging markets it was 17.7%. Interestingly same kind of results were found during a more recent time period from 2002 to 2016. The frontier equity markets have been the least volatile markets compared to EM and DM, as measured by the standard deviation of returns (Pätäri et al. 2019).

Some conclusions can be drawn based on the previous research of frontier equity markets as part of an internationally diversified portfolio. In many instances, frontier equity markets provide better diversification compared to emerging markets, but there are significant regional differences between the performance of frontier equity market (see e.g., Thomas et al. 2022; Pätäri et al. 2019; Berger et al. 2011). The results indicate that especially emerging equity markets have become increasingly integrated with the developed markets, while the frontier equity markets are still relatively separated from the developed world and offer, therefore, more efficient diversification opportunities. It Should be noted if the same development of increasing integration continues with the frontier markets, investors might prefer diversifying to selected less-established frontier markets. Altogether, the results of previous studies indicate that frontier equity markets seem to still offer diversification benefits and are an incredibly effective way for a risk-tolerant investor to adopt an investment strategy that considers the frontier markets to enhance the performance of the investment portfolio.

6 Data & methodology

In this chapter the data and methodology will be introduced. The data section covers a brief introduction of the used indices and the overall data, the descriptive statistics, and the correlation coefficients of the selected market indices. Later in the chapter the study's methodology of the study will be represented in more detail.

6.1 Data

Weekly data of 9 different indexes, including developed, emerging, and frontier markets are, used in this research covering a period from 2006 to 2023 with a total of 898 weekly observations. The weekly returns are used in this empirical research for two main reasons: first, to avoid the non-synchronicity of daily returns and to obtain as many observations as possible without using the monthly data since it can be insufficient for the analysis. All of the indices used in this research are price indices and therefore examined indices only measure the price movements of the selected markets. Emerging and frontier market indices are denominated in USD, whereas the indices of France and Germany are denominated in EUR and UK index in GBP.

In order to examine the performance of different market areas for different periods in more detail, this paper examines not only the full period but also two separate sub-periods. The first sub-period from 2006 to the end of 2014 covers the 2007–2008 financial crisis and the euro debt crises including the recovery period. The second sub-period investigates the performance of selected indexes from 2015 to the beginning of 2023 including a mainly bullish market period, particularly in the US, which was interrupted by a sharp fall in 2020 due to the COVID-19 crisis. The second sub-period also covers the recovery from the COVID-19 crash.

The whole data set covers 17 full years, which can be considered a large sample compared to previous studies. For example, studies such as Gilmore et al. (2005), Platanakis & Urquhart (2022), and Thomas et al. (2022) have used much shorter time

horizons when studying the benefits of diversification. Overall, the entire sample period as well as both sub-periods cover significant events which have robustly affected the leading stock indices. In addition, many of the most significant events over the period are very different in nature and have had a different intensity of impact on the main market areas.

All data are collected from the LSEG (previously known as Refinitiv / Thomson Reuters) workspace. As a market portfolio, in academic research widely accepted MSCI World Index is used to describe the overall market return. By applying a similar assumption than Thomas et al. (2022), this study assumes the weekly risk-free rate to be 0%. Both the risk-free rate and the market return are used in the portfolio performance calculations. All of the selected indexes and the main details of the selected indexes are represented in more detail in table 1 below.

Table 1 Summary of the selected indexes

MSCI Germany Index	MSCI Germany Index measures the performance of large and mid cap segments of Germany stock market total of 58 constitutes.
MSCI France Index	The MSCI France index represents the performance of the large and mid cap segments in France stock markets. The total number of constitutes is 61.
MSCI UK index	MSCI United Kingdom Index represents the performance of large and mid cap segments in UK stock markets. Total number of constitutes is 83.
MSCI Emerging Market Index	large and mid-cap representation across 24 Emerging Markets with a total number of constituents of 1,440
MSCI Frontier Market Index	large and mid-cap representation across 29 Frontier Markets (FM) countries with a total number of constituents of 211.
MSCI Emerging Market Asia Index	Captures large and mid-cap representation across 8 EM countries with 1,193 constituents
MSCI Emerging Market Europe Index	captures large and mid-cap representation across 5 Emerging Markets with total of 49 constituents
MSCI Frontier Market Africa Index	large and mid-cap representation across 13 Frontier Markets (FM) Africa countries with a total of 47 constituents

MSCI Frontier Market EMEA Index	captures large and mid-cap representation across 25 FM EMEA countries with a total number of 126 constituents

The use of geographically selected indices to study stock market performance in emerging and frontier market economies is useful for two reasons. First, it allows for comparison of different economic areas as a whole and the analysis of the findings in more detail, for example, in terms of correlations, risk-adjusted returns, and volatility. Secondly, the differences between markets in terms of the indicators mentioned above can be identified and a conclusion can be drawn based on this information as to how the economies in question have developed and what an investor should consider when diversifying internationally into these markets.

6.2 Calculating returns

In this study, the weekly returns of each selected indices are calculated as the natural logarithm differences with the following equation:

$$R_{i,t} = \ln\left(\frac{P_t}{P_{t-1}}\right)$$

Where:

$R_{i,t}$ refers to return of index *i* at week *t*

P_t refers to the value of selected stock index at time *t*.

6.3 Descriptive statistics and portfolio performance

The descriptive statistics of all selected market indices from the full sample period are represented in panel A of table 2, whereas the descriptive statistics of both sub-periods are provided in panel B and panel C.

Table 2. Summary statistics

Panel A: Summary statistics of weekly returns during the full sample period from January 2006 to March 2023

	Germany	France	UK	EM	FM	EM Asia	EM Europe	FM Africa	FM EMEA
Mean	0,0004	0,0005	0,0002	0,0003	-0,0006	0,0006	-0,0018	-0,0002	-0,0005
Median	0,0036	0,0031	0,001	0,0037	0,0016	0,0031	0,0016	0,0005	0,0018
Minimum	-0,2358	-0,2450	-0,2343	-0,2605	-0,1796	-0,1867	-0,7312	-0,1705	-0,1803
Maximum	0,1563	0,1228	0,1254	0,1676	0,0848	0,2033	0,2071	0,1260	0,0956
Standard dev.	0,030	0,0296	0,0249	0,0312	0,0215	0,0310	0,0526	0,0267	0,0221
Sharpe-ratio	0,014	0,017	0,009	0,011	-0,030	0,021	-0,035	-0,010	-0,025
Skewness	-1,236	-1,378	-1,512	-2,399	-2,3991	-0,5225	-4,3402	-0,8005	-2,4670
Kurtosis	9,2749	9,8454	14,397	8,2927	15,742	5,5898	49,3940	5,6915	16,4696
Jarque-Bera	3447,7	3911,5	8098,3	2767,0	10134,1	1210,0	94107,6	1307,9	11060,2
Observations	898	898	898	898	898	898	898	898	898

Panel B: Summary statistics of weekly returns from during the first sub-period from January 2006 to December 2014

	Germany	France	UK	EM	FM	EM Asia	EM Europe	FM Africa	FM EMEA
Mean	0,0006	-0,000	0,0002	0,0006	-0,0007	0,0010	-0,001	0,0007	-0,0007
Median	0,0050	0,0030	0,0015	0,0048	0,0021	0,0037	0,0018	0,0007	0,0019
Minimum	-0,2385	-0,2450	-0,2343	-0,2606	-0,1796	-0,1868	-0,3753	-0,1330	-0,1803
Maximum	0,1563	0,1228	0,1254	0,1676	0,0848	0,2033	0,2071	0,1260	0,0956
Standard dev.	0,0327	0,0316	0,0270	0,0357	0,0247	0,0352	0,0509	0,0318	0,0252

Sharpe-ratio	0,018	-0,002	0,010	0,018	-0,028	0,028	-0,019	0,024	-0,028
Skewness	-1,059	-1,261	-1,433	-1,107	-2,242	-0,388	-1,374	-0,515	-2,182
Kurtosis	8,114	8,529	14,102	7,644	13,553	5,117	9,197	2,814	13,317
Jarque-Bera	1377,6	1549,2	4055,6	1240,5	3991,2	524,6	1804,5	175,9	3846,3
Observations	470	470	470	470	470	470	470	470	470

Panel C: Summary statistics of weekly returns during the second sub-period from Jan 2015 to Mar 2023

	Germany	**France**	**UK**	**EM**	**FM**	**EM Asia**	**EM Europe**	**FM Africa**	**FM EMEA**
Mean	0,0002	0,0011	0,0002	-0,0000	-0,0005	0,0002	-0,0027	-0,0013	-0,0003
Median	0,0028	0,0032	0,0026	0,0033	0,0011	0,0027	0,0012	0,0001	0,0016
Minimum	-0,2275	-0,2219	-0,1885	-0,1836	-0,1362	-0,1662	-0,7312	-0,1705	-0,1489
Maximum	0,1004	0,0986	0,0735	0,0715	0,0400	0,0775	0,1312	0,0737	0,0610
Standard dev.	0,0264	0,0272	0,0224	0,0256	0,0174	0,0257	0,0544	0,0196	0,0181
Sharpe-ratio	0,009	0,042	0,009	-0,001	-0,034	0,011	-0,050	-0,071	-0,021
Skewness	-1,520	-1,533	-1,618	-1,112	-2,503	-0,880	-7,011	-2,131	-2,947
Kurtosis	11,003	11,815	13,441	6,078	15,891	4,100	83,121	15,891	20,872
Jarque-Bera	2324,1	2657,5	3408,9	747,09	4950,47	355,07	126721,6	4827,60	8388,96
Observations	428	428	428	428	428	428	428	428	428

Regarding mean weekly return, the EM Asia index outperformed all of the other markets during the entire sample period (Panel A) and the first sub-period (Panel B). The performance of European developed economies is relatively good during the full sample

period compared to other markets. Still, the example, the frontier market index has a lower standard deviation of 0.0215% compared to the standard deviations of all three developed economies. From the developed economies, the MSCI France index outperforms the UK and Germany in terms of weekly average mean return and risk-adjusted return during the full sample period. There is a large variation in the performance of France between the first and second sub-periods and especially during the second sub-period, the performance has been relatively strong.

