National College of Ireland

Project Submission Sheet

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Dissertation

Impact of International Portfolio Diversification on European Markets

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The Impact of International Portfolio Diversification on European Markets: A Modern Portfolio Theory Approach

Abstract

In this thesis, we examine the quantitative returns of a European investor while diversifying his portfolio internationally. Investors are continually striving to make the most money with the least amount of risk since global financial markets are getting more intertwined. This is harder because of home prejudice. Employing a Modern Portfolio Theory-based analytical and empirical methodology, this study surpasses theoretical debates over the necessity for investment diversification. The study employs the Monte Carlo simulation on 10 recognized Exchange-Traded Funds (ETFs) that monitor European equities (IEUR), U.S. stocks (SPY), emerging market equities (EEM), and U.S. aggregate bonds (AGG). It looks at the daily prices of sample ETF data from 2015 to 2025 to look at 20,000 different portfolio allocations. The study shows that there are two optimum portfolios: one with the least amount of risk and the other with the highest Sharpe Ratio. The findings suggest that strategically diversifying across global markets may yield a substantial risk-adjusted performance benefit compared to a strategy concentrated solely in European markets. The results also show that using assets that don't move together, like international bonds, can make it easier to design a portfolio with less volatility. This research may be beneficial for investors, financial advisors, and institutional planners in Europe, as it provides quantitative evidence that supports the notion that it is an effective tool for portfolio management. The study's findings enhance the existing body of knowledge on portfolio management by providing a modern, practical viewpoint on the enduring advantages of international diversification.

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Chapter 1: Introduction

1.1 Background: The Unfolding Era of Financial Globalization

Over the previous fifty years, investing has evolved a lot. One of the biggest changes has been the merging of national financial systems into a single global market. This is also known as financial globalization, and it is a huge change from the time after World War II when capital controls and reasonably independent national economies were the norm (Eichengreen, 2008). They started taking down structures like this in the 1970s, but it really took off in the 1980s and 1990s. This made it possible for money to move across borders in ways that people thought were impossible before. Two revolutions that transpired at the same time forced this fundamental transformation to happen. The first was the rise of information and communication technology, which made it easier and cheaper than ever to do business with people in other countries. The second was the change in ideas that happened in both industrialized and developing countries (Obstfeld & Taylor, 2004) that led to more open markets and less government control. The effects of this new way of doing things have been tremendous. Globalization of finance has aided economies by making it easier to move money around. For example, people in nations with a lot of savings can invest their money in projects that will make more money in countries with less money. This helps economies grow all across the world. It has helped businesses grow and lower their cost of capital by making it easier for them to access bigger and more liquid financial markets. Because the world is increasingly connected, investors have a lot of choices. They can put money into different countries, industries, and currencies. It's clear what the theoretical benefits are: the chance to construct investment portfolios that work better, which would then be able to generate bigger returns, reduced risk, or both.

The only worry is that this link could be bad. It helps share both wealth and risk, but it also makes it easier for shocks and financial contagion to spread. An event occurring at one extremity of the globe, shown by the Asian Financial Crisis of 1997-98 or the U.S. The 2008 Subprime Mortgage Crisis can now spread like a disease to the other end of the system, leading markets that were supposed to be unrelated to fall at the same moment (Kaminsky & Reinhart, 2000). As systemic risk develops, it is increasingly more important to find better strategies to control risk. Countries' borders don't keep investors secure anymore. They are now part of a complex global system and need to know how assets and countries work together. These rules

for diversifying your portfolio have gone from being an academic theory to being a matter of life and death in a world that is always changing and full with possibilities.

1.2 The Central Tenet of Modern Finance: The Diversification Principle

One of the most important ideas in modern finance is diversification, which may be summed up in the phrase "Don't put all your eggs in one basket." Harry Markowitz's 1952 book "Portfolio Selection" was the first to use clear mathematical language to explain old ideas. The work that won Markowitz the Nobel Prize in Economics is what we now call Modern Portfolio Theory (MPT). MPT changed the way people thought about investing by forcing them look at the whole portfolio instead of just each asset.

Markowitz showed that the risk of a portfolio, which is measured by the statistical metric of variance (or its square root, standard deviation), is not just the weighted average of the hazards of its individual assets. The risk level of the portfolio, on the other hand, depends a lot on how the returns of the assets change in relation to each other. Covariance and its standardized version, correlation, measure this link. The basic premise behind MPT is that an investor can lower the total risk of a portfolio by putting together assets that have low or, even better, negative correlations. Idiosyncratic or unsystematic risk is a type of risk that solely affects one asset. For instance, a factory strike or a product that doesn't work. You can lower it by keeping other things that aren't affected by that occurrence. The last risk, called systemic or market risk, can't be lowered because it comes from things that influence the whole market, including changes in interest rates or a slump in the economy.

MPT really does the "efficient frontier." On a risk-return graph, this curve illustrates the portfolios that deliver the best expected return for a certain level of risk or the least risk for a certain level of expected return. The best portfolio is not in this frontier. William F. Sharpe and others built on Markowitz's work to produce the Capital Asset Pricing Model (CAPM). This model let people figure out how much to charge for assets based on how risky they were. They also created the Sharpe Ratio, which is a common way to figure out how much return you get for taking on risk. These theoretical foundations collectively established a robust principle for rational investors: the optimal strategy is to maintain a well-diversified portfolio. Grubel (1968) and Solnik (1974) were among the first researchers to show that diversifying internationally could lower risk even more. This is due to the fact that different economic cycles, monetary policies, and industrial structures drove the economies and stock

markets of different countries. This meant that assets in separate countries were less likely to move in the same direction than assets in the same country.

1.3 The Enduring Puzzle: The "Home Bias" Phenomenon

Finance theory asserts that a rational investor's portfolio should primarily mirror the global market portfolio, due to strong theoretical underpinnings and persuasive initial empirical evidence advocating for international diversification. However, extensive empirical research has established that this prediction is erroneous and has been for an extended period: the "home bias" phenomenon. French and Poterba (1991) and Tesar and Werner (1995) were the first to give a detailed explanation of home bias. Investors tend to have more local assets in their portfolios than they should based on their part of the global market capitalization. For example, U.S. investors have historically retained most of their equity capital in U.S. companies, even though the U.S. stock market was worth less than half of the world's stock market at that time. This occurrence is not confined to the United States; it has been noted in almost every nation with a developed capital market.

The enduring occurrence of home bias has sparked a robust and continuous academic discourse, with researchers proposing several explanations for this ostensibly irrational behavior. One group of reasons looks at both clear and not-so-clear reasons why people don't invest abroad. These are direct costs including transaction fees, withholding taxes on profits given to people who don't live in the country, and various rules and accounting standards that make it tougher to own and analyze assets in other countries (Black, 1974). Another closely related argument is that information asymmetry gives domestic investors an advantage when it comes to their home market, which helps them make better investment decisions there and supports a focus on domestic markets (Gehrig, 1993; Ahearne, Griever, & Warnock, 2004).

There are other books and articles that deal about why people hedge. Some people say that investors keep their money in their own country to protect themselves from risks that are only in their country and could hurt their overall financial health, like sudden inflation or changes in the value of things that can't be traded, like real estate and human capital (Adler & Dumas, 1983). Since most of your debts are in the local currency, having assets in that currency may help keep your real wealth from changing too much.

Finally, an increasing number of studies are utilizing behavioral finance to elucidate home bias. These views assert that the bias is not a rational reaction to costs or risks, but instead a

consequence of psychological heuristics. Some of these are familiarity bias, which means that investors prefer things they know and are comfortable with; patriotism, which means that investors prefer US-based companies; and institutional inertia, which means that pension fund rules or standards may favor US investments (Huberman, 2001). Although each of these hypotheses probably contains a piece of the answer, none of them has been able to explain the size and long-lasting effects of the home bias. This makes it one of the most long-lasting mysteries in international finance. This thesis adds to the conversation by not explaining the prejudice and instead trying to figure out how much it costs from a modern European point of view.

1.4 The European Context: A Unique Laboratory for Diversification

The European continent is a compelling and intricate case study for international diversification. The creation of the European Union (EU) and, even more importantly, the introduction of the euro in 1999 were important steps toward more cooperation in finance and the economy. The goal of using a single currency was to get rid of exchange rate risk between member countries, lower transaction costs, and build a strong, unified, and liquid capital market that could compete with the US market (De Santis & Gerard, 2009). In principle, this integration should have changed a lot how people spread out their investments. Moving from one country to another, as from Germany to France, would not be as useful because the Eurozone's national markets were more connected. This should have led European investors to seek opportunities beyond the Eurozone, particularly in North America, Asia, and emerging markets, to mitigate their risk (Baele et al., 2004).

But the truth has been more complicated. There is still a lot of "regional home bias," which indicates that investors still prefer Eurozone assets over a genuinely global allocation, even though market integration has grown. There have also been a number of big shocks in the last twenty years that have tested European integration and showed how difficult risk is in Europe. The European sovereign debt crisis came about not long after the Global Financial Crisis of 2008. It showed that there were still big structural problems in the monetary union and that country-specific risk still existed, but it had changed into a different kind of credit and political risk (Lane, 2012). Brexit, the UK's decision to leave the EU in 2016, was a big step toward the EU's breakup since it brought back trade barriers and made politics less stable. The COVID-19 pandemic's effects on the economy and the 2022 crisis in Ukraine's effects on the region's politics have shown how easily events that happen both inside and outside of the region

can have an impact. This means that diversification is very important for an investor in Europe. Is a portfolio that largely has European assets, even if they are spread out across the Eurozone, strong enough to handle thus many risks? Or do you need to invest in non-European assets to manage risk appropriately in today's European markets? This thesis directly addresses the issue by adopting the viewpoint of an investor in the European market and evaluating the effects of capital allocation to essential foreign asset classes.

1.5 The Modern Investment Landscape: The Rise of ETFs and MPT in Practice

Even though it seems wonderful in theory, most people have found it hard to implement Modern Portfolio Theory in actual life. It used to be hard and expensive to build and keep a portfolio of stocks and bonds that was spread out over the world. It required a lot of money, time, and effort to get things back in order. Exchange-Traded Funds (ETFs) have been very popular since they first came out. They have changed the way people make portfolios by making it easier for everyone to find new ways to spread out their investments.

