Analyzing the impact of geographical diversification on portfolio performance

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Keywords:
portfolio diversification, geographical diversification, exchange-traded funds, Monte Carlo simulation, Sharpe ratio

The portfolio theory, which originated in the 1950s, pointed out that portfolio diversification allows investors to reduce risk. However, in addition to sector diversification, geographical diversification has been considerably less emphasized in equity investment evaluation. Our study contributes to this area. The calculations were conducted over two periods: 2008–2013 and 2014–2019. We constructed our portfolio using only exchange-traded funds (ETFs). We created two portfolios: one geographically diversified and the other focused exclusively on European markets. The geographically diversified portfolio comprised the IEV (iShares Europe ETF), EWH (iShares MSCI Hong Kong ETF), and EWZ (iShares MSCI Brazil ETF) portfolios. For our analysis, we used an approach based on the Monte Carlo simulation. The simulation calculated the Sharpe ratio of the portfolios, annualizing the metrics using the 252 trading day approach. We performed 10,000 iterations to ensure the robustness and reliability of our model.
In the first period (2008–2013), we found that the geographically diversified portfolio showed higher volatility and generally lower risk-adjusted returns than the non-geographically diversified portfolio focused on Europe. Conversely, in the second period (2014–2019), the geographically diversified portfolio outperformed the non-geographically diversified portfolio in terms of risk-adjusted returns, suggesting that geographic diversification is preferable in certain market environments, particularly during periods of economic growth. In conclusion, investors should explore the potential of geographic diversification.

Regional Statistics, Vol. 15. No. 2. 2025: 321–340; DOI: 10.15196/RS150206

Introduction

The modern portfolio theory, created by Markowitz (1952, 1959), laid the groundwork for risk measurement. This theory pioneered the combination of return and risk in equity investing. Lintner (1965), Mossin (1966), Sharpe (1964), and Treynor (1999) attempted to extend the model to other instruments. The theory highlights the potential for risk reduction through diversification. Investing in a large number of stocks can reduce an investor's risk relative to investing in individual stocks while increasing or maintaining returns. The variance, proposed by Markowitz to measure risk, is still used by many investors in practice. However, the theory has received considerable criticism. The primary challenge of using variance as a risk measure lies in its identification of positive deviations from expected returns as risk. For most investors, only negative deviations can be interpreted as risk (Bányai et al. 2024).

Studies that underpinned risk management provided a conceptual guide regarding the ways in which risk can be measured and optimized. Risk management is based on diversifying the portfolio to mitigate individual risks associated with each company (Csesznik et al. 2021). The practical application of the theory has revealed that investing in shares of companies within the same economy does not fully eliminate certain risks. The characteristics of a country's economy result in a common, systematic risk factor. However, this risk factor can be managed through international diversification of investments (Bacsosz 2019), as pointed out by Odier–Solnik (1993). In their view, historical evidence suggests that international investment reduces an investor's risk, regardless of their nationality. However, previous authors reported that correlations between countries may vary. On the negative side, the authors noted that correlations become tighter precisely when market volatility in the global economy increases. This, in turn, exerts a negative impact on the effect of diversification.

Although few studies have focused on emerging markets, the number of stocks required to achieve optimal diversification benefits is considerably lower in emerging markets than in developed financial markets. Emerging markets are an effective hedge precisely owing to their low correlation with developed markets. However, the integration of global markets has increased owing to a greater propensity for liberalization, which may increase the potential for higher correlations and consequently reduce the benefits of international diversification. Thus, more and more stocks may be required to build a well-diversified portfolio (Zaimovic et al. 2021). However, Sztavrosz (2019) found that investors do not consider territorial diversification as a sufficiently relevant factor among risk mitigation techniques. The reason given was that the importance of geographical diversification is not easily recognized in the context of increasingly unrestricted and rapid capital flows, the existence of continuous trading systems, and the rise of electronic money.

The aim of our study was to test the spatial potential of risk management and risk-return optimization in a changing market environment. We performed a numerical evaluation using data on portfolio investments in equities from three geographically distinct regions. The analysis was conducted separately over two periods to investigate whether changing market situations reveal differences in risk management opportunities.

The regions selected for our study were the European Union, China, and Brazil. As the focus was to explore the potential of territorial diversification, we worked with portfolios that were already diversified by sector in the selected areas. Portfolios diversified in terms of stocks within a given area were represented by exchange-traded funds (ETFs).

In addition to the Markowitz risk analysis, we used the Sharpe ratio for our analysis. We examined two distinct periods: 2008–2013, which coincided with the global financial crisis, and 2014–2019, characterized by the consolidation of the world economy.

Economic trends in the regions over the periods studied

The turmoil in the US housing markets from 2008 onward escalated into a deep crisis. The massive collapse of the crisis followed the failure of the investment bank Lehman Brothers on September 15, 2008. The disappearance of market liquidity led to panic, characterized by the sale of toxic assets, withdrawals of deposits from banks and money market funds, and the freezing of credit. All this triggered a collapse in cross-border trade and led to the worst global recession in the seven decades preceding 2008. In the last quarter of 2008 and the first quarter of 2009, the downturn rapidly spread to countries not initially affected by the banking crisis (Laeven et al. 2010).

To cushion the impact of the financial meltdown, governments in many countries intervened with economic rescue packages in the following years. In many places, central banks attempted to address liquidity and then the credit crunch using unconventional instruments. In the following years, the banking crisis led to a downturn in the world's real economy (Quinn−Turner 2020).

The regions selected for our study to assess the territorial diversification of investments had been impacted by the global crisis. The main economic trends in these regions, which were considered in the assessment of territorial diversification opportunities, are reviewed below.

Macroeconomic characteristics of the countries and regions covered in 2008–2013

European Union

The euro area economies went through a severe crisis between 2008 and 2013. Owing to differences between economies, the depth and course of the crisis varied. Concurrently, the overall region was characterized by financial instability and a downturn in the real economy. From 2008 onward, the crisis rapidly spread from the US financial markets to the euro area financial systems through the banking system. The turmoil in financial markets led to a downturn in the real economy. As a result of the economic downturn, unemployment in the euro area reached 10% in 2009 (Molnár et al. 2024, Eurostat 2024). In 2009 and 2010, the public finances of several countries came close to bankruptcy owing to rising financing costs. The sovereign debt crisis affected Greece, Spain, and Portugal the most. In 2011, the Greek debt crisis deepened, and it could only be addressed through specific measures implemented by EU institutions. Recovery from the recession could only slowly start after 2012, and the exit from the crisis was sluggish and difficult. The European Union and the European Central Bank took a number of measures to stabilize the economy and promote growth. These measures included rescue packages for crisis-hit countries, strengthening bank capital, and implementing structural reforms (Novák−Tatay 2021, Braun 2015).

China

Hong Kong is one of the largest stock markets in the East Asian region. The Hong Kong stock market is predominantly composed of Chinese equities, representing approximately three-quarters of its capitalization. In addition, the stock market has significant exposure to shares of large US companies, with smaller weightings for companies from other regions. Price trends on the Hong Kong Stock Exchange (HKEX) (2024) are determined by developments in the Chinese economy.

The Chinese economy grew rapidly between 2008 and 2013, with an annual growth