Moving on to examine the performance of both emerging and frontier economies over selected periods, the first thing to note is that the differences in market performance can be considered quite enormous. From the emerging economies, the EM Europe has been the weakest of the selected markets, offering a -0,0018 mean return with a 0,0526 standard deviation, whereas the EM Asia index generated a positive mean return of 0,0006 during the full sample period, which is the highest from the whole sample measured.

Although the frontier market index and both of the regional frontier market indices (FM, FM Africa, FM EMEA) generated negative mean returns of -0,06%, -0,02%, and -0,05% during the full sample period, these markets represent the least volatile indices measured by the weekly standard deviation. Interestingly, when comparing the reward-to-risk ratios of FM Africa indices during the two sub-periods, the first sub-period has been quite more rewarding than the second sub-period (0,024 vs. -0,071). In addition, FM Africa was the worst-performing index in terms of risk-returns during the second sub-period.

All of the weekly returns during all periods are negatively skewed. Although the statistics are only from individual developed, emerging and frontier markets, the results are not so encouraging for an investor willing to diversify to especially to certain developing markets. This, of course, will need a more in-depth analysis of the benefits of international diversification, and this is provided later in the chapter. Overall, in terms of

returns the developed economies appear to be attractive markets and EM also seems to offer attractive returns for investors. It should be noted that an investor wishing to minimize volatility would probably allocate at least part of his assets to frontier markets.

Table 3. Correlation coefficients

Panel A: Correlation coefficients of weekly returns of all markets full sample period from Jan 2006 to March 2023

	Germany	France	UK	EM	FM	EM Asia	EM EU	FM Africa	FM EMEA
Germany	1								
France	0.94	1							
UK	0.86	0.90	1						
EM	0.44	0.43	0.43	1					
FM	0.30	0.29	0.26	0.59	1				
EM Asia	0.35	0.34	0.34	0.96	0.56	1			
EM EU	0.40	0.38	0.37	0.75	0.52	0.64	1		
FM Africa	0.03	0.03	0.01	0.21	0.46	0.20	0.19	1	
FM EMEA	0.29	0.28	0.24	0.55	0.96	0.51	0.05	0.48	1

Panel B: Correlation coefficients of weekly returns of all markets during first sub-period from Jan 2006 to Dec 2014

	Germany	France	UK	EM	FM	EM Asia	EM EU	FM Africa	FM EMEA
Germany	1								
France	0.94	1							
UK	0.90	0.93	1						
EM	0.47	0.46	0.46	1					
FM	0.26	0.25	0.22	0.57	1				
EM Asia	0.36	0.36	0.36	0.95	0.55	1			
EM EU	0.45	0.41	0.41	0.89	0.58	0.76	1		
FM Africa	-0.01	-0.03	-0.03	0.14	0.38	0.15	0.15	1	
FM EMEA	0.25	0.24	0.20	0.55	0.99	0.56	0.56	0.39	1

Panel C: Correlation coefficients of weekly returns of all markets during second sub-period from Jan 2015 to Mar 2023

	Germany	France	UK	EM	FM	EM Asia	EM EU	FM Africa	FM EMEA
Germany	1								
France	0.94	1							
UK	0.81	0.85	1						
EM	0.40	0.37	0.38	1					
FM	0.38	0.37	0.35	0.63	1				
EM Asia	0.35	0.31	0.32	0.98	0.58	1			
EM EU	0.34	0.34	0.32	0.58	0.46	0.51	1		
FM Africa	0.13	0.13	0.09	0.37	0.65	0.34	0.28	1	
FM EMEA	0.35	0.35	0.31	0.53	0.88	0.48	0.44	0.72	1

The correlation coefficients of the selected markets are provided in Table 3. The correlation coefficients are calculated from the full sample period and from both sub-periods separately, allowing to compare the correlation development of the markets during these two time periods. Not surprisingly, the correlation among the developed markets is relatively high during all periods measured. Still, the correlation between UK and both France and Germany have decreased when the two sub-periods were compared.

The overall frontier markets index and the regional frontier markets indices share low correlation with all of the three developed markets. During the first sub-period, the FM Africa index even shares a negative correlation with the developed markets, which can, of course, be seen as very effective from a diversification point of view. Still, the correlation increases during the second sub-period.

The correlation of frontier markets with developed economies and with emerging markets has risen considerably during the second period. Pätäri et al. (2019) found a similar trend when comparing the correlation between frontier and developed markets

during two sub-periods from 2002 to 2007 and from 2008 to 2016. Contrary to the correlation development of frontier markets, the correlation of EMs with the developed economies has decreased during the second sub-period which is encouraging for an investor seeking diversification benefits specifically by investing in emerging markets.

Although the correlation trend has been upward when comparing the two periods, it can still be seen that regional emerging and frontier markets, for example, can offer diversification benefits in terms of correlation for the investor seeking international diversification. The main reason for this is that cross-market return linkages are still relatively low.

6.4 Methodology

This subchapter presents the empirical model used in this study. The purpose is to present and justify the model used and to demonstrate its usefulness in addressing the research problem. The next chapter presents and analyses the results of the study.

6.4.1 Empirical model of the study

The empirical part of this study focuses on examining the diversification of an optimally constructed portfolio for emerging and frontier markets over different periods. The model aims to examine whether the emerging and frontier markets add value to a portfolio constructed only from selected European developed markets. In addition, the performance of optimal portfolios is examined to determine whether frontier and emerging markets add value for the investor in terms of diversification benefits, also measured by risk-adjusted portfolio performance measures.

In this research, six optimal portfolios are constructed containing developed, emerging and frontier markets. The first portfolio (P1) comprises only European developed markets including Germany, France and UK, whereas the second portfolio (P2) comprises the developed markets and overall index of EM. The third portfolio researched contains

European developed markets and FM (P3). In order to examine geographical differences in more detail, the fourth and fifth portfolios to be studied consist of developed markets and regional emerging and frontier market indices as follows: P4 contains developed markets and the regional Emerging markets including EM Asia and EM Europe, whereas the P5 is formed from developed markets and regional frontier market FM Africa and FM EMEA. The sixth portfolio (P6) contains the developed markets and both EM and FM indices as well as both regional indices. This enables to identify the optimal selection of different assets to optimal portfolio and to investigate how optimal portfolio allocation variates when both emerging and frontier markets are added to the overall portfolio.

These portfolios mentioned above is constructed by utilizing two different portfolio optimization methods. The first portfolio optimization method considered is the Minimum Variance Portfolio (MVP) by Markowitz (1952). In the model the aim is to select the portfolio weight so that the portfolio variance will be minimized. The formula for the minimization problem can be expressed as:

$$\text{Minimize } \sigma_p^2 = \sum_{i=1}^{n} \sum_{j=1}^{n} w_i w_J \sigma_{ij} \tag{11}$$

$$\text{Subject to } \sum_{i=1}^{n} w_i \mu_i = \mu_p$$

$$\sum_{i=1}^{n} w_i = 1$$

$$w_i > 0$$

Where:

σ_p^2 = variance of the portfolio return

μ_p = is the target expected return of the portfolio

n = number of assets in the portfolio

In the equation, the total weight of the indices in the portfolio is set to 100%, the weight of each individual index is equal or more than 0 and the assumption that no short sales are allowed holds. One of the major disadvantages of MVP optimization method is that it assumes that the investors are concerned about the total volatility of the portfolio, in other words the MVP optimization method does not take into account the direction of

the portfolio volatility. However, investors are, in general, mainly interested in the downside volatility of the portfolio instead of the total volatility.

This study has taken into account the shortcoming of the MVP method and therefore the Minimum Semivariance Portfolio (MSVP) optimization method has also been used to construct the optimal portfolios. MSVP optimization method by Estrada (2008) focuses only on the downside risk of portfolio, and therefore, it can be considered a better alternative to the MVP optimization method especially when the returns are not symmetrically distributed. The equation for the Mean Semivariance Portfolio optimization can be stated as follows:

$$\odot_{xyB} = \frac{1}{T} = \sum_{i=1}^{T} [\min(R_x - B, 0) * \min(R_y - B, 0) \quad (12)$$

In the equation, the R_x and R_y represent the returns of assets x and y respectively, the B represents the target rate which is set to 0. This method allows to generate symmetric semi-covariance matrix referred as $\odot_{xyB}$, which enables to minimize the semivariance of portfolio.

The minimization problem of Mean Semivariance Portfolio optimization model can be stated as:

$$\text{Minimize } \sigma_{PB}^2 = w'^{\odot_{xyB}} \quad (13)$$

Where:

σ_{PB}^2 is the semivariance of portfolio

w represents the vector of portfolio weights

$\odot_{xyB}$ is the semi-covariance matrix

The same constraints as in the MVP also applied in the MSVP method and therefore the sum of total weights is set to 100% and no short sales are allowed. By utilizing both portfolio optimization methods, it is possible to form a holistic picture of optimal diversification and also to compare the results between these two methods. Overall, a total of six optimal portfolios have been generated for both MVP and MSVP methods for

all periods under study. In addition, the performance of optimally constructed portfolios has been evaluated by using the Sharpen ratio, Treynor ratio, and Jensen's alpha.

7 Empirical results

This chapter will introduce the main empirical results and findings of this study and after that the conclusion and suggestion for further research are provided.

7.1 Empirical results of optimal asset allocation

The optimally constructed portfolios of the full sample period, first sub-period and second sub-period are provided in this chapter. Figures 5, 6 and 7 display the average portfolio weights of MVP portfolios and figures 8,9 and 10 represent the average weights of MSVP portfolios.

Of the European developed markets, the UK index is the only one which is selected to optimally constructed portfolio during all three periods measured. When using the MSVP methodology for optimization, the UK holds its place among the developed markets, with none of the portfolios weighting the German or French stock markets. Therefore, investors willing to minimize the portfolio's total risk and downside risk should weigh only UK in the investment portfolio constructed from the major European developed markets.

Although the UK index has a significant role in optimally constructed portfolios, the index's weight falls to 69% and 40% when indices of emerging markets and frontier markets are added to the portfolio (P2 and P3). Therefore, in the minimum variance portfolios (P2 and P3), the EM and FM hold total weights of 31% and 60% of the allocation. During the entire sample period, the trend is similar when the MSVP method is applied. However, the weight of both EM and FM indices are lower compared to minimum variance portfolios constructing 22% and 54% respectively of the total allocation.