ETFs are traded on stock exchanges, just like stocks. They usually follow a specific index, such as the MSCI Europe Index, the S&P 500, or a wide bond market index. They have grown because they have a number of substantial advantages over traditional mutual funds, such as lower costs (expense ratios), better tax efficiency, the ability to trade during the day, and the chance to see what they own. ETFs are a great way to put your plan for spreading out your investments into action. With just a few simple trades, an investor can have a taste of a lot of different U.S. stocks, stocks from developing countries, or bonds from other countries. This allows them spread out their investments at a far lower cost and with less work than buying the assets one at a time (Agapova, 2011).

Quantitative analysis of international diversification is no longer solely an academic endeavor due to the availability of these techniques. It is a pragmatic inquiry with immediate, actionable implications. This thesis employs a modern toolkit by utilizing a well chosen array of highly liquid and representative ETFs as the fundamental components for its portfolio analysis. The study goes beyond theoretical indexes by using real-world tools, which gives data that are easy to understand and could be useful for investors and financial advisors. This study is grounded on the contemporary investing environment, linking financial theory with practical portfolio management.

1.6 Problem Statement and Research Gap

Combining these disparate yet interconnected concepts reveals a significant and necessary gap in the research. We live in a globalized financial system that makes it easier than ever to move our money around (Section 1.1). The theoretical framework of Modern Portfolio Theory offers comprehensive and widely endorsed guidelines for the construction of optimal portfolios through the amalgamation of assets exhibiting low correlations (Section 1.2). Nonetheless, investors worldwide, especially in Europe, display a significant and persistent home bias, leading to investments limited to their own country and thereby missing out on these potential benefits (Section 1.3). Because Europe has a distinct economic and political context that has seen a lot of integration and some big changes recently, it is important to do a more thorough cost-benefit analysis of diversification from this region (Section 1.4). Lastly, the rise of low-cost, effective investment options like ETFs has made it easier than ever to use global diversification tactics (Section 1.5).

There exists a substantial body of literature on each of these topics individually; nevertheless, there is a need for research that synthesizes them in a contemporary, quantitative, and practical manner. A lot of basic empirical studies on international diversification are already decades old, and their results may not be as relevant in today's more connected world, where correlations are known to act differently, especially during crises (Longin & Solnik, 2001). This thesis addresses the pressing need for a contemporary, empirical reevaluation of the risk-return benefits of international diversity from a European perspective. It will not clarify the origins of home bias but will quantitatively evaluate its impacts. This research aims to provide a conclusive and significant answer to the fundamental question: What is the tangible, measurable impact of foreign diversification for a modern European investor? It uses modern financial tools and statistics that show how the market has been very unstable lately.

1.7 Research Questions

This thesis is guided by a primary research question and a set of ancillary sub-questions to enable a methodical analysis of the topic.

Primary Research Question:

How does diversifying overseas portfolios impact returns and risk in the European financial markets?

Sub-questions:

For a European investor, how do different forms of assets, including international stocks and bonds, affect the risk and return of portfolios that have a lot of diverse types of assets?

2. How much does investing in global markets lower the risk and volatility of European portfolios?

3. How have larger economic factors, such as inflation and GDP growth, affected the results and success of international diversification for European investors?

4. 4. 4. How do significant geopolitical events, such wars or changes in government, impact the risk and return balance in European portfolios that are spread out all over the world?

5. How have changes in exchange rates and currency-related concerns affected how well international diversification works for European investment portfolios?

This study will provide a direct and comprehensive quantitative answer to sub-questions 1 and 2, while simultaneously laying the analytical groundwork required for addressing sub-questions 3, 4, and 5 in future research endeavors

1.8 Significance of the Study

This research is important for a number of reasons, and it will affect a lot of people who are relevant. This thesis offers individual and institutional investors in Europe clear, data-driven, and actionable advice on how to build a portfolio. It makes a strong case against the default attitude of home bias by showing how much less danger there is and how much more reward there is. It also gives useful tips on how to improve portfolios. The findings furnish financial advisors and wealth managers with actual data to validate their client recommendations, thereby demonstrating the importance of global asset allocation in their strategies.

This work offers the academic community a contemporary empirical analysis of Modern Portfolio Theory in a highly interconnected but volatile market environment. It provides new information on how diversification functions in a world where market correlations are always changing. The results show how investors act and how well the EU's financial systems are connected. This information can help politicians and regulators in the EU. Figuring out how much money investors put into overseas markets can assist make policies that promote financial stability, grow capital markets, and teach investors more.

1.9 Thesis Structure

This thesis has seven chapters that solve the research questions in a organized way. Chapter 2 expands upon the introduction by conducting a comprehensive examination of extant scholarly literature. It talks about the basics of portfolio theory, how diversification works in real life, the problem of home bias, and what makes European markets different. Chapter 3 talks about the study technique, including the quantitative design, how the data was collected and prepared, and how Monte Carlo simulations were used to put Modern Portfolio Theory into practice. Chapter 4 shows the most important results, such as exploratory data analysis, the correlation matrix, efficient frontier charts, and a comparison of the best-performing portfolios. Chapter 5 talks about what these results mean in a bigger way, how they relate to the research topics and previous studies, and what the study's limits are. Chapter 6 finishes the thesis by going over the main points and giving specific ideas for more investigation. Finally, Chapter 7 provides a list of all the sources that were used in the paper.

Chapter 2: Literature Review

2.1 Introduction

One of the most important things in today's financial economics is figuring out how to make the greatest investment portfolios. In this chapter, the author examines the substantial and evolving corpus of academic literature that supports this proposition, highlighting its theoretical and empirical underpinnings. The review aims to construct a comprehensive narrative, commencing with an overview of the enduring concepts of Modern Portfolio Theory (MPT) as articulated in contemporary literature. It also discusses fresh empirical research that examines the benefits of applying these concepts to other nations and substantiates the rationale for global diversification. The second part of the chapter talks about the long-lasting mystery of home bias. This is a big problem in the actual world that goes against the basic assumptions of finance theory, especially when you think about fresh studies on behavior and information. The next step is to look closely at one of the biggest problems with the diversification paradigm today: how market correlations around the world are changing and often increasing stronger. This issue has gotten worse because of the latest problems around the world. Lastly, the paper examines the unique and complex European financial landscape, utilizing those concepts to contextualize the current findings. This chapter will systematically

outline the research gap that the thesis wants to address, thereby integrating the rationale of the approach and objectives presented in the next chapters.

2.2 The Enduring Principles of Modern Portfolio Theory

These theories are still used to teach and analyze money. Modern Portfolio Theory (MPT) revolutionized how people think about investing by telling them to look at how the whole portfolio is doing instead of just one asset. The fundamental point of it is to demonstrate how risk and return work together. This method says that the prospective return and the level of risk should be the two main things to look at when evaluating portfolios. You may find out how risky the portfolio is by looking at the variance or standard deviation of its returns.

What this model and the math underpinning diversification show us is that the risk of a portfolio is not just the average risk of the assets that make it up. Instead, portfolio risk is mostly affected by how much asset returns change in relation to each other, which is called covariance. If an investor puts together a portfolio of assets that don't move in the same direction very often, the prices of each item will usually stay the same. This will make it less probable that the value of the portfolio will vary. This way of thinking creates a major difference between two types of threat. There are two kinds of risk: systemic risk and idiosyncratic risk. The first category is only in one company or asset. Putting a lot of various assets into a portfolio could make it less important. The second type of risk, called systemic or market risk, comes from large changes in the economy that affect all assets and can't be avoided. The main idea behind the thesis is that smart investors shouldn't expect to be paid for taking on unsystematic risk because it's easy to spread out.

You can use the efficient frontier to put these ideas into reality. This graph shows all the "efficient" portfolios, which are the ones that have the best chance of making money for a certain level of risk. This line indicates the finest portfolios. If your portfolio isn't on it, it's not the best one. The Capital Asset Pricing Model (CAPM) was created to improve and add to the current investment framework. It shows that the market is stable. The Capital Asset Pricing Model (CAPM) posits that the anticipated return on an asset is equivalent to the risk-free rate augmented by a premium for assuming systematic risk, as indicated by the asset's beta (β) (Fama & French, 2015). The Sharpe Ratio is still the best way to figure out how well investment portfolios do when you take risk into consideration (Sharpe, 2015). It shows how much more return you get for each unit of total risk. Both MPT and CAPM have been criticized and improved over time, but the main ideas behind them—how assets move in relation to each

other, the balance between risk and return, and the difference between market-wide and asset-specific risks—are still very important for building and diversifying a portfolio.

2.3 The Modern Case for International Diversification

A lot of studies have been done on how MPT's principles can be implemented in places other than the US. The initial phase of study in the late 20th century presented a compelling case for worldwide diversity. But the conversation has moved in the last few years from questioning if there are benefits to measuring how they have changed as globalization has developed. Recent studies continue to suggest that a global investing universe gives investors more choices, but the benefits are not as clear-cut as they used to be.

A recent study by Calvo, De Santis, and Opp (2019) investigates the benefits of international diversification for a U.S. investor in the post-2000 period, marked by heightened financial interconnection. They discover that the advantages of diversifying among established equity markets to mitigate risk have diminished in significance compared to previous times. But they claim that there are still enormous benefits, especially if you put your money into emerging markets. Their data reveal that the connections have gotten stronger, but they haven't come together to form one. Adding economies with varied development patterns and underlying causes keeps making the efficient frontier better. Research in factor investing corroborates the efficacy of a global perspective. Goetzmann, Koijen, and Uspenskii (2019) looked at real estate returns in several countries and concluded that global factors had a big impact on prices. This shows that just looking at investments from a local point of view misses crucial things that affect risk and return. The research shows that even though many of the obvious benefits of diversity may have already been seen, there is still a solid rationale for investing abroad. This is not only to disperse risk, but also to take advantage of a wider range of possibilities and economic situations.