The weight of developed markets decreases even more when the regional emerging markets are added to the portfolio (P4). Interestingly, the distribution of the portfolio

allocation is more dispersed among the regional frontier markets than to the regional emerging markets (P4 and P5). It can be noted that from the regional EM indices, the European Emerging market index does not provide diversification benefits, since the weight in all portfolios measured is 0%. Thomas et al. (2022) also concluded that the diversification benefits offered by the European emerging markets can be considered limited. Looking at the correlation coefficients in Table 3, not surprisingly, the European developed markets share a higher degree of correlation with the European emerging markets compared to their Asian counterparts. Hence, the EM Asia index constructs approximately 34%, 30% and 40% weight in the minimum variance portfolios during full sample period, 1. sub-period and 2. sub-period.

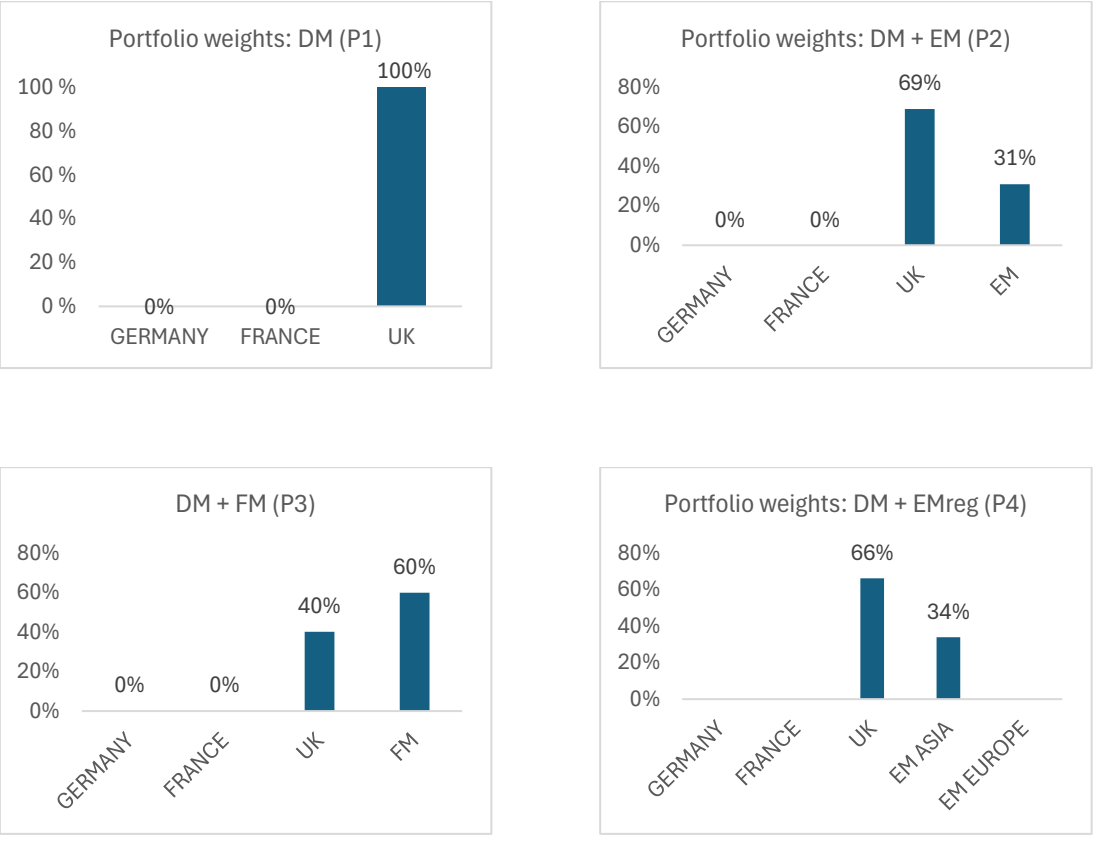
Berger et al. (2011, pp. 239-240) concluded that portfolio improvements can be achieved by adding the frontier markets to the investment portfolio, since the frontier markets decrease the overall risk of the portfolio while maintaining the expected return. In this research, the exposure to frontier markets remains robust during all sample periods. By looking at the MVP of all selected markets (P6), the method suggests no exposure to emerging markets. In contrast, the overall frontier market index and frontier market Africa index constitute together approximately 61% of the total allocation.

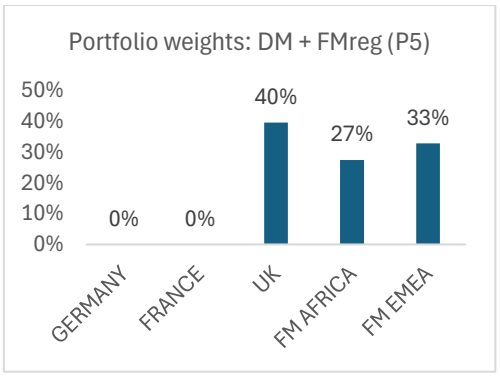
Moreover, when considering the MSVP allocation, the total exposure to emerging markets is only 5% of the total portfolio allocation. It can be observed that the total exposure of EM Asia index increases to 11% from 0% during the second sub-period in P6. However, the emerging market exposure remains relatively low when comparing emerging and frontier market weightings within the portfolio. Therefore, to minimize portfolio risk, frontier markets can be said to be part of an optimally diversified portfolio whereas the emerging markets become less significant in the portfolio diversification when frontier markets are introduced. Especially the FM Africa index reduces the portfolio risk and, therefore, holds relatively high weight in MVP and MSVP allocations. From table 3 it can be observed that especially FM Africa share relatively low or even

negative correlation with the developed and emerging markets which may to some extent explain their high weight in an optimally diversified portfolio.

By comparing the two sub-periods, interesting conclusions can be drawn about the weight of emerging and frontier economies in an optimally diversified portfolio. The exposure to both emerging and frontier markets increases remarkably during the second sub-period in both portfolios MVP and MSVP. The exposure to developed markets in P6 of both portfolios decreased by approximately 9% and 7%, respectively, when the first and second sub-periods are being compared. The same tendency is present in the other optimized portfolios, suggesting that emerging and frontier economies have become more critical in the risk-optimized portfolio compared to the previous period. Still, it needs to be noted that while other emerging and frontier markets retain a large proportion of weight in the optimized portfolio, for some investigated markets, the share of the optimized portfolio is nonexistent or rather limited.

Figure 5 Weights of Minimum Variance Portfolios (MVP) during full sample period





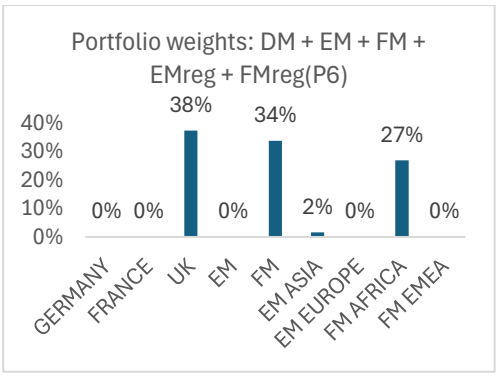
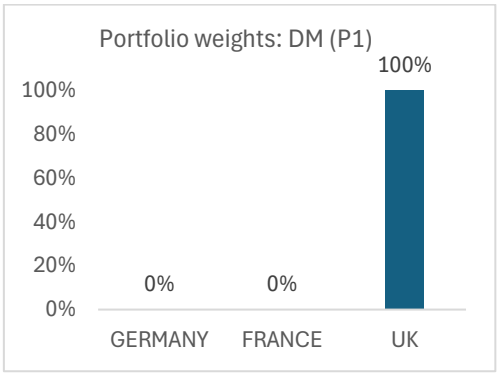
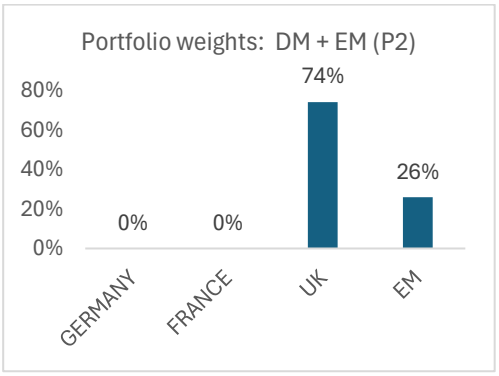
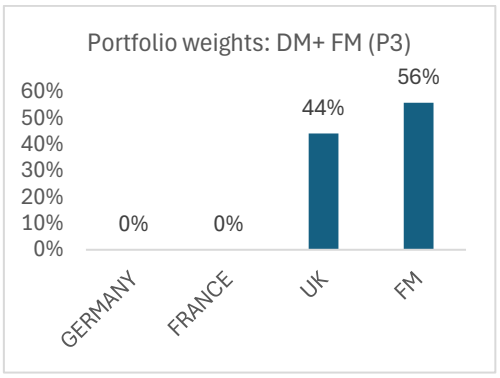
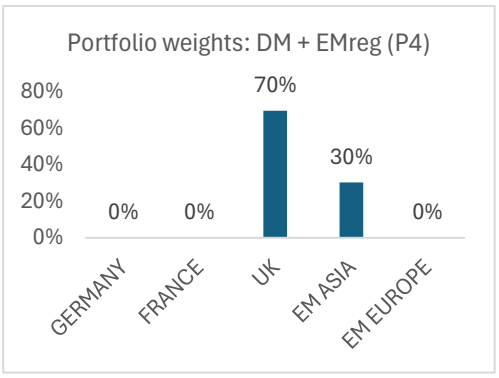


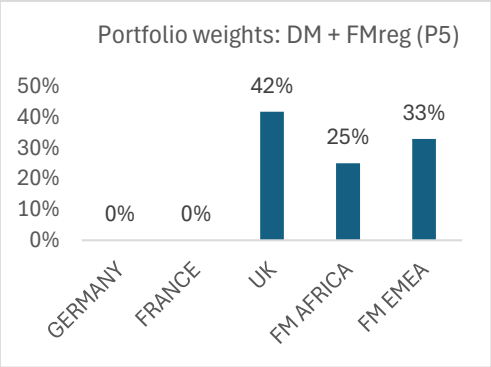
Figure 6 Weights of Minimum Variance Portfolios (MVP) during first sub-period











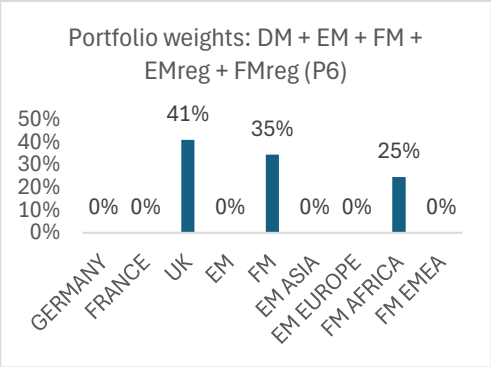
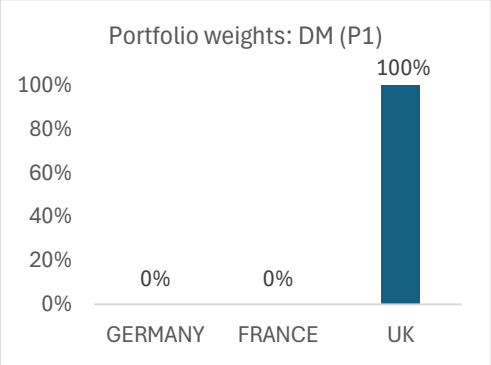
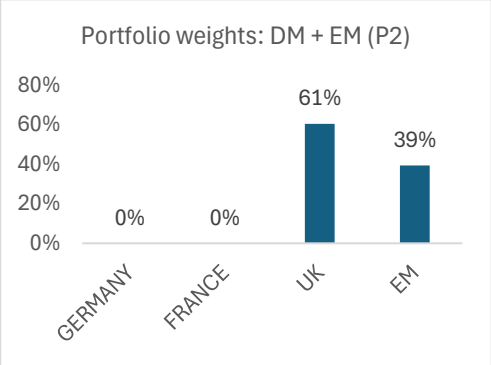
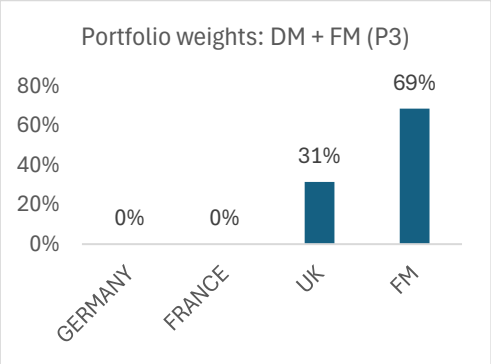
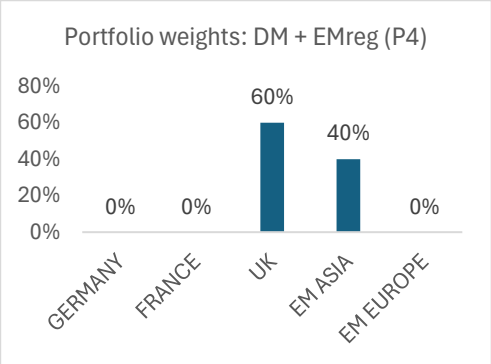


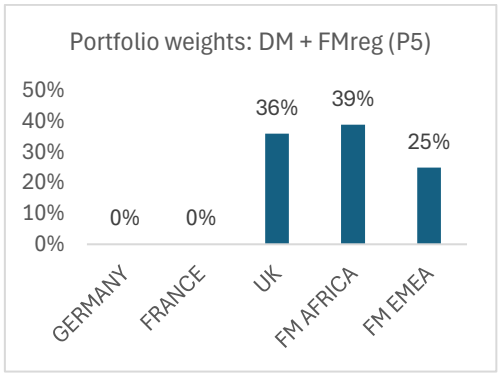
Figure 7 Weights of Minimum Variance Portfolios (MVP) during second sub-period











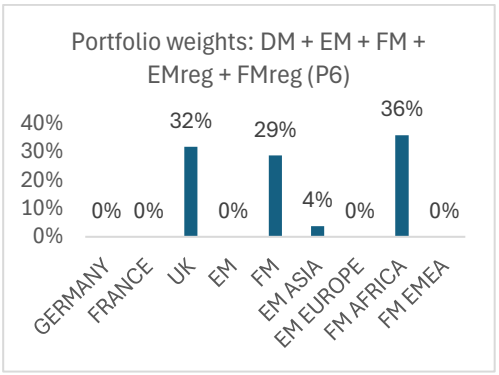
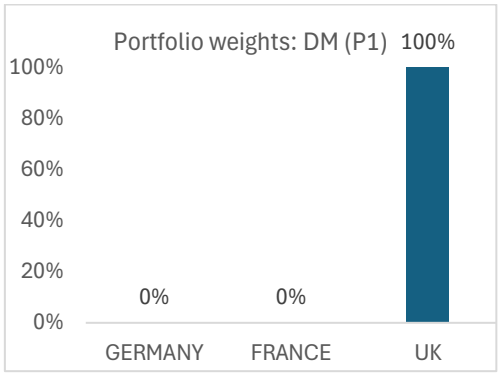
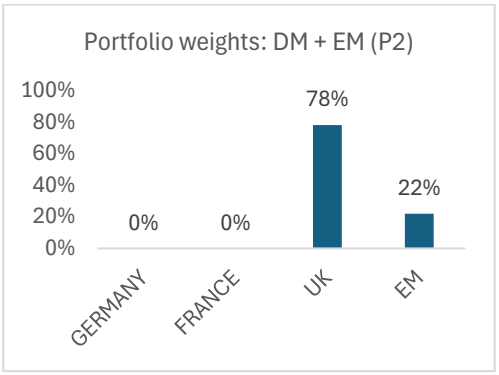
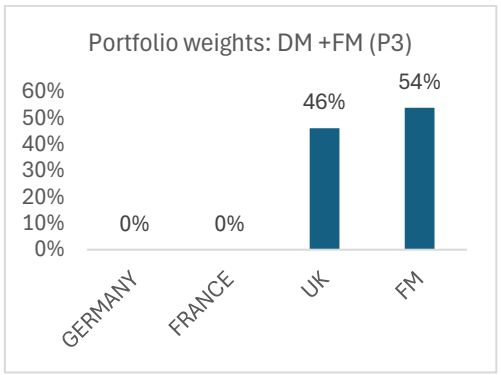
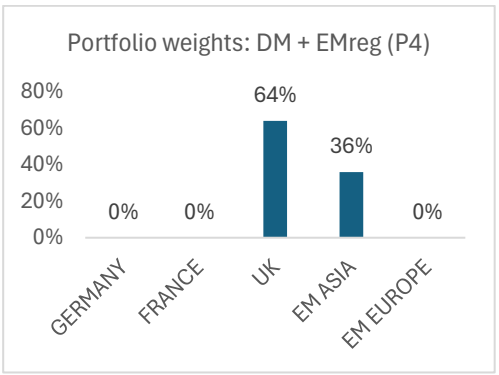


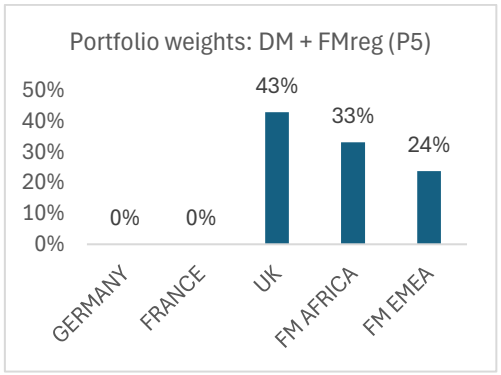
Figure 8 Weights of Minimum Semivariance Portfolios (MSVP) during full sample period











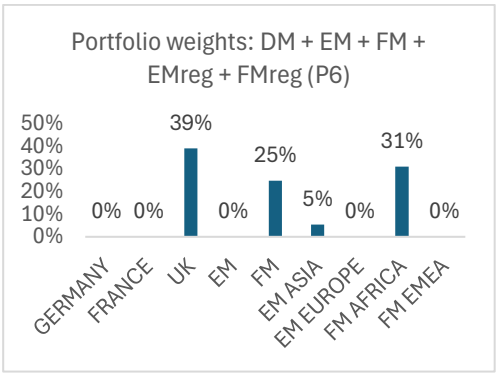
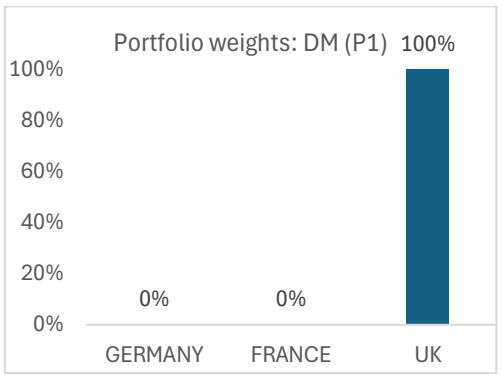
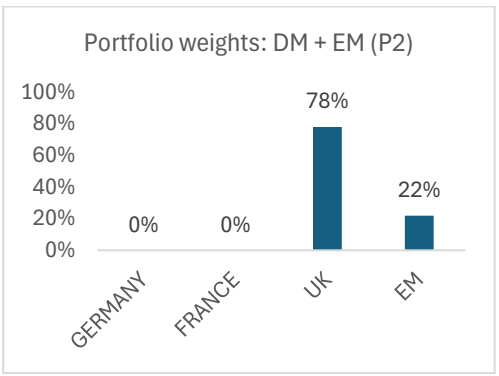
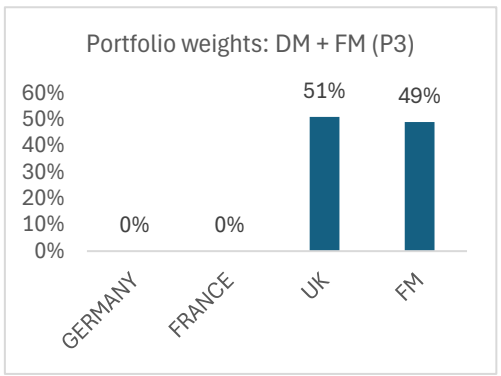
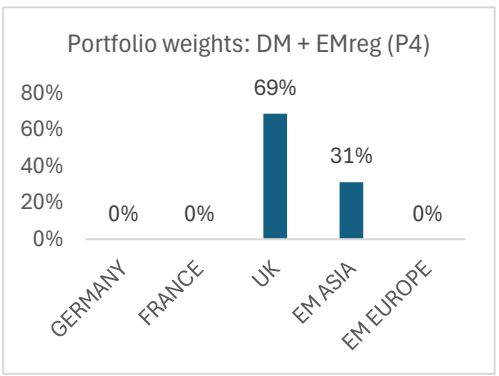