New dynamics have also come about since the way global markets work has changed. A lot of companies now do business in more than one country, so even stocks that are traded in the U.S. often make a lot of money from outside the U.S. This provides them exposure to the whole world. Bekaert, Harvey, and Wang (2022) contend that "diversification-at-home" is not an optimal substitute for direct foreign investment, as the profits of these firms are still heavily affected by the risks inherent in their domestic market. So, the greatest way to really diversify

your geographic portfolio is still to put money directly into other markets. In conclusion, the current scientific consensus does not dispute the advantages of international diversification; instead, it enhances our comprehension of the concept. The benefits may not be as significant as they were in the 1970s, although they remain crucial from both economic and statistical perspectives, particularly for emerging markets and the implementation of sophisticated investment strategies that require diverse worldwide options.

2.4 The Home Bias Puzzle in the 21st Century

The so-called "home bias puzzle" is still one of the hardest difficulties in international finance. This is when investors tend to keep too many assets in their own country, even if theory and practice have shown for a long time that global diversification is a good idea. This modern study has gone beyond the idea of explaining through clear barriers like fees and limits, which have been lessened to focus on a more complicated topic that includes a mix of informational frictions and behavioral bias. Recently, it has been confirmed that information asymmetry is an important way to explain things. Back when the idea of being able to talk to everybody in the world right now didn't seem so far-fetched, it looked like the important thing was being able to grasp information, not just having access to it. Poyry and Rintamaki (2020) show that analysts from other nations are not as good at estimating the earnings of national companies as analysts from the same country. They say that being close to the economy, institutions, and corporate culture is preferable than being far away. This informational edge may drive investors to make logical choices about national markets, where they think they can make better selections and get better returns. This is why they are against globally diversified portfolios.

However, new research has made behavioral theories more popular. According to a comprehensive meta-analysis conducted by Ba58196ari9219 milohellic quantitative survey of articles, the behavioral factors affecting home bias are significant and can be replicated across various countries and time periods, including familiarity, overconfidence, and patriotism (Ba5819 six decimal spaces among others, 2021). Their finding suggests that the preference for domestic assets is often not a well-informed business choice, but rather an emotional or cognitive shortcut. Research on how investors acted during recent crises backs up this point of view very strongly. Bouteska (2023) examined the U.S. market during the COVID-19 pandemic and has compelling evidence to support the notion that a flight to familiarity occurred. This means that when markets are extremely uncertain and stressful, investors not

only lose the comfort of diversity, but they also migrate further toward the comfort of the presumably safer returns of home country assets. Because of this, home bias lasts for a short time. This conduct is entirely opposed to what portfolio theory advises to do because it goes against what risk management says to do. It puts the most risk on the line at the time when risk management should be the most critical thing. Institutional components also continue to play an important role in keeping things stable. Andonov, Hochberg, and Rauh (2018) did a thorough study on public pension funds and discovered that political issues and the way local governments are set up have a large impact on how investments are made. This is because the investment directions usually promote investments in the area and the country, which aren't necessarily the best method to make money. This institutional inertia, coupled with fundamental behavioral biases and persistent, albeit slight, informational advantages, constitutes a robust amalgamation that elucidates the persistence of the home bias problem, even in contemporary, highly integrated, and readily accessible financial markets. This thesis does not aim to provide solutions to this dilemma; instead, it assesses the cost of yielding to the identified difficulty within the pertinent market context.

2.5 The Modern Challenge: Correlation Breakdown in a Hyper-Connected World

The well-known problem of growing and uneven correlations is a huge problem for the practical benefits of international diversification. The biggest concern is that the relationships between stock markets around the world aren't always the same. When the market is strained or there is a worldwide crisis, they tend to shoot up a lot, which means that variety isn't as useful as it should be. This trend, which started in the last few decades, has gotten worse in the 21st century's highly integrated financial system.

The COVID-19 epidemic gave a realistic and contemporary setting for examining this topic. Akhtaruzzaman, Boubaker, and Sensoy (2021) conducted a comprehensive analysis on the dissemination of financial shocks during the crisis. They noted an extraordinary increase in conditional correlations among the stock markets of the U.S., China, and other international markets. Their research strongly suggests that possessing a lot of equities in multiple areas doesn't help during a real global crisis. The contagion effects were immediate and wide-ranging, illustrating that financial markets are now so linked that a severe shock to the system makes all major equity markets move away from risk at the same time. This illustrates that

during a crash, the benefits of having both a European and a U.S. equity portfolio at the same time to lessen risk are substantially less.

This discovery has garnered significant scholarly interest about the necessity of cross-asset class diversification. If stocks around the world all move in the same direction during crises, then true diversification means putting stocks with assets that are affected by different things. Conlon, Corbet, and McGee (2020) looked at how different assets acted as safe havens during the COVID-19 market crisis. They discovered that classic safe havens like gold and government bonds preserved their low or negative correlation with stocks during the slump, which protected the value of their portfolios. Some so-called diversifiers, like cryptocurrency, on the other hand, did not function. For example, Bitcoin started to act more like a hazardous "tech stock" than something that doesn't link to anything else. This is similar to how the S&P 500 works. This shows that dividing "equity" from "non-equity" asset classes is now a better method to diversify than separating "domestic equity" from "foreign equity." This is an important rule for developing a modern portfolio.

Scientists are still attempting to figure out why this co-movement is happening more often. Bekaert, Hoerova, and Lo Duca (2021) provide evidence for a "global financial cycle," in which factors like U.S. monetary policy and global risk aversion (sometimes measured by the VIX index) create large waves that affect capital flows and asset prices around the world. The shift toward passive investing might also be a factor. Zeng and Yu (2021) contend that substantial inflows and outflows in broad, market-cap-weighted global ETFs can intensify co-movement, as these instruments induce concurrent buying or selling across entire collections of international stocks, thereby reinforcing overarching market trends instead of promoting price discovery for individual securities. The most recent body of data unequivocally indicates that reliance exclusively on geographic equity variety is an increasingly risky approach; successful portfolio creation necessitates a focus on allocation among clearly varied asset types.

2.6 The European Context: A Confluence of Common Factors

You may learn a lot about these new approaches to grow in the European economy. The area is odd since it has a lot of essential things in common that affect asset prices and correlations. The European Central Bank (ECB) gained a lot more power after the 2008 financial crisis, and the market changed a lot. Koijen, Koulischer, Nguyen, and Yogo (2021) wrote one of the most important papers about how the ECB's purchase of corporate bonds

altered the economy. They discovered that the program significantly influenced the valuations of the majority of other assets inside the European capital system and concurrently reduced borrowing rates for qualifying firms. This is a large part of why the correlation between European assets gets up and idiosyncratic risk goes down. This makes it more enticing to invest in items outside of Europe.

Second, the policies that shape the European market and how it works have changed a lot. The Brexit process has been put on hold, which has changed how the UK and the EU trade and do business with each other and made the political situation more perilous. Donadelli, Paradiso, and Sakkas (2019) undertook a unique study employing a financial market-based statistic to evaluate public attitude regarding Brexit. They found that political news had a big and long-lasting effect on market volatility and asset values. This means that fights over politics could make the area more hazardous and harder to protect.

Third, Europe is at the forefront of one of the most fundamental revolutions in investing: the shift to Environmental, Social, and Governance (ESG) norms. A lot of money is going into methods that include ESG, and this has a big effect on the value of assets. A groundbreaking study by Pástor, Stambaugh, and Taylor (2021) develops a theoretical model and empirical evidence that establishes the presence of a green factor in stock returns. They argue that green assets represent a new sort of risk and return because investors like them better. You could say that green assets cost more and have lower projected returns since investors are willing to spend a lot of money for them. This makes it harder and easier to design portfolios in Europe because investors now have to cope with both classic risk factors and this new ESG one. The peak of this historical period is the dominance of monetary policy, political fragmentation, and the emergence of ESG as a major investment driver. This makes Europe an interesting and complicated place that needs a modern and quantitative look at diversification strategies.

2.7 Synthesis and Identification of the Research Gap

This examination of contemporary academic literature, focusing exclusively on research published from 2015 onwards, has outlined a progression from the enduring principles of portfolio theory to the complex realities of modern global markets. A clear and convincing story emerges, directly highlighting the research vacuum this thesis aims to fill.

First, the core assumptions underpinning MPT are still the best place to start when you want to look at a portfolio. They help us talk about risk, return, and correlation in a comprehensible

way (Bodie, Kane, & Marcus, 2021). Second, the home bias problem persists, functioning not merely as a historical anomaly but as a dynamic behavioral phenomenon that intensifies during crises, resulting in a "flight to familiarity" when variety is critically needed (Bouteska, 2023; Bašić et al., 2021). Third, and most importantly, recent crises have tested traditional international diversification based on stock. The COVID-19 pandemic has unequivocally demonstrated that correlations among global stock markets surged significantly, resulting in widespread financial contagion and rendering geographic diversification within equities mostly ineffective as a protective measure against crises (Akhtaruzzaman et al., 2021). Fourth, this has logically shifted the emphasis of advanced diversification to a cross-asset class strategy. Recent research strongly indicates that the most reliable diversification gains are currently attained by combining equities with assets that possess fundamentally distinct drivers, such as high-quality government bonds (Conlon et al., 2020). Lastly, a number of strong common factors, like the widespread intervention of central banks and the structural rise of ESG investing, have changed the traditional risk-return relationship in Europe. This means that it is now more important to look at diversification strategies from a local point of view (Koijen et al., 2021; Pástor et al., 2021).

Putting these ideas together makes it clear what the research gap is. There is an urgent need for a study that synthesizes these new discoveries into a clear, practical, and quantitative analysis for European investors. This thesis aims to address this deficiency by:

• Offering a Contemporary Evaluation: Utilizing a recent dataset (2015-2025) that accurately reflects the current market conditions influenced by unconventional monetary policy, political instability exemplified by Brexit, and the COVID-19 pandemic, to evaluate diversification principles under these acknowledged stress factors.