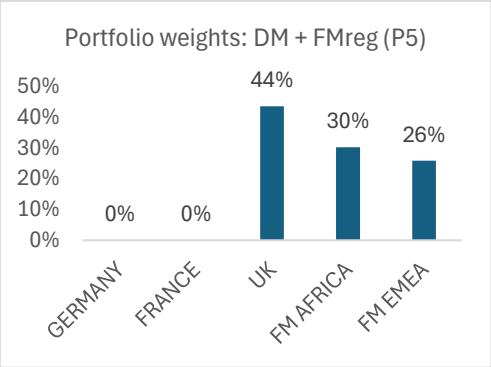
Figure 9 Weights of Minimum Semivariance Portfolios (MSVP) during first sub-period











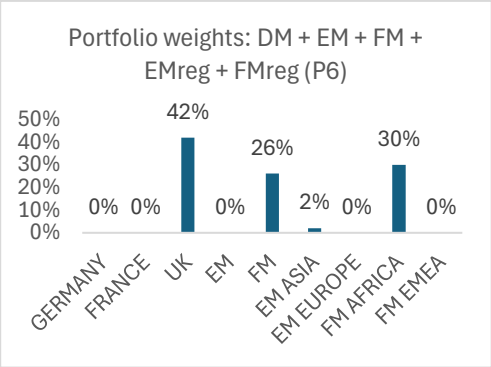
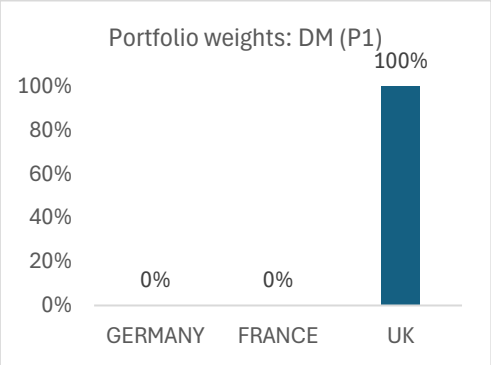
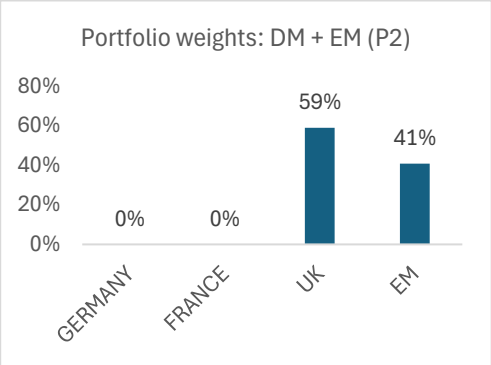
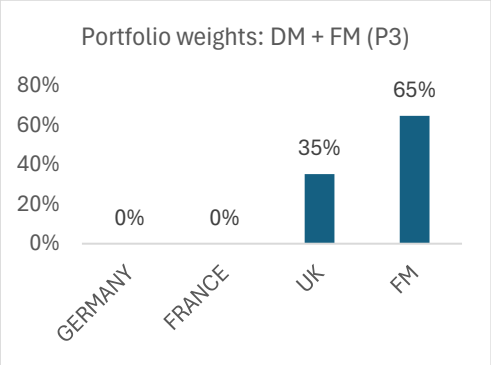
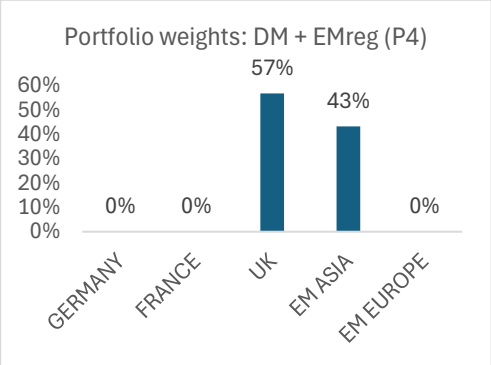


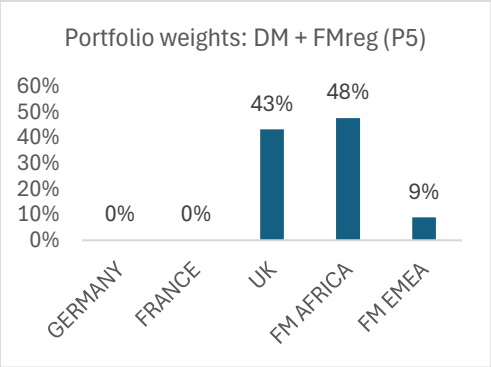
Figure 10 Weights of Minimum Semivariance Portfolios (MSVP) during first sub-period

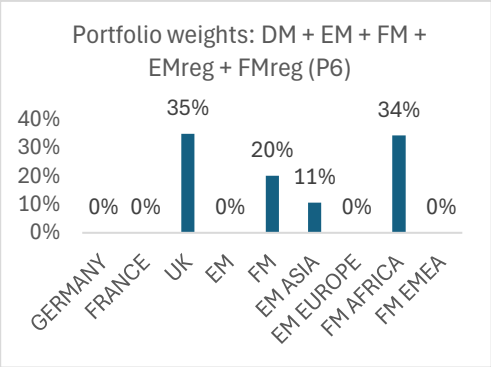












7.2 Portfolio performance evaluation

The performance of all portfolios is represented in the tables below. Table 4 and 5 presents the MVP and MSVP performance during the entire sample period, whereas the table 6 and shows the optimal portfolio performance during the 1. sub-period. In addition, the portfolio performance during the 2. sub-period is reported in table 8 and 9. The performance will be measured using three portfolio performance metrics: Sharpe ratio, Treynor ratio, and Jensen's alpha. In addition, the systematic risk of each portfolio is measured by the portfolio beta.

7.2.1 Performance analysis

By comparing the Sharpe ratios of the optimal portfolios, it can be concluded that the emerging equity markets offer diversification benefits to investors. Both minimum variance portfolios with an exposure to emerging markets (P2 and P4) scored a higher Sharpe ratio compared to the portfolio constructed only from the developed markets (P1). From the minimum semivariance portfolios, only the DM+EM portfolio outperforms the DM-only portfolio during the full sample period. Overall, the performance of P4 can be considered remarkably convincing. The MVPs and MSVPs, with exposure to developed markets and regional emerging markets, outperformed all other portfolios during both sub-periods. This indicates that by adding the EM Asia index to the portfolio is possible to reduce portfolio risk and increase risk-adjusted return.

It must be noted that that both portfolios P2 and P4, with exposure to developed and emerging markets, have highest beta-factor from the full sample indicating that these portfolios hold higher systematic risk than other portfolios studied. Hence, the emerging market portfolios P2 and P4 underperform against the DM-only portfolio when the portfolio's excess return is compared to its volatility. Therefore, although the P2 and P4 offer higher Sharpe ratios compared to P1, Treynor ratios of these portfolios fall below the P1.

Table 4 The performance of minimum variance portfolios during first sub-period

	DM (P1)	DM EM (P2)	DM FM (P3)	DM EMreg (P4)	DM FMreg (P5)	DM EM FM EMreg FMreg (P6)
Sharpe ratio	0.009	0.011	-0.0158	0.017	-0.009	-0.011
Treynor ratio	0.0004	0.0003	-0.0006	0.001	-0.0004	-0.0004
Jensen's alpha	-0.0002	-0.0003	-0.001	-0.0002	-0.0005	-0.001
Beta	0.54	0.70	0.50	0.68	0.42	0.43

Table 5 The performance of minimum semivariance portfolios during sample period

	DM (P1)	DM EM (P2)	DM FM (P3)	DM EMreg (P4)	DM FMreg (P5)	DM EM FM EMreg FMreg (P6)
Sharpe ratio	0.0114	0.0168	-0.016	0.013	-0.023	0.008
Treynor ratio	0.0004	0.0003	-0.0004	0.0003	-0.0007	0.0002
Jensen's alpha	-0.0001	-0.0003	-0.0006	-0.0002	-0.056	-0.0005
Beta	0.54	0.70	0.51	0.69	0.41	0.44

Table 6 The performance of minimum variance portfolios during first sub-period

	DM (P1)	DM EM (P2)	DM FM (P3)	DM EMreg (P4)	DM FMreg (P5)	DM EM FM EMreg FMreg (P6)
Sharpe ratio	0.011	0.015	-0.012	0.020	0.004	0.004
Treynor ratio	0.005	0.0005	-0.0005	0.0007	0.0002	0.0000
Jensen's alpha	-0.0001	-0.0001	-0.0006	0.000	-0.0002	-0.0002
Beta	0.58	0.74	0.52	0.72	0.43	0.43

Table 7 The performance of minimum semivariance portfolios during first sub-period

	DM (P1)	DM EM (P2)	DM FM (P3)	DM EMreg (P4)	DM FMreg (P5)	DM EM FM EMreg FMreg (P6)
Sharpe ratio	0.016	0.021	-0.0123	0.030	0.0123	0.0133
Treynor ratio	0.0005	0.0005	-0.0004	0.0007	0.0004	0.0004
Jensen's alpha	-0.0001	0.0003	-0.0005	0.000	-0.0001	0.000
Beta	0.58	0.72	0.53	0.72	0.42	0.43

Table 8 The performance of minimum variance portfolios during second sub-period

	DM (P1)	DM EM (P2)	DM FM (P3)	DM EMreg (P4)	DM FMreg (P5)	DM EM FM EMreg FMreg (P6)
Sharpe ratio	0.0092	0.0058	-0.021	0.012	-0.037	-0.053
Treynor ratio	0.004	0.0001	-0.0007	0.0003	-0.001	-0.002
Jensen's alpha	-0.0002	-0.0005	-0.0008	-0.0003	-0.0009	-0.001
Beta	0.49	0.64	0.48	0.62	0.40	0.43

Table 9 The performance of minimum semivariance portfolios during second sub-period

	DM (P1)	DM EM (P2)	DM FM (P3)	DM EMreg (P4)	DM FMreg (P5)	DM EM FM EMreg FMreg (P6)
Sharpe ratio	0.0133	0.0083	-0.0254	0.0179	-0.0522	-0.043
Treynor ratio	0.0004	0.0002	-0.0006	0.0003	-0.0015	-0.0010
Jensen's alpha	0.0002	-0.0005	-0.0008	0.0002	-0.001	-0.0009
Beta	0.49	0.65	0.48	0.63	0.39	0.45

Examining the frontier market portfolios reveals that the asset allocation to the frontier market index and the regional frontier market indices can be considered unattractive in terms of risk-adjusted returns. For P6 containing all indices, the high exposure to frontier

markets reduces overall portfolio returns. By comparing the portfolio performance measures during the full sample period, the results show the portfolios with an exposure to the frontier markets (P3, P5 and P6) underperformed against the developed markets and emerging markets portfolios. All of these portfolios had negative average returns during the full sample period leading to negative portfolio performance measures. This indicates that the optimally constructed portfolios with an exposure to frontier markets have not been able offer higher average returns compared to the risk-free rate.

All in all, the results of the portfolio performance comparison are not so encouraging for an investor who has had high exposure to frontier markets during the full sample period and during both sub-periods. The results of the optimal portfolio allocation and portfolio performance evaluation indicate that although the investor is able to reduce the risk of the portfolio by adding the frontier markets in the investment portfolio, the portfolio returns are also significantly reduced. Especially the poor performance of FM Africa index during the second decreases the risk-adjusted returns and therefore the overall attractiveness of FM Africa index in the portfolio despite its low correlation with the major developed European countries. Overall, the weak performance of frontier markets underlines the attractiveness of emerging markets as an investment opportunity.

8 Conclusions

Main motivation of this thesis was to investigate if emerging and frontier markets provide diversification benefits in terms of lower portfolio risk and higher risk-adjusted returns in internationally diversified portfolio. The study was carried out by creating six different portfolios, which included European developed markets, emerging markets, and frontier markets. For emerging and frontier markets, to increase the scope of the study, regional indices were used in addition to the overall EM and FM indices to identify the differences that arise when an optimal portfolio is constructed with different geographical weightings.

These six different portfolios are constructed by utilizing two portfolio optimization methods: Markowitz's (1952) Minimum Variance Portfolio (MVP) and Estrada's (2008) Mean Semivariance Portfolio (MSVP) optimization method. In addition to the whole sample period, two sub-periods have been created to examine the optimal portfolio allocation between different time periods.

Overall, the results of this study suggest that emerging and frontier markets are an integral part of MVP and MSVP optimized investment portfolios. In terms of overall allocation, risk can be reduced simply by increasing the weight of EM or FM in the portfolio. However, even more effective diversification can be obtained by increasing exposure to regional FM and EM indices. For emerging markets in particular, the importance of EM Asia as part of an optimized portfolio is highlighted whereas the European emerging market plays a negligible role in the portfolio over the entire survey period. In the case of frontier markets, especially the exposure to Africa decreases the overall risk of the optimally constructed portfolio.

By comparing two different time periods and the optimal diversification for these periods, we see that the importance of emerging and frontier markets has surprisingly even increased during recent years. However, it should be noted that there are already significant regional differences in these markets, and diversification to certain

geographical areas has yielded higher diversification benefits. It is therefore essential for the investor to study market developments carefully and to choose the optimal allocation so that the risk of the portfolio can be minimized without a substantial reduction in returns. Hypothesis 1 suggests that exposure to emerging and frontier markets would decrease the risk of optimally constructed portfolios. Although there are large differences in the weights of emerging and frontier markets in optimally constructed portfolios, the results indicate that exposure to developing markets can indeed decrease the variance of the portfolios.

By comparing the results of the value addition of emerging and frontier markets in an internationally diversified portfolio, the results obtained can be considered two-fold. Although the importance of frontier markets in an optimally diversified portfolio can be considered robust, these markets cannot be regarded as a very attractive investment in terms of risk-adjusted returns. The results show that although in the MVP and MSVP optimized portfolios the weight of emerging and developed markets decreases when frontier markets are added to the portfolio, this allocation has a return-reducing effect. Therefore, if the aim is to lower the overall risk of the investment portfolio with a decrease in the expected returns, the frontier markets have not been the convenient allocation destination during the period covered by this research.

The results indicate that to enhance the portfolio performance, the emerging markets can be considered notably more attractive investment opportunities than their frontier market counterparts. Overall, this study shows that while frontier markets offer investors more excellent diversification benefits relative to emerging markets in risk-optimized portfolios, their performance is still relatively weaker than that of emerging economies. The highest risk-adjusted return over the entire time period is provided by a portfolio of with a weight in developed and emerging markets. Therefore, the H2 suggesting that the exposure to emerging and frontier markets will enhance the portfolio performance in risk-adjusted measures; the results show that this only holds for emerging markets. During the full entire period, the MVP and MSVP, with exposure to EM Asia and EM,

overperformed against the benchmark portfolio, which allocated only to European developed markets.

There is widespread concern in academic literature about the increasing correlation of emerging markets and the consequent loss of diversification opportunities compared to, for example, frontier markets. This study shows that emerging markets continue to offer a meaningful investment opportunity alongside developed economies and that the declining correlation between emerging and developed markets observed when the two sub-periods are compared, may continue to offer opportunities for investors also in the future.

The empirical results of this study may provide valuable information for investors considering emerging and frontier markets as a component in an internationally diversified portfolio. The findings of this study allow investors to compare the benefits offered by emerging and frontier markets in optimally diversified portfolio, and to construct an investment strategy where the aim is to minimize the risk by combining emerging and frontier markets in the allocation. Overall, the results highlight the importance of emerging markets component in optimally diversified portfolios, in order to increase the performance of portfolio compared to the naïve benchmark portfolio containing only European developed markets. Still, the findings indicate that the regional differences can be considered significant, and therefore, investors should take a critical look towards certain regions when considering the allocation in an internationally diversified portfolio.

For developing economies, the scope of existing academic research has mainly focused on the large regional indices or the development of country indices. Therefore, an exciting area of future research could combine the examination of performance of developing economies measured from the perspective of factor investing. This could enable the identification of attractive investment opportunities within the emerging and frontier economies on a country-by-country basis.

References

Abreu, M., Mendes, V., & Santos, J.A.C. (2011). Home country bias: Does domestic experience help investors enter foreign markets? *Journal of Banking & Finance* 35(9), 2330-2340. https://doi.org/10.1016/j.jbankfin.2011.01.032

Ang, A., & Bekaert, G. (2002). International Asset Allocation with Regime Shifts. The *Review of Financial Studies*, 15(4), 1137–1187. http://www.jstor.org/stable/1262694

Ardia, D., Boudt K. (2015). Testing equality of modified Sharpe ratios. *Finance Research Letters 13*, 97-104.

Bailey, W., & Stulz, R. M. (1990). Benefits of international diversification: The case of pacific basin stock markets. *Journal of Portfolio Management*, 16(4), 57-61. https://www.proquest.com/scholarly-journals/benefits-international-diversification-case/docview/195584223/se-2?accountid=14797

Banerjee, P., & Dutta, S. (2022). The effect of political risk on investment decisions. *Economics Letters*, 212(1): 110301. https://doi.org/10.1016/j.econlet.2022.110301

Bekaert, G., & Harvey, C. R (2000). Foreign speculators and emerging equity markets. *The Journal of Finance*, 55(2). 565-613. https://www.jstor.org/stable/222516

Bekaert, G., & Harvey, C. R. (1995). Time-Varying World Market Integration. *The Journal of Finance*, 50(2), 403–444. https://doi.org/10.2307/2329414

Bekaert, G., & Hodrick, R. J. (2011). *International financial management (2nd edition)* Pearson Education.

Bekaert, G., Ehrmann, M., Fratzscher, M., & Mehl, A. (2014). The Global Crisis and Equity Market Contagion. *The Journal of Finance*, 69(6), 2597–2649. http://www.jstor.org/stable/43611077

Bekaert, G., Harvey, C. R., Lundblad, C. T., & Siegel, S. (2014). Political risk spreads. *Journal of International Business Studies*, 45(4), 471-493. https://doi.org/10.1057/jibs.2014.4

Berger, D., Pukthuanthong, K., & Yang, J.J. (2011). International diversification with frontier markets. *Journal of Financial Economics*, 101(1), 227-242. https://doi-org.proxy.uwasa.fi/10.1016/j.jfineco.2011.02.009

Berk, J. & DeMarzo, P. (2011*). Corporate Finance: The Core (second edition)*. Pearson Education Limited.

Bodie, Z. & R. C. Merton (2000). *Finance*. International edition. New Jersey: Prentice-Hall, Inc.

Bodie, Z., Kane, A. & Marcus, A. (2014). *Investments*. 10th ed. New York: McGraw-Hill Education.

Brealey, R.A., Myers, S.C. & Allen, F. (2017). *Principles of Corporate Finance*. Twelfth edition. McGraw-Hill Education.