• Focusing on Cross-Asset Class Diversification: Directly addressing the key point made in recent crisis literature by making the difference between a portfolio of exclusively European stocks and portfolios that include international bonds the main point of the examination. This checks to see if cross-asset allocation is still the best way to do things in the world we live in today.

• Quantifying the Contemporary Cost of Home Bias: Shifting from explaining the roots of home bias to evaluating its tangible financial consequences. This study will quantify the risk-adjusted performance that a European investor sacrifices by succumbing to a "flight to familiarity" and disregarding foreign and cross-asset class diversification.

• Adopting a Pragmatic, Implementable Methodology: Utilizing easily available and economical ETFs as the study's basic components, ensuring that the conclusions are not only theoretical but are directly applicable and actionable for both individual and institutional investors.

This thesis will basically employ established theory, while its motivation and interpretation will be solely guided by the latest academic research. It seeks to answer a question of great practical importance: in a situation with high equity correlations and strong common factors, what are the measurable risk-return benefits for a European investor who overcomes home bias and pursues a strategy of international portfolio diversification across asset classes?

Chapter 3: Methodology

3.1 Introduction

This chapter explains the study strategy used to find out how having a varied portfolio of international investments affects an investor living in Europe in terms of risk and return. The major purpose is to do a complete, quantitative analysis instead of just making theoretical statements. It is based on well-known financial theory. This happened because of a well-organized and logical framework that was built. To gather, arrange, simulate, and evaluate the data, a lot of work had to be done. This chapter will go over each step of the research process in detail. First, there will be a brief summary of how the study was developed and the principles that will support it. After that, it will explain in more detail how to pick assets, gather data, and get everything ready. The next section will go into a lot of detail regarding Monte Carlo simulation, which is the major approach to do analysis. We will speak about how to make and try a lot of different portfolio assignments. Finally, the chapter will talk about the software that is used to make sure that the study results are correct, easy to comprehend, and can be used again, as well as the factors that are used to determine the best portfolios.

3.2 Research Design

This study utilized a quantitative, longitudinal research methodology. The research methodology is quantitative, employing historical numerical data and mathematical models to evaluate hypotheses and address research inquiries. The architecture is longitudinal since it looks at time-series data from the beginning of 2015 to the middle of 2025, which is ten

years. This long time is necessary for the results to be relevant since they might show how different market regimes have changed over time. For example, long-term growth, a quick change in volatility, or the terrible and large international economic events that occured because of the COVID-19 epidemic. Because there are so many different factors at play in a market, there can't be one explanation that works for all situations. The research is deductive, starting with the established tenets of home finance as delineated by Modern Portfolio Theory, and then applying them to the specific circumstance. The simulation-based framework is the most convincing aspect of the methodology since it is naturally adept at solving challenging problems that entail adjusting a lot of variables, like making a multi-asset portfolio as good as it can be. The study's approach may facilitate a systematic and empirical framework for analyzing the risk-return trade-off features of diverse foreign asset allocation strategies, thereby building a data-driven foundation for the thesis outcomes.

3.3 Theoretical Framework: Modern Portfolio Theory

Harry Markowitz created Modern Portfolio Theory (MPT), which is the analytical engine of this study. It is still the basis for managing a portfolio of assets. People use the MPT's math and ideas to construct portfolios that will give them the best possible returns for each level of risk. The study employed has effectively yielded a meticulous assessment of the advantages of diversification. The basic parts of MPT that this page talks about include the formulas used to figure out the Sharpe Ratio, portfolio return, and portfolio volatility. The expected return of a portfolio is the weighted average of the expected returns of the assets it contains. It is the dot product of two vectors: one that displays how much each item in the portfolio weighs and the other that shows how well each asset has done on its own in the past. To make the data easier to interpret and compare, this study multiplies the average daily returns by the number of trading days in a year, which it considers to be 252. In MPT, the risk of a portfolio is a more important and complicated idea. The portfolio's volatility, which is the standard deviation of its returns, is used to figure this out.It is important to note that the portfolio's volatility is not the same as the weighted average of the volatilities of its individual assets. The weights of the assets, how much they change, and, most importantly, how they depend on each other are all important. The covariance matrix is very important because it shows how closely asset returns are related to each other. To use the formula, first switch the weights vector and the covariance matrix, then multiply the two together again. The portfolio's standard deviation is the square root of this product. To find the annualized value, you multiply it by the square root of the number of trading days in a year. This math explains how diversification works in

numbers: when two or more assets have low or negative covariance, the portfolio's volatility goes down. This research use the Sharpe Ratio to evaluate the efficacy of each portfolio, focusing on the returns produced in relation to the corresponding risks. This Ox, which is a way to evaluate risk-adjusted gain, was made by William F. Sharpe. To find this amount, you divide the portfolio's annualized return by its annualized volatility, taking into consideration the portfolio's risk-free rate. The following analysis assumes a risk-free rate of zero, which makes it easier to compare the portfolios. A portfolio with a higher Sharpe Ratio is more active, which implies it knows more about risk for each unit of return. This number is highly crucial for finding the best portfolio for risk-based behavior across all the simulated options.

3.4 Data Acquisition and Preparation

Any quantitative financial analysis is only valid if the input data is correct and meaningful. This section goes into detail on how to pick the financial instruments to look at, how to find the historical data you need, and how to make that data ready for the portfolio simulation.

To properly evaluate the impacts of international and cross-asset class diversification from a European perspective, a carefully chosen set of financial instruments was required. The study chose Exchange-Traded Funds (ETFs) as the investment vehicles because they are a good way to see how a modern investor would employ a diversification approach. This is because they are very liquid, cheap, and clear. The following four ETFs were selected to illustrate various asset classes and global regions:

We chose the iShares Core MSCI Europe ETF (IEUR) as a stand-in for the European domestic market. This ETF gives you a lot of exposure to a lot of companies in European markets that are already well-developed. The basic objective of the study topic is to see how well diversified portfolios do, and this is the "home" asset that is used to do that.

Second, the SPDR S&P 500 ETF Trust (SPY) was added to indicate how the stock market in the U.S. is doing. The S&P 500 is the largest and one of the most advanced markets in the world. It is a key aspect of any plan to diversify globally and the best approach to invest in stocks from developed markets around the world.

Third, the iShares MSCI Emerging Markets ETF (EEM) was picked to stand in for the stock markets of nations that are still emerging. These markets frequently have different risk-return profiles and are less connected to developed markets than developed markets are to each

other. Adding EEM to the analysis helps us find out if putting money into places with higher growth and higher risk really pays off.

It was crucial to include the iShares Core U.S. Aggregate Bond ETF (AGG) in order to measure cross-asset class diversification. You may buy a lot of U.S. investment-grade bonds through this ETF. Bonds and stocks don't normally move in the same direction, which makes them an excellent method to make a portfolio less volatile. AGG is needed to figure out if the best way to diversify is to invest in different geographic areas or in different asset classes.

We used Yahoo Finance's own Python package to get the historical price data for these four ETFs. Yahoo Finance is a well-known and free place to find old financial data. For this kind of academic research, its reliability for daily closing prices is excellent enough. We chose daily data over weekly or monthly data to make a more complete dataset that would allow us to calculate volatility and covariance more accurately.

The study examined data spanning from January 1, 2015, to July 20, 2025. The time frame of just over ten years was chosen on purpose to make sure that the analysis is both up-to-date and complete. It includes the relatively stable market conditions of the mid-to-late 2010s, the huge market swings and speedy recovery that happened during the COVID-19 epidemic in 2020, and the time after that when prices and interest rates rose higher. Because the study includes a range of market situations, the conclusions on correlation and volatility are less likely to be affected by a specific market regime. This means they show how modern financial markets change over time better.

Yahoo Finance gives you the raw data in a table with multiple levels that shows the open, high, low, close, and volume data for each ticker. Based on MPT, the daily closing price is the most important price series for analyzing a portfolio. It shows what the market thinks an asset is worth at the end of each trading day, and it's the most common approach to find out how much money you made in the past. The first step in getting the data ready was to gather the "Close" price for each of the four ETFs we chose. This made a neat data frame with dates as the index and tickers as the columns. An integrity check was done later to see whether any values were missing from the dataset. There were no missing values for the chosen assets and time period, hence there was no need to use data imputation methods.

MPT and its calculations are based on the statistical properties of asset returns, not their values. Price series are not frequently stationary, which indicates that their statistical properties change over time. This means they aren't good for this kind of research. On the other side,

daily returns are usually more stable. The next crucial step was to adapt the cleaned time series of closing prices into a time series of daily percentage returns. We did this by looking at how much the closing price of each asset changed from one day to the next. We took out the first row of the returns data frame because it would have a null value as there is no previous day to compare it against. This was done to make sure that the future covariance and return calculations would have all the data they needed.

3.5 Analytical Procedure: Monte Carlo Simulation

This article employed a Monte Carlo simulation to ascertain optimal portfolio allocations in relation to the efficient frontier and portfolio selection. This is one of the finest techniques to address this problem because it is hard to discover the answer to a multi-asset efficient frontier quantitatively. The simulation enables a methodical heuristic search across the spectrum of possible portfolio combinations, producing and evaluating a comprehensive range of randomly weighted portfolios. The goal of using Monte Carlo simulation is to show us the risk-return exposure of the four assets we have and to provide us a range of risk-return exposures that we could receive by putting the four assets together in different proportions. The simulation is designed to create and evaluate 20,000 distinct portfolios. This figure was picked because it is a good compromise between how easy it is to find the data online and how effectively the map of the efficient frontier shows the data and how dense it is. The map gets more information as more simulations are run. But the more simulations there are, the less accurate the map becomes. Finding truly optimal portfolios doesn't require too many simulations. The simulation was conducted in an iterative loop, with each iteration involving the creation and analysis of a single portfolio. We did this same set of stuff 20,000 times. Then, four random numbers were made, one for each asset. These are the weights that still need to be normalized. Second, the random weights were made equal, and then each weight was divided by the sum of all four weights. This is significant since it makes sure that each portfolio has a weight of one. This suggests that the portfolio is completely invested, which is what MPT usually assumes.

Third, we used the normalized weights we got in Section 3.3 to find the annualized returns and annualized volatility of a certain portfolio. We used the covariance matrix of the returns and the vector of the mean daily returns that had already been determined to perform this. Fourth, we found the portfolio's annualized return and annualized volatility. Then we divided those two numbers to get the Sharpe Ratio for the portfolio. Fifth, an array of these three essential

performance indicators—annualized return, annualized volatility, and the Sharpe Ratio—along with the four-component normalized weight that produced them was preserved in an array. We did this 20,000 times, which gave us a huge dataset where each row showed a different outcome and each row was a different portfolio with the estimated weights and performance metrics.

3.6 Identification of Optimal Portfolios

Monte Carlo simulation created a dataset containing the risk-return profiles of 20,000 different portfolios. The final step in the study was to go through this dataset and find the best portfolios for distinct investing goals. Two significant portfolios were identified.

The first one is the Maximum Sharpe Ratio Portfolio. To find this portfolio, which had the greatest Sharpe Ratio, you need to look through the whole dataset. Most people think of it as the "best" hazardous portfolio since it gives the highest return for every unit of risk taken. This is the best way to disperse your money among risky assets when you think about risk.

The second one is the Minimum Volatility Portfolio. You can find this portfolio by looking through the dataset and choosing the one with the least amount of annualized volatility. People who don't like taking chances and want to keep their money safe and prevent big price changes will find this portfolio quite fascinating. It might not give you the best returns, but it's the safest combination of the assets you've chosen. We can fully examine the trade-offs between risk and reward that come with investing in overseas markets by showing all 20,000 simulated points for these two portfolios.

3.7 Software and Tools

To do this study in a form that is clear and can be repeated, we used the Python computer language (Version 3.x), which makes it more accurate. The idea was put into reality using a group of open-source scientific computing tools. We utilized the pandas package to change data, which includes making and managing data frames for prices and returns. Using linear algebra, the NumPy library made math problems like figuring out a portfolio's return and volatility move faster. In a program, we utilized the yfinance module to get and save old market prices. Lastly, the libraries matplotlib and seaborn were used to produce graphs of the data and show the results, like the one that shows the final efficient frontier.

Chapter 4: Findings

4.1 Introduction

In this chapter, we talk about what happened when we put the plan from Chapter 3 into action. This section's purpose is to provide data to illustrate the results that directly address the research questions on how having a diverse international portfolio influences things. The way the results are shown depends on the sequence in which the analysis was done. The research begins with an Exploratory Data Analysis (EDA) that examines the fundamental performance and risk variables of the assets utilized in the study. Next, we need to think carefully about how these assets are linked to each other, because that's what makes diversification important. Next, we show the most important outcomes of the Monte Carlo portfolio optimization, like a graph of the efficient frontier and the best portfolios. The chapter concludes with a direct mathematical comparison of these optimal portfolios against a benchmark investment of 100% in European equities. This makes it easy to see how much value diversification adds.

4.2 Exploratory Data Analysis of Constituent Assets

It's important to comprehend what makes each building-block asset different before developing and judging portfolios. The EDA shows this basic information by examining at how the iShares Core MSCI Europe ETF (IEUR), the SPDR S&P 500 ETF Trust (SPY), the iShares MSCI Emerging Markets ETF (EEM), and the iShares Core U.S. Aggregate Bond ETF (AGG) did in terms of returns, volatility, and performance from 2015 to 2025.

We modified the historical closing values of the four ETFs to a single starting value of 100 so it would be easier to observe how the assets changed over time. This change makes it easy to see how much a $100 investment in each asset would have increased over ten years.

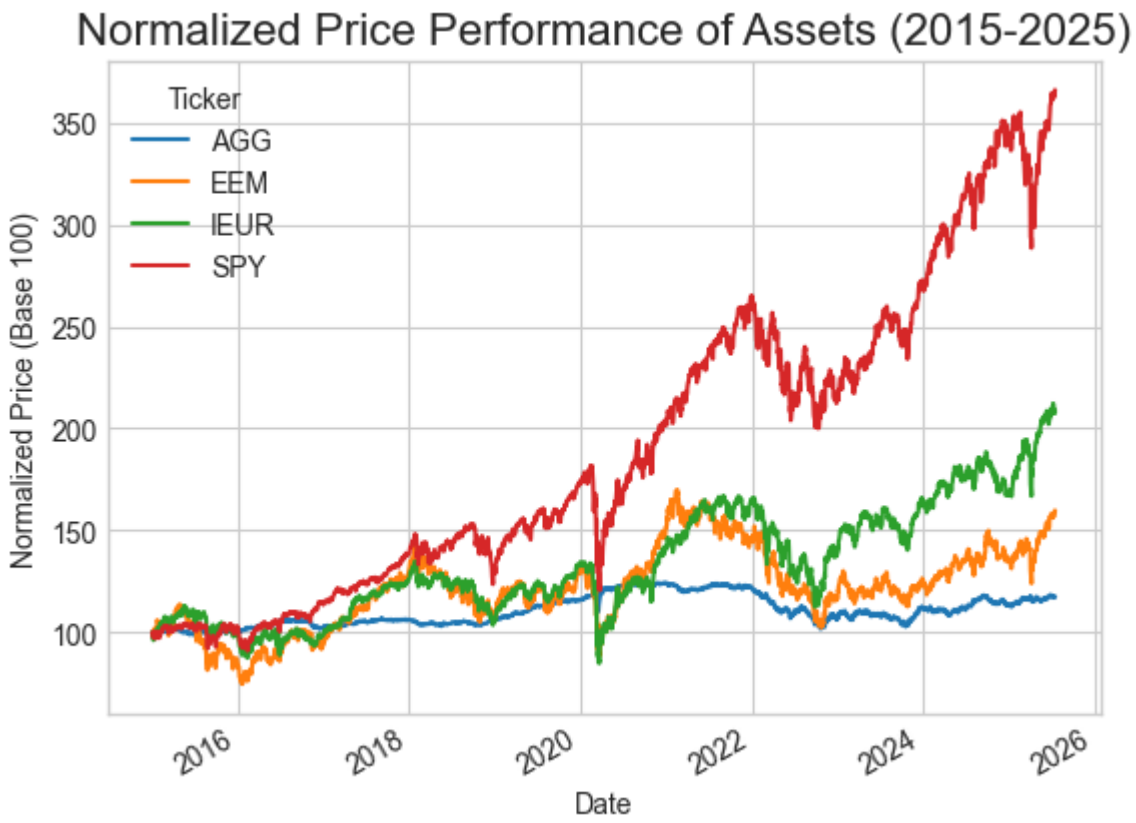

Figure 4.1: Normalized Price Performance of Assets (2015-2025)

Figure 4.1: The Price Performance of Assets After Inflation (2015–2025)

Figure 4.1 shows that the assets perform things in quite different ways. The SPY, which stands for the U.S. market, does the best. It has a steady and powerful upward tendency that ends with it being the most valuable asset at the conclusion of the period. The IEUR (European market) and EEM (Emerging Markets) are going up more slowly, and their values are quite unstable, with long periods of sideways movement. Their performances are very similar, which means that they are both very affected by changes in the world economy. The AGG (U.S. bonds), on the other hand, has a path that is much flatter. This means that the returns are substantially lower, but the stability is much higher. Even when the stock market is having a lot of trouble, such when it fell abruptly in early 2020, its route has a steady rising slope with only little changes. This picture displays the first hints that different types of assets and geographies have varied risk-return profiles.

Price charts are useful, but you can learn more by looking at the statistics of daily returns. The descriptive statistics for each asset's daily returns tell us how central (mean) and how spread out (standard deviation) they are.

Descriptive Statistics of Daily Returns:

Ticker	AGG	EEM	IEUR	SPY
count	2650.000000	2650.000000	2650.000000	2650.000000
mean	0.000066	0.000261	0.000347	0.000554
std	0.003345	0.013020	0.011841	0.011355
min	-0.040010	-0.124793	-0.116541	-0.109424
25%	-0.001482	-0.006638	-0.004996	-0.003711
50%	0.000178	0.000726	0.000714	0.000612
75%	0.001707	0.007602	0.006400	0.005962
max	0.023721	0.080529	0.091052	0.105019

Table 4.1: Descriptive Statistics of Daily Returns

Table 4.1 shows numbers that support what the pricing chart said. SPY has the highest average daily return, which is in accordance with how quickly its price is going up. The standard deviations of the equity-based ETFs (SPY, IEUR, EEM) are substantially more than those of the bond ETF (AGG). This means that they change more from day to day. The standard deviation of AGG is roughly one-third to one-fourth that of the equity assets. This means that it is a low-risk investment. The lowest and maximum daily returns make this even clearer: the bond ETF experienced considerably smaller daily price movements, both up and down, than the equity ETFs.

Histograms of the daily return distributions were generated for each asset to show how different the volatility was.