Brooks, R. & Del Negro, M. (2004). The rise in comovement across national stock markets: market integration or IT bubble? *Journal of Empirical Finance*, 11(5). 659-680. https://doi-org.proxy.uwasa.fi/10.1016/j.jempfin.2003.08.001

Cagliesi, G., & Guidi, F. (2021). A three-tiered nested analytical approach to financial integration: The case of emerging and frontier equity markets. *International Review of Financial Analysis,* 74, No. 101698. https://doi-org.proxy.uwasa.fi/10.1016/j.irfa.2021.101698

Carrieri, F., & Majerbi, B. (2006). The pricing of exchange risk in emerging stock markets. *Journal of International Business Studies*, 37, 372-391. https://doi.org/10.1057/palgrave.jibs.8400204

Carrieri, F., Errunza, V., & Hogan, K. (2007). Characterizing World Market Integration through Time. *The Journal of Financial and Quantitative Analysis*, 42(4), 915–940. http://www.jstor.org/stable/27647329

Chan, K., Covrig, V., & Ng, L. (2005). What Determines the Domestic Bias and Foreign Bias? Evidence from Mutual Fund Equity Allocations Worldwide. *The Journal of Finance*, 60(3), 1495-1534. http://www.jstor.org/stable/3694933

Christoffersen, P., Errunza, V., Jacobs, K., & Langlois, H. (2012). Is the Potential for International Diversification Disappearing? A Dynamic Copula Approach. The *Review of Financial Studies*, 25(12), 3711–3751. http://www.jstor.org/stable/41678630

Chue, T.K., & Cook, D. (2008). Emerging market exchange rate exposure. *Journal of Banking & Finance*, 32(7), 1349-1362. https://doi-org.proxy.uwasa.fi/10.1016/j.jbankfin.2007.11.005

Cooper, I., & Kaplanis, E. (1994). Home Bias in Equity Portfolios, Inflation Hedging, and International Capital Market Equilibrium. *The Review of Financial Studies*, 7(1), 45–60. http://www.jstor.org/stable/2962285

Diamante, R. L., Liew, J. M., & Stevens, R. L. (1996). Political risk in emerging and developed markets. *Financial Analysts Journal*, 52(3), 71-76. https://www.proquest.com/scholarly-journals/political-risk-emerging-developed-markets/docview/219121891/se-2

Didier, T., Hevia, C., & Schmukler, S.L. (2012). How resilient and countercyclical were emerging economies during the global financial crisis? *Journal of International*

Money and Finance, 31(8). 2052-2077. https://doi-org.proxy.uwasa.fi/10.1016/j.jimonfin.2012.05.007

Dimic, N., Orlov, V., & Piljak, V. (2015). The political risk factor in emerging, frontier, and developed stock markets. *Finance Research Letters*, 15, 239-245. https://doi.org/10.1016/j.frl.2015.10.007

Divecha, A. B., Drach, J., & Stefek, D. (1992). Emerging Markets: A Quantitative Perspective. *Journal of Portfolio Management*, 19(1), 41-50. https://www-proquest-com.proxy.uwasa.fi/scholarly-journals/emerging-markets-quantitative-perspective/docview/195575582/se-2?accountid=14797

Dumas, B. (1978). The Theory of the Trading Firm Revisited. *The Journal of Finance*, 33(2), 1019-1030. https://doi-org.proxy.uwasa.fi/10.2307/2326500

East Capital (2023). *Emerging and frontier markets outlook 2024 – emerging from the rates storm?* Retrieved: 10.4.2024 from: https://www.eastcapital.com/insights/emerging-and-frontier-markets-outlook-2024-emerging-from-the-rates-storm

Erb, C. B., Harvey, C. R., & Viskanta, T. E. (1995). Country risk and global equity selection. *Journal of Portfolio Management*, 21(2), 74-83. https://www.proquest.com/scholarly-journals/country-risk-global-equity-selection/docview/195573607/se-2?accountid=14797

Estrada, J. (2008). Mean-Semivariance Optimization: A Heuristic Approach. *Journal of Applied Finance, 18*(1), 57-72. https://www.proquest.com/scholarly-journals/mean-semivariance-optimization-heuristic-approach/docview/201513367/se-2

Eun, C. S., & Resnick, B. G. (1984). Estimating the Correlation Structure of International Share Prices. *The Journal of Finance*, 39(5), 1311–1324. https://doi.org/10.2307/2327729

Fama, E.F., French K.R. (2004). The Capital Asset Pricing Model: Theory and Evidence. *Journal of Economic Perspectives*, 18(3), 25-46.

Favre, L., Galeano, J. (2002). Mean-Modified Value-at-Risk Optimization with Hedge Funds. *The Journal of Alternative Investments*, 5(2), 21-25

Fracis, J.C., Kim, D. (2013). Modern Portfolio Theory: Foundations, Analysis, and New Developments. John Wiley & Sons, Incorporated.

French, K.R. & Poterba, J.M. (1991). Investor Diversification and International Equity Markets. *The American Economic Review*, 81(2), 222-226. https://www.jstor.org/stable/2006858

Gadanecz, B., Miyajima, K., & Shu, C. (2018). Emerging market local currency sovereign bond yields: The role of exchange rate risk. *International Review of Economics and Finance*, 57, 371-401. https://doi-org.proxy.uwasa.fi/10.1016/j.iref.2018.02.004

Gao, H.L., & Mei, D.C. (2018). The correlation structure in the international stock markets during global financial crisis. *Physica A: Statistical Mechanics and its Applications*, 534, 1-8. https://doi-org.proxy.uwasa.fi/10.1016/j.physa.2019.122056

Ghozzi, B.B., & Chaibi, H. (2022). Political risks and financial markets: emerging vs developed economies. *EuroMed Journal of Business*, 17(4), 677-697. DOI 10.1108/EMJB-11-2020-0123

Gilmore, C.G., McManus, G.M., & Tezel, A. (2005). Portfolio allocations and the emerging equity markets of Central Europe. *Journal of Multinational Financial Management*, 13(3), 287-300. https://doi-org.proxy.uwasa.fi/10.1016/j.mulfin.2004.12.001

Graham, J. R., Harvey, C. R., & Huang, H. (2009). Investor Competence, Trading Frequency, and Home Bias. *Management Science*, 55(7), 1094-1106. https://www.proquest.com/scholarly-journals/investor-competence-trading-frequency-home-bias/docview/213268099/se-2

Gregoriou, G.N., Gueyie, J. (2003). Risk-Adjusted Performance of Funds of Hedge Funds Using a Modified Sharpe Ratio. *The Journal of Wealth Management*, 6(3), 77-83

Grubel, H.G. (1968). Internationally Diversified Portfolios: Welfare Gains and Capital Flows. *The American Economic Review*, 58(5), 1299-1314. https://www.jstor.org/stable/1814029

Guntur, A. R., & Velip, S. P. (2021). Does Integration in the Asian Frontier, Emerging, and Developed Stock Markets Conceal a Hidden Opportunity for Portfolio Diversification? *The Journal of Wealth Management,* 23(4), 76-91. https://doi.org/10.3905/jwm.2020.1.123

Gupta, R. & Donleavuy, G.D. (2009). Benefits of diversifying investments into emerging markets with time-varying correlations: An Australian perspective. *Journal of Multinational Financial Management* 19(2), pp. 160-177. https://doi.org/10.1016/j.mulfin.2008.10.001

Gupta, R., Yang, J., & Jithendranathan, T. (2017). Diversification into Emerging Markets – An Australian and the US Perspective Using a Time-varying Approach. Australian *Economic Papers*, 56(2). 134-162. https://doi.org/10.1111/1467-8454.12081

Hadhri, S., & Ftiti, Z. (2019). Asset allocation and investment opportunities in emerging stock markets: Evidence from return asymmetry-based analysis. *Journal of International Money and Finance*, 93, May 2019, 187-200. https://doi.org/10.1016/j.jimonfin.2019.01.002

Han, K.C., Lee, S., Suk, D.Y., & Sung, H.M. (2017). International Diversification into Emerging Equity Markets: Perspective of U.S. Investors. *The International Journal of Finance*, 29(1).

Harvey, C. R. (1995). Predictable Risk and Returns in Emerging Markets. *The Review of Financial Studies*, 8(3), 773–816. http://www.jstor.org/stable/2962239

Hodder, J.E. (1982). Exposure to exchange-rate movements. *Journal of International Economics,* 13(3-4), 375-386. https://doi.org/10.1016/0022-1996(82)90065-4

Huang, T., Wu, F., Yu, J., & Zhang, B. (2015). Political risk and dividend policy: Evidence from international political crises. *Journal of International Business Studies*, 46, pp. 574-595. https://doi-org.proxy.uwasa.fi/10.1057/jibs.2015.2

Hwang, E., Min, H-G., Kim, B-H., & Kim, H. (2013). Determinants of stock market comovements among US and emerging economies during the US financial crisis. *Economic Modelling 35*. 338-348. https://doi-org.proxy.uwasa.fi/10.1016/j.econmod.2013.07.021

International Monetary Fund. Monetary and Capital Markets Department (2020). *Chapter 3. Emerging and Frontier Markets: Managing Volatile Portfolio Flows.* https://www.elibrary.imf.org/display/book/9781513529196/ch003.xml

Janki, M., Jubin, S. (2013). Dealing with the Limitations of the Sharpe Ratio for Portfolio Evaluation*. Journal of Commerce and Accounting Research*, 2(3), 10-18.

Jayasuriya, S.A., Sambora, W. (2009). Oops, we should have diversified! *Applied Financial Economics*, 19(22), 1779-1785. https://doi.org/10.1080/09603100903035947

Karadam, D.Y., & Öcal, N. (2020). Analysis of distinct asymmetries in financial integration-growth nexus for industrial, emerging and developing countries. *International Journal of Finance & Economics*, 27(2). 2326-2344. https://doi-org.proxy.uwasa.fi/10.1002/ijfe.2275

Karlsson, A. & Norden, L. (2007). Home sweet home: Home bias and international diversification among individual investors. *Journal of Banking & Finance*, 31(2), 317-333. https://doi.org/10.1016/j.jbankfin.2006.04.005

Ke, D., Ng, L., & Wang, Q. (2010). Home bias in foreign investment decisions. *Journal of International Business Studies*, 41(6), 960-979. https://doi.org/10.1057/jibs.2009.48

Kirikkaleli, D. (2020). The effect of domestic and foreign risks on an emerging stock market: A time series analysis. *The North American Journal of Economics and Finance*, 51, 100876. https://doi.org/10.1016/j.najef.2018.11.005

Kiymaz, H., Öztürkkal, B., & Akkemik, K. Ali. (2016). Behavioral biases of finance professionals: Turkish evidence. *Journal of behavioral and experimental finance*, 12, 101-111. https://doi-org.proxy.uwasa.fi/10.1016/j.jbef.2016.10.001

Koepke, R. (2019). What Drives Capital Flows to Emerging Markets? A Survey of the Empirical Literature. *Journal of Economic Surveys*, 33(2), 516-540. doi: 10.1111/joes.12273

Kohers, T., Kohers, G., & Pandey, V. (1998). The contribution of emerging markets in international diversification strategies. *Applied Financial Economics*, 8(5), 445-454. https://doi-org.proxy.uwasa.fi/10.1080/09603109833273

Krugman, P. (1981) Consumption Preferences, Asset Demands, and Distribution Effects in International Financial Markets. *NBER Working Paper No. 651*. DOI 10.3386/w0651

Kumar, S.S.S. (2011). Are Emerging Markets Relevant for Portfolio Diversification? *Review of Market Integration*, 3(2), 103-119. https://doi.org/10.1177/097492921100300201

Lehkonen, H., & Heimonen, K. (2015). Democracy, political risks and stock market performance. *Journal of International Money and Finance*, 59, 77-99. https://doi.org/10.1016/j.jimonfin.2015.06.002

Lessard, D.R. (1974). World, National, and Industry Factors in Equity Returns. *The Journal of Finance*, 29(2), 379-391. https://doi.org/10.2307/2978807

Levy, H., & Sarnat, M. (1970). International Diversification of Investment Portfolios. *The American Economic Review*, 60(4), 668–675. http://www.jstor.org/stable/1818410

Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *Review of Economics and Statistics*, 47(1),

Longin, F., & Solnik, B. (2001). Extreme Correlation of International Equity Markets. The *Journal of Finance*, 56(2), 649–676. http://www.jstor.org/stable/222577

Markowitz, H. (1952). Portfolio selection. *The Journal of Finance*, 7(1), 77-91.