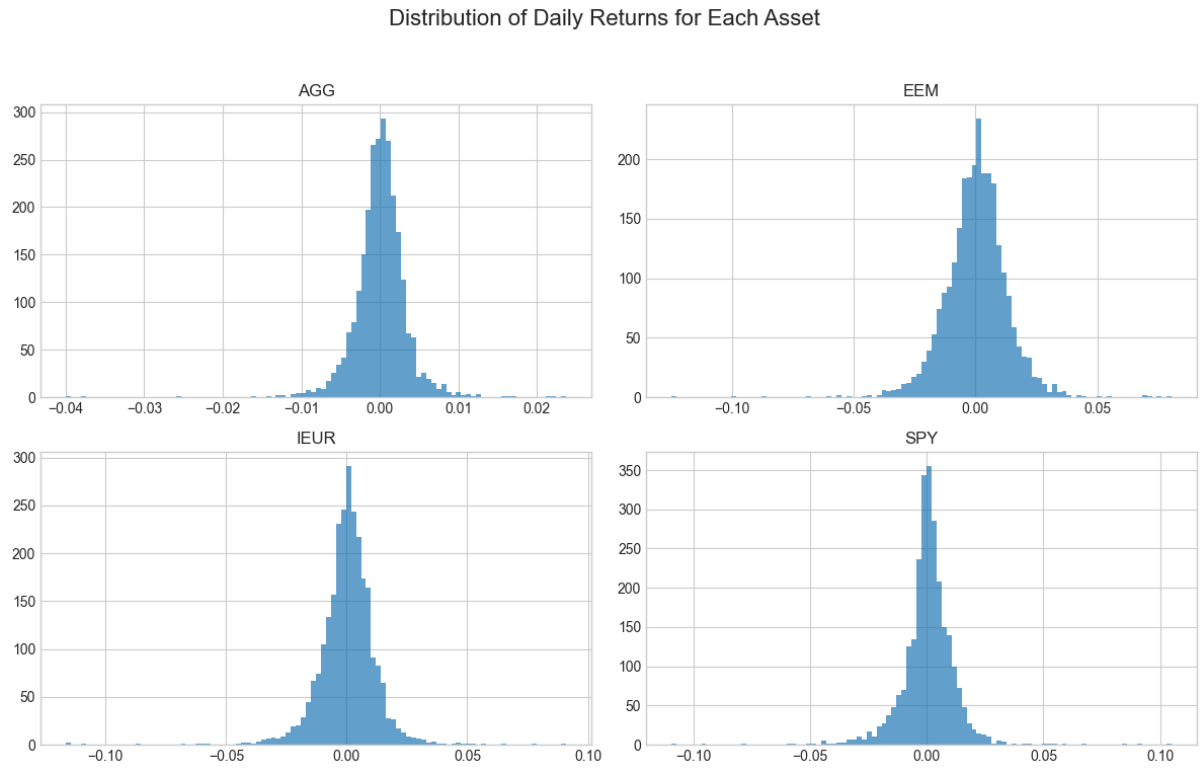

Figure 4.2: Distribution of Daily Returns for Each Asset

Figure 4.2 makes risk extremely evident. The AGG distribution is tall and skinny, and most of the numbers are close to zero. This means that costs don't move much from day to day. On the other hand, the distributions for SPY, IEUR, and EEM are substantially bigger and flatter. Because of this form, there is a larger chance of getting bigger daily returns, both good and bad. This is the statistical proof that things are getting less stable. This exploratory study validates that the chosen assets exhibit unique and varied risk-return profiles, rendering them appropriate for the formation of diversified portfolios.

4.3 Analysis of Asset Correlations

The primary principle underlying Modern Portfolio Theory is that the best method to spread out your risk is to mix assets that don't have high or negative correlations. To quantify these relationships, a correlation matrix was built using the daily returns of the four assets. The matrix depicts how the returns of each combination of assets fluctuate in relation to each other. A value of 1 signifies that two things are perfectly correlated, a value of -1 means that they are perfectly negatively correlated, and a value of 0 suggests that they are not correlated at all.

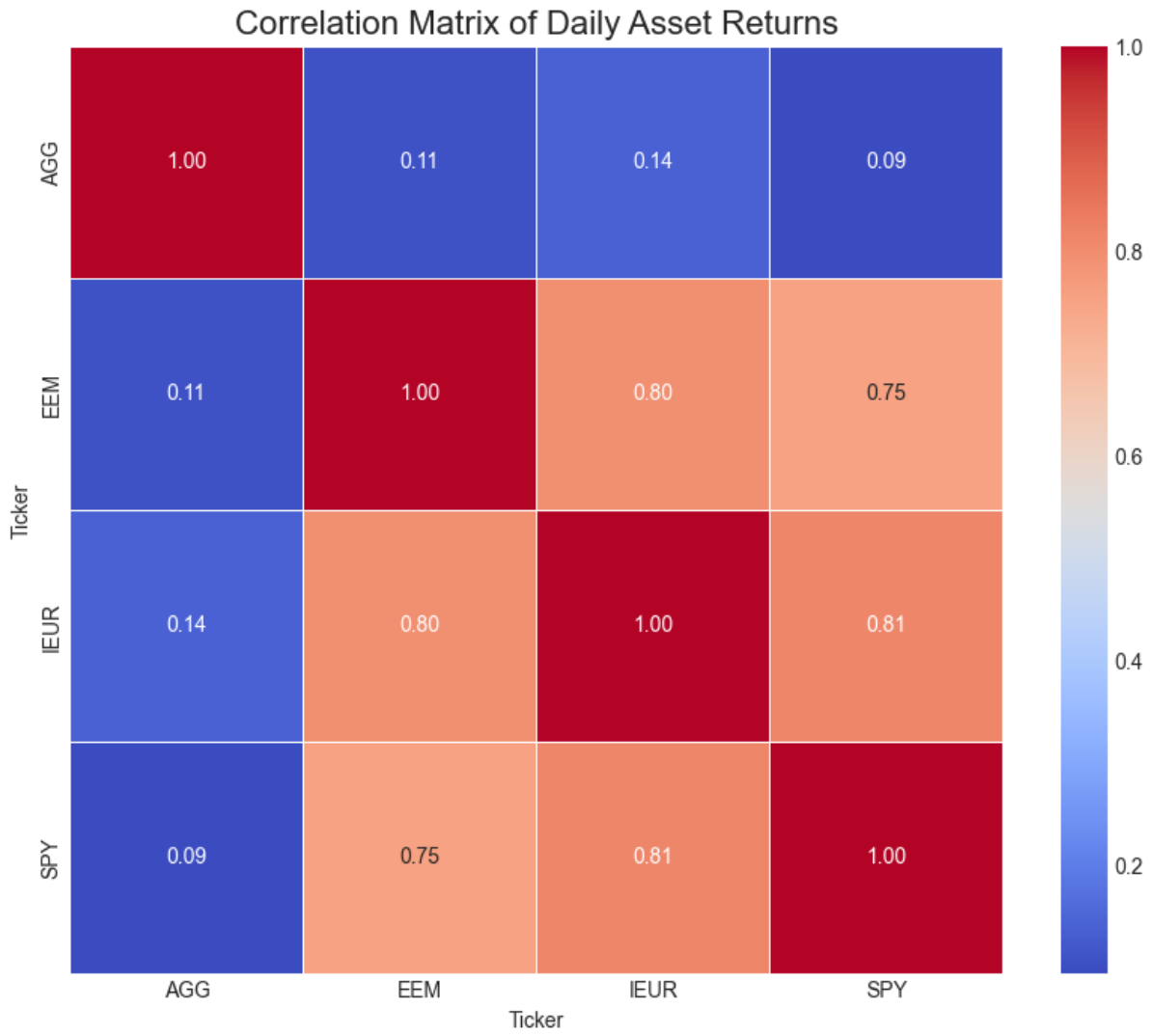

Figure 4.3: Correlation Matrix of Daily Asset Returns

The correlation matrix in Figure 4.3 illustrates two significant facts that will help with the next portfolio analysis. The first thing to notice is how tightly the three equity-based ETFs are linked. The correlation between IEUR and SPY is 0.81, between IEUR and EEM is 0.80, and between SPY and EEM is 0.75. These high numbers, all close to 1.0, illustrate that the stock markets in Europe, the U.S., and developing markets tend to move in the same direction every day, even though they are in different parts of the world. This result is consistent with current research on the increasing interconnectivity of global markets. It suggests that while geographic diversification within equities may provide some benefits, its effectiveness in reducing risk is limited by this significant underlying co-movement.

The second and possibly more crucial thing to observe is that the bond ETF (AGG) and the three stock ETFs are almost completely unrelated. AGG and IEUR are just 0.14 linked, AGG

and SPY are only 0.09 linked, and AGG and EEM are only 0.11 linked. These numbers, which are all near to zero, show that the daily returns of the U.S. bond market and the daily returns of global equities markets are not very closely related. This study empirically validates the prevailing notion that bonds constitute an essential diversification element for equity-focused strategies. The low correlation suggests that adding AGG to a stock portfolio should make the whole portfolio much less volatile. This is because the price of AGG doesn't change in the same way that the price of stocks does, especially when the market goes down. This information strongly suggests that distributing your money across diverse sorts of assets will lower your risk more than just spreading it across different areas

4.4 Portfolio Simulation and the Efficient Frontier

The empirical study primarily used a Monte Carlo simulation of 20,000 portfolios with arbitrary weights. You can see the risk-return trade-off and identify the best asset allocations using the results of this simulation.