Markowitz, H. (1959). *Portfolio Selection: Efficient Diversification of Investment*. New York : John Wiley and Sons, Incorporated.

Marshall, B.R., Nguyen, N.H., & Visaltanachoti, N. (2015) Frontier market transaction costs and diversification. *Journal of Financial Markets* 24, 1-24.

Massa, M., & Simonov, A. (2006). Hedging, Familiarity and Portfolio Choice. *The Review of Financial Studies*, 19(2), 633-685. https://www.jstor.org/stable/3844008

McCallum, J. National Borders Matter: Canada-U.S. Regional Trade Patterns. The *American Economic Review*, 85(3), 615-623. https://www.jstor.org/stable/2118191

Mensi, W., Hammooudeh, S., Reboredo, J.C., & Nguyen, D.K. (2014). Do global factors impact BRICS stock markets? A quantile regression approach. *Emerging Markets Review*, 19 (2014), 1-17. http://dx.doi.org/10.1016/j.ememar.2014.04.002

Meric, I. & Meric, G. (1989). Potential gains from international portfolio diversification and inter-temporal stability and seasonality in international stock market

relationships. *Journal of Banking & Finance*, 13(4-5). 627-640. https://doi.org/10.1016/0378-4266(89)90034-4

Miles, W. (2005). Do Frontier Equity Markets Exhibit Common Trends and Still Provide Diversification Opportunities? *International Economic Journal*, 19(3), 473-482. https://doi.org/10.1080/10168730500199475

Mishra, A.V. (2015). Measures of equity home bias puzzle. *Journal of Empirical Finance*, 35, 293-312. https://doi.org/10.1016/j.jempfin.2015.08.001

Morgan Stanley Investment Management. (2021). Emerging Market Allocations How Much to Own? Investment insight. Retrieved: 13.2.2024 from: https://www.morganstanley.com/im/publication/insights/articles/article_howmuchtoown_us.pdf

Mossin, J. (1966). Equilibrium in a Capital Asset Market. *Econometrica*, 34(4), 768-783.

MSCI (2021). *Market Classification Framework*. Retrieved 15.6.2022 from: https://www.msci.com/documents/1296102/1330218/MSCI_MARKET_CLASSIFICATION_FRAMEWORK_2021.pdf/2639cb9b-7687-b3c2-f9c2-b766fde077c9

MSCI Index Research (2012). *Emerging vs. Developed Markets Classification Why It Matters to Investors*. Retrieved 15.6.2022 from: https://www.msci.com/documents/10199/7424d920-cdcb-462c-9e16-4c450ed70e2a

Obstfeld, M. (1998). The Global Capital Market: Benefactor or Menace? *The Journal of Economic Perspectives,* 12(4), 9-30. https://www.jstor.org/stable/2646892

Oehler, A., Rummer, M., & Wendht S. (2008). Portfolio Selection of German Investors: On the Causes of Home-biased Investment Decisions. *The Journal of Behavioral Finance*, 9(3), 149-162. https://doi-org.proxy.uwasa.fi/10.1080/15427560802341434

Pätäri, E., Ahmed, S., John, E., & Karell, V. (2019). The changing role of emerging and frontier markets in global portfolio diversification. *Cogent Economics & Finance*, 7(1), 1-23.

Perotti, E.C., & van Oijen, P. (2001). Privatization, political risk and stock market development in emerging economies. *Journal of International Money and Finance*, 20(1), 43-69. https://doi.org/10.1016/S0261-5606(00)00032-2

Platanakis, E., & Urquhart, A. (2020). Should investors include Bitcoin in their portfolios? A portfolio theory approach. *The British Accounting Review*, 52(4). https://doi.org/10.1016/j.bar.2019.100837

Pukthuanthong, K. & Roll, R. (2009). Global market integration: An alternative measure and its application. *Journal of Financial Economics*, 94(2), 214-232. https://doi-org.proxy.uwasa.fi/10.1016/j.jfineco.2008.12.004

Quisenberry, C.,Jr, & Griffith, B. (2010). Frontier equity markets: A primer on the next generation of emerging markets. *The Journal of Wealth Management*, 13(3), 50-58. https://www.proquest.com/scholarly-journals/frontier-equity-markets-primer-on-next-generation/docview/770470832/se-2?accountid=14797

Schmukler, S.L. (2004). Financial globalization: Gain and pain for developing countries. *Federal Reserve Bank of Atlanta Economic Review*, 89(2),

Sercu, P. (1980). A Generalization of the International asset Pricing Model. *Revenue de l'Association Francaise de Finance*, 1, 91-135.

Shapiro, A.C. (1975). Exchange Rate Changes, Inflation, and the Value of the Multinational Corporation. *The Journal of Finance*, 30(2), 485-502. https://doi-org.proxy.uwasa.fi/10.2307/2978728

Sharpe, W.F. (1966). Mutual Fund Performance. *The Journal of Business*, 39(1), 119-138 https://www.jstor.org/stable/2351741

Sirr, G., Garvey, J., & Gallagher, L. (2011). Emerging markets and portfolio foreign exchange risk: An empirical investigation using a value-at-risk decomposition technique. *Journal of International Money and Finance*, 30, pp. 1749-1772. https://doi-org.proxy.uwasa.fi/10.1016/j.jimonfin.2011.08.002

Smales, L. A. (2021). Policy uncertainty in Australian financial markets. *Australian Journal of Management*, 46(3), 523–547. https://doi-org.proxy.uwasa.fi/10.1177/0312896220959120

Solnik, B.H. (1995). Why Not Diversify Internationally Rather Than domestically? *Financial Analyst Journal*, 51(1), 89-94. https://www.proquest.com/scholarly-journals/why-not-diversify-internationally-rather-than/docview/219203356/se-2?accountid=14797

Solomons, R. & Grootveld, H. (2003). The equity risk premium: emerging vs. developed markets. *Emerging Markets Review*, 4(2), 121-144. https://doi.org/10.1016/S1566-0141(03)00024-4

Speidell, L. S. (2017). Looking both ways: A quarter century in emerging and frontier markets. *Journal of Investing*, 26(1), 9-21. https://doi-org.proxy.uwasa.fi/10.3905/joi.2017.26.1.009

Speidell, L., Krohne, A. (2007). The Case for Frontier Equity Markets. *Journal of Investing*, 16(3). 12-22,4. //www.proquest.com/trade-journals/case-frontier-equity-markets/docview/220762820/se-2

Strong, N., & Xu, X. (2003). Understanding the Equity Home Bias: Evidence from Survey Data. *The Review of Economics and Statistics*, 85(2), 307–312. http://www.jstor.org/stable/3211582

Stulz, R. (1983). The Demand for Foreign Bonds. *Journal of International Economics*, 15(3-4), 225-238. https://doi.org/10.1016/S0022-1996(83)80002-6

Sukumaran, A., Gupta, R., & Jithendranathan, T. (2015). Looking at new markets for international diversification: frontier markets*. International Journal of Managerial Finance*, 11(1), 97-116.

Tang, A. & Yao, W. (2022). The effects of financial integration during crises. Journal of *International Money and Finance*, 124, No. 192613. https://doi-org.proxy.uwasa.fi/10.1016/j.jimonfin.2022.102613

Tesar, L. & L., Werner, I. M. (1995). Home bias and high turnover. *Journal of International Money and Finance*, 14(4), 467-492. https://doi-org.proxy.uwasa.fi/10.1016/0261-5606(95)00023-8

Thomas, N.M., Kashiramka, S., Yadav, S.S., & Paul, J. (2022). Role of emerging markets vis-a-vis ` frontier markets in improving portfolio diversification benefits. *International Review of Economics & Finance*, 78, 95-121. https://doi.org/10.1016/j.iref.2021.11.012

Tobin, J. (1958). Liquidity Preference as Behavior Towards Risk. *The Review of Economic Studies*, 25(2), 65–86. https://doi.org/10.2307/2296205

Treynor, J.L., & Black, F. (1973). How to Use Security Analysis to Improve Portfolio Selection. *The Journal of Business*, 46(1), 66-86. https://www.jstor.org/stable/2351280

UNCTAD (2022). *Global foreign direct investment flows over the last 30 years*. Retrieved: 16.1.2023 from: https://unctad.org/data-visualization/global-foreign-direct-investment-flows-over-last-30-years

Valls, N., & Chuliá, H. (2012). Volatility Transmission and Correlation Analysis between the USA and Asia: The Impact of the Global Financial Crisis. *Global Economic Review*, 41(2). 111-129. https://doi-org.proxy.uwasa.fi/10.1080/1226508X.2012.686476

Wallmeier, M., & Iseli, C. (2022). Home bias and expected returns: A structural approach. *Journal of International Money and Finance*, 124, No. 102634. https://doi-org.proxy.uwasa.fi/10.1016/j.jimonfin.2022.102634

You, L. & Daigler, R.T. (2010) Is international diversification really beneficial? *Journal of Banking & Finance*, 34, 163-173.