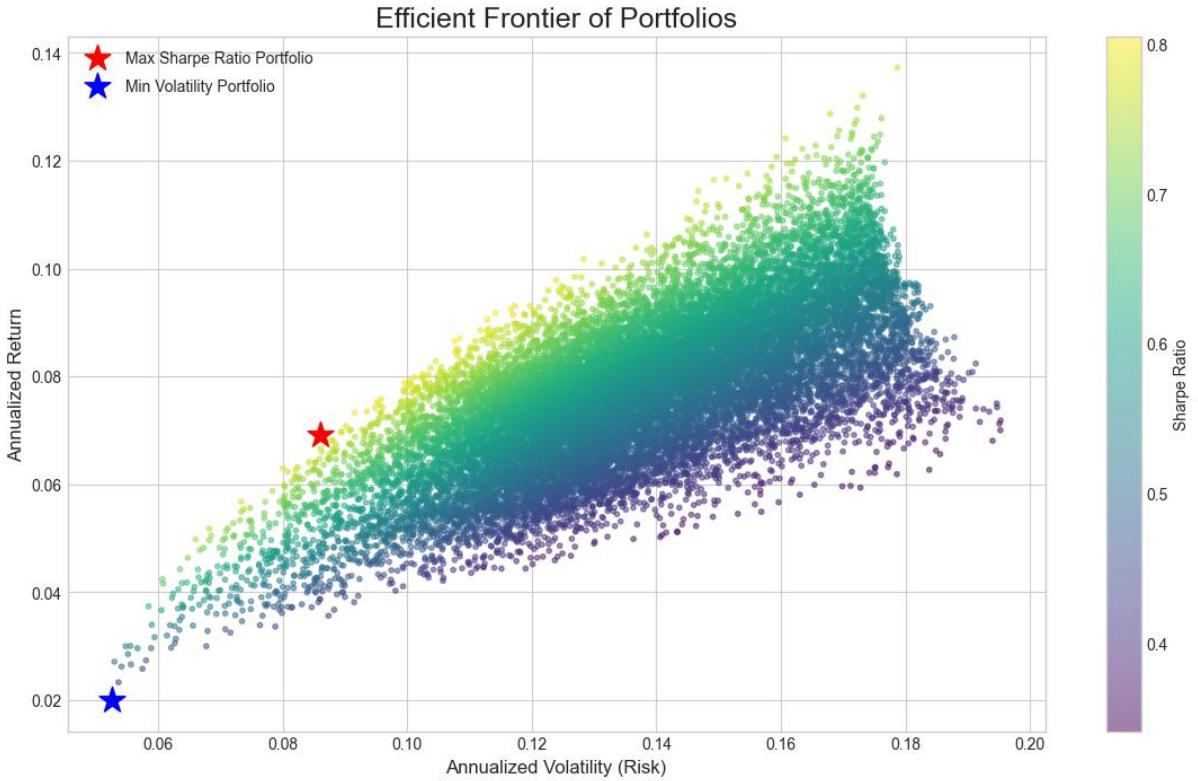

Figure 4.4: Efficient Frontier of Portfolios

The x-axis of Figure 4.4 displays the annualized return, and the y-axis represents the annualized volatility (risk). The graph shows all 20,000 simulated portfolios. The color of each point shows what its Sharpe Ratio is. Colors that are warmer, like yellow, reflect a better risk-adjusted return. The points that come out of this make a cloud that looks like a distinctive shape. The upper-left edge is termed the efficient frontier. This line indicates the portfolios that are mathematically the best.

There are two portfolios on this frontier that are really interesting. The blue star points to the Minimum Volatility Portfolio, which is at the very left end of the frontier. When you combine these assets together, they are the ones that are least likely to lose money. The second one, which has a red star next to it, is the Maximum Sharpe Ratio Portfolio. People sometimes call this portfolio the "optimal" hazardous portfolio since it gives the best return for the amount of risk it entails. The figure indicates that there are many alternative risk-return outcomes. If you carefully choose which assets to combine, you can make portfolios that are better than many other random combinations.

4.5 Composition and Performance of Optimal Portfolios

You can use the results of the simulation to figure out the specific asset allocations and performance indicators for the two best portfolios. These portfolios are actual options for an investor who wants to take on the least amount of risk or get the most done.

	Weight
IEUR	56.768762
SPY	0.054454
EEM	1.009182
AGG	42.167602

Table 4.2: Asset Allocation for Maximum Sharpe Ratio Portfolio

	Weight
IEUR	93.823711
SPY	4.614006
EEM	1.424394
AGG	0.137889

Table 4.3: Asset Allocation for Minimum Volatility Portfolio

The best portfolios are made up of extremely fascinating things. The Maximum Sharpe Ratio Portfolio has roughly 56.8% IEUR, 42.2% AGG, 1.0% EEM, and a tiny 0.05% SPY. There are a lot of European stocks and U.S. bonds in this allocation, which is the most essential feature about it. This is because these two types of assets don't have much in common, which is beneficial for a portfolio.

The Minimum Volatility Portfolio is mostly made up of the least volatile asset. About 93.8% of it is AGG, and the rest is split out over stocks and ETFs (4.6% SPY, 1.4% EEM, and 0.1% IEUR). This allocation illustrates that the safest way for an investor to invest is to put almost all of their money into the low-volatility bond fund.

4.6 Comparative Performance Analysis: The Value of Diversification

The final step of the research is to assess how well the diversified ideal portfolios do compared to a baseline portfolio that only invests in the European home market (IEUR). This will provide a definitive answer to the primary research question. This difference shows how diversification can help you in real life.

	Return (%)	Volatility (%)	Shape Ratio (%)
100 % EUROPE (IEUR)	8.75	18.80	0.47
Min Volatility	2.01	5.26	0.38
Max Shape ratio	6.92	8.60	0.81

Table 4.4: Comparison of Portfolio Performance

The Sharpe Ratio for a portfolio that only invested in IEUR was 0.47, the annualized return was 8.75%, and the volatility was 18.80%.

The Minimum Volatility Portfolio, on the other hand, shows how powerful spreading out your investments can be at minimizing risk. Its annualized volatility is only 5.26%, which is less than a third of the volatility of the Europe-only portfolio. The Sharpe Ratio is 0.38, which suggests that the risk has gone down a lot, but the return has gone down to 2.01%. This shows that an investor whose main goal is to protect their money can make their portfolio far more reliable by investing in a variety of countries and asset types.

The Maximum Sharpe Ratio Portfolio shows how having a lot of various kinds of investments can be advantageous. The annualized return of 6.92% is lower than that of the pure IEUR portfolio, but the annualized volatility is just 8.60%, which is less than half. The Sharpe Ratio is 0.81 since the risk is decreased and the return is still good. The Sharpe Ratio for the 100% IEUR portfolio is almost half of this number. The main quantitative conclusion of the thesis is that an investor may construct a portfolio that is much more efficient by purposefully diversifying. This means that they will get a much higher return for each unit of risk they take on. The study shows that deliberately diversifying a global portfolio offers significant and quantifiable advantages compared to a concentrated local investment approach.

Chapter 5: Discussion

5.1 Introduction

The last chapter talked about the real-world results of the quantitative analysis. This chapter now moves from presentation to interpretation, where it critically looks at the results' significance and effects. The purpose of this section is to bring together the results, connect them to the main research questions that were set out at the start of this thesis, and put them in the context of the larger academic conversation that was covered in the literature review. The talk will begin with the main theme of the study, which is the effect of diversity. It will then give a more detailed look at the quantitative data. Then, it will explain in more depth the precise roles that different asset classes play and how risk might be decreased. It will also connect the outcomes at the portfolio level back to the correlation structure that was discovered. The chapter will next talk about what the results indicate in real life and in theory, especially since home bias is still a problem and modern market dynamics might be hard to deal with. Lastly, it will discuss honestly about the study's limits. This will help set the setting for the last chapter's suggestions for more research.

5.2 The Quantified Effect of International Diversification

The primary research objective of this thesis was to determine the effect of foreign portfolio diversification on the risk and return profile for an investor concentrating on Europe. Chapter 4's results present a clear, persuasive, and multi-faceted answer: the effect is highly positive and enormous, and it doesn't simply mean higher returns; it signifies a huge improvement in the risk-return trade-off.

The comparative performance table is the best proof. The IEUR investment in the European market made a respectable 8.75% return per year, but it also had a lot of ups and downs, with a volatility rate of 18.80%. The Sharpe Ratio of 0.47 that came out of this mix is a common metric that represents the risk-adjusted return of a strategy that isn't particularly diversified and is based in the US. The Monte Carlo simulation found two portfolios that exhibit the two main benefits of variety quite well.

The Minimum Volatility Portfolio shows how effective diversity can be for managing risk. By making a portfolio largely out of U.S. aggregate bonds, it was possible to cut the portfolio's volatility to just 5.26%, which is more than 70% lower than the portfolio that solely had European bonds. This directly answers the second sub-question, which is how much diversification can influence the overall risk. The study shows that it is possible to build a portfolio that is very protected from the high volatility that is common in equity markets. This portfolio had a much lower expected return, but it is particularly significant for investors who don't like taking risks, retirees, or organizations that have strong regulations about keeping their wealth safe. It shows that volatility doesn't have to happen; it can be controlled on purpose and effectively through sensible asset allocation.

Second, and maybe more important for the common investor who wants to increase their money, the Maximum Sharpe Ratio Portfolio shows how diversification can help a portfolio do better. The Sharpe Ratio for this portfolio was 0.81, which is around 72% higher than the 0.47 for the pure IEUR portfolio. This is a significant finding. It indicates that an investor may make a lot more money for every unit of risk they are willing to take on if they mix their assets in a wise way. It's interesting that this superior risk-adjusted performance wasn't achieved by getting the most money possible. Instead, it was achieved by striking the best balance between risk and return. The portfolio's annualized return of 6.92% was lower than that of the pure European portfolio, but its volatility of 8.60% was less than half as high. People often think that diversification is simply about making more money in foreign markets, but this result shows that this isn't true. Instead, as seen below, its key benefit is that it can lower volatility, which makes investment easier and more effective over time. The basic goal of diversification is not to produce more money, but to make money in a safer and more productive way.

5.3 The Primacy of Cross-Asset Class Diversification

The first sub-question asked how different types of assets affect the risk and return of diverse portfolios. The results of this analysis indicate a distinct hierarchy of diversification benefits, wherein the differentiation between asset classes (equities versus bonds) is markedly more significant than the differentiation between geographic regions (Europe versus U.S. versus Emerging Markets).

This conclusion came from the correlation matrix analysis. IEUR, SPY, and EEM were three equity ETFs that had daily returns that were pretty close to each other, with correlations between 0.75 and 0.81. Bekaert et al. (2021) explain on how the world's markets are getting more integrated and what a "global financial cycle" is. This great amount of co-movement is what they say. It reveals that the same global macroeconomic factors and risk perceptions had the biggest effect on these markets, even if they were in different parts of the world at the time of the study. Putting them together didn't make things much safer because if one broke, the others would also.The bond ETF (AGG) and the three equity ETFs, on the other hand, were not very close at all, with coefficients of about 0.1. The most important thing that affected the portfolio simulation's outcomes was that there was no relationship. The quickest way to build up the Maximum Sharpe Ratio Portfolio is to put a lot of money into both IEUR and AGG because they don't have anything in common. The bonds helped keep the portfolio stable because their returns weren't as closely linked to the stocks' more unpredictable fluctuations. This improved the portfolio's total return stream smoother and less erratic.

This finding has big effects on how to invest. It shows that for a European investor, the most important diversification choice is not whether to include U.S. stocks or stocks from emerging markets in their European portfolio, but rather how much high-quality bonds to include. The data demonstrates that in today's financial environment, when stock markets are becoming more and more coordinated, real diversification is primarily about putting your money in different kinds of risk. Knowing where these assets are is still vital, but it's not the most important thing. Recent research, particularly the study by Conlon et al. (2020), has demonstrated that bonds and other traditional safe-haven investments maintained their diversification characteristics regardless of simultaneous declines in many equity markets.This is in keeping with what we know from the COVID-19 crisis.

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5.4 Implications for Theory and Practice: A Rebuke to Home Bias

The findings of this thesis provide a robust, modern, and quantitative refutation of the enduring phenomenon of home bias. The academic literature has examined the informational and behavioral factors that contribute to this prejudice (e.g., Pöyry & Rintamäki, 2020; Bouteska, 2023); however, this study offers a definitive evaluation of its opportunity cost. If an investor only looked at the European market, they would have had to deal with a lot more ups and downs and a smaller return than they would have gotten with a simple, diversified strategy. When you can develop a portfolio with a Sharpe Ratio that is almost twice as high as the local market with just a few low-cost, liquid ETFs, it's clear to understand how helpful these benefits are.

The results show European investors and financial advisors how to act in real life. The most important thing is to make sure that diversification across asset classes is at the top of your list. The Maximum Sharpe Ratio portfolio shows that a good mix of US stocks and high-quality international bonds can be a good place to start when building an investment portfolio. This contradicts the oversimplified notion of "flight to familiarity" and advocates for a systematic, evidence-driven approach to portfolio development.

The results essentially confirm the enduring principles of Modern Portfolio Theory within a current context. Quantitative easing, geopolitical shocks, and higher correlations are just a few examples of how the markets are difficult to understand these days. The main idea behind MPT is still true: combining assets that don't have anything to do with each other makes a portfolio's risk-return profile better. The analysis demonstrates that the idea of low correlation is still strong, even if it has changed from being utilized between countries to being used between asset classes. The findings demonstrate that the efficient frontier is not merely a theoretical construct; it is a tangible entity that can be identified and utilized through effective portfolio management. This is true, even if the stock markets are fairly similar.

5.5 Acknowledging the Limitations of the Study

Even though the methodologies in this thesis strongly support its conclusions, it's still vital to know its limits so that the results are comprehended in the appropriate way and academic integrity is upheld.These constraints underscore prospective pathways for subsequent inquiry.

The analysis is based only on data from the past. The most important rule for investing is that something that worked in the past doesn't indicate it will work again. The connections, returns, and volatilities seen from 2015 to 2025 may not endure. A major change in the structure of the

global economy, such as a long period of high inflation that hurts both stock and bond prices at the same time, might change these links and lessen the benefits of diversification seen in our study.

Second, the model is built on a few assumptions that make things simpler. The MPT paradigm assumes that returns follow a normal distribution. However, this is not always the case in real life. In a normal distribution, extreme events happen less frequently than they do in a "fat tail" distribution. The model also doesn't take into account real-world events like taxes, fees for transactions, and the difference between the bid and ask prices. These things can lower the total return on portfolios. It is too simple to say that the risk-free rate is zero, but it helps us figure out how well a portfolio is doing.

Third, even though it's an excellent example, the choice of assets isn't complete. You can invest your money in a variety of assets, including bonds from other countries, commodities, real estate, and more. Adding these additional asset classes could change the efficient frontier and the best portfolios.

Lastly, and this may be the most important element for a European investor, the risk of currency was not modeled directly. The investigation used ETFs that were priced in US dollars, and the returns were not adjusted back to Euros. The findings show how well the US currency did. The real return for a European investor would be the return on an asset in USD plus the difference between the EUR and USD exchange rates. The earnings on U.S. assets would have gone down if the Euro had gone up higher. If the Euro had lost value, the returns would have gone up. This currency effect is a unique and important part of risk and return that the current study did not look at. This suggests a unique and important direction for future research.

Chapter 6: Future Recommendations

6.1 Introduction

This thesis provides a comprehensive and current quantitative evaluation of the advantages of international and cross-asset class diversification for an investor focused on Europe. This study establishes a robust basis by illustrating substantial enhancements in risk-adjusted returns attainable through a straightforward, ETF-centric methodology. But like any concentrated study, it has inherent limits and assumptions. The limits mentioned in the preceding chapter

function as both warnings and signals of areas requiring further examination. This chapter offers a set of study proposals designed to enhance the framework delineated below, rectify its deficiencies, and tackle the unresolved intricate research questions. These suggested modifications will help us understand how to make our portfolios more diverse in today's difficult financial world by making them more complete, adaptable, and real. The suggestions are grouped by theme and cover topics like how to add new assets to the universe, how to deal with currency risk, how to improve the present optimization model, and how to combine macro variables.

6.2 Incorporating Macroeconomic Regimes and Dynamic Analysis

This study conducted a static analysis, pinpointing a unique efficient frontier derived from a comprehensive historical dataset spanning 2015 to 2025. This approach offers a significant long-term outlook; however, it presupposes that the statistical properties of asset returns, including their means, volatilities, and correlations, remain stable over time. However, academic research indicates that these traits are ephemeral and may undergo substantial changes in response to existing socioeconomic conditions. A significant direction for future study is to employ a dynamic, regime-based methodology to investigate the third sub-question: "What impacts have macroeconomic variables, such as inflation and GDP growth, exerted on the outcomes of foreign portfolio diversification?"

One technique to do this is to use a rolling-window analysis. The analysis might not look at the whole ten-year dataset at once, but instead break it up into three- or five-year pieces that overlap. You can make a time series of the best weights to find the best portfolio allocations for each time period. You might then use this time series to see how the best mix of stocks, bonds, and geographies changes over time. For example, did the best amount of bonds to possess go up while inflation was low in the late 2010s and down when it was high following the pandemic?

Moreover, this dynamic study may have a direct relationship with macroeconomic data. You can separate the historical data into multiple regimes, such as "high inflation vs. low inflation," "rising interest rates vs. falling interest rates," or "positive GDP growth vs. recession." Then, you can find a different efficient frontier for each regime. This would provide us a lot of information on how the benefits and nature of diversification shift when the economy is doing well or poorly. For instance, it would explicitly test if the low correlation between stocks and bonds, which is one of the main points of this thesis, is still valid during "stagflation," when

both types of assets would not do well. This kind of study would alter the analysis from a fixed strategy to one that changes with the economy.

6.3 Event-Study Analysis of Geopolitical Shocks

The present work indirectly demonstrates the influence of significant events, like as the COVID-19 pandemic, on the general volatility of the dataset. A more targeted future study might utilize an event-study methodology to perform an exhaustive analysis of diversification's performance during times of considerable market stress, directly tackling the fourth sub-question: "How do geopolitical developments affect the dynamics of risk and return?"

This would mean taking short breaks during important business or political events. The Brexit referendum in 2016, the deepening of the U.S.-China trade war in 2018-2019, the market crisis in March 2020, and the commencement of the conflict in Ukraine in 2022 are all events that happened during the research period. The research may analyze the daily performance of diversified optimal portfolios in comparison to the baseline Europe-only portfolio for each instance. It would also be very important to find the correlation matrices for the moments right before, during, and right after the event.

This plan would help you learn more about how different something is. Did the connection between equities and bonds stay low throughout the first shock of the epidemic? If this is the case, it would mean that bonds are a "safe-haven" investment. What happened to the links between the European and U.S. markets during the trade war, which was mostly about the U.S. and China? To find out if diversity really does help protect against disasters in real time, an event-study method would look at more than simply long-term averages.Investing in the real world is very important since investors are normally most concerned about their portfolios when things are very tumultuous.

6.4 Explicit Modeling of Currency Risk for the European Investor

As part of this effort, it may be necessary to develop a model of currency risk, which would address the fifth sub-question regarding the effects of changes in exchange rates. A European investor with an operational currency of the euro did not experience the same results as an investor analyzing data from a USD perspective. The EUR/USD exchange rate would have an effect on the returns for U.S. and Emerging Market assets (SPY, EEM, AGG).

There are two main strategies to deal with this. The easiest and fastest way to do this would be to do the full study again, but this time using currency-hedged ETFs. Many ETF providers now offer versions of their most popular products that employ currency futures to guard against changes in exchange rates. For instance, the research could analyze the distinctions between a standard U.S. stock ETF and a U.S. equities ETF that is safeguarded against the euro. This would let you compare a strategy that just spreads risk with one that protects against changes in the value of currencies. This would assist you separate the return on your money from the return on your assets.

A second, more complicated way is to get the historical daily EUR/USD exchange rate and the underlying index data for each ETF. You may then calculate out the returns in euros on your own. For a European investor, the return on a U.S. asset would depend on how much the asset makes in USD and how the exchange rate between the euro and the dollar varies. The efficient frontier and best portfolios you receive from the entire Monte Carlo simulation with these returns in euros will show you the real risk-return options that an investor in euros has. This would make it clear whether changes in the value of a currency make it easier or harder to hold assets in another country. It would also be a pretty big difference to what this study found.

6.5 Expanding the Asset Universe and Refining the Model

Finally, future research should focus on improving the model's applicability and realism. The four assets employed in this thesis, however instructive, represent but a limited segment of the global investing landscape. A more in-depth analysis can include various kinds of assets to find new strategies to spread your risk. This might mean introducing ETFs that track global real estate (REITs), goods (like gold or a wide product index), and new parts of the fixed-income market, including bonds from other nations or bonds that are related to inflation. Adding these assets could change the efficient frontier a lot and maybe even help you identify better portfolios.

The optimization model that is used should also be better. MPT is the basic standard, however it is known that it makes things easier by assuming that returns are spread out equally. More complicated risk models that can better deal with the "fat tails" and skewness that are typical in financial data should be used in future research. For example, instead of trying to find the mean difference, the purpose of the optimization could be to lower the Conditional Value-at-

Risk (CVaR). CVaR, or Expected Shortfall, tells you how much you could lose in the worst-case scenarios. This might be a better way for investors who are worried about big losses to figure out how risky something is. Adding real-world problems like estimated transaction costs and tax effects could help improve the model. This would help you understand the net benefits of a certain diversification strategy after costs. These adjustments would make the gap between a theoretical academic model and a complete, functional investing framework less.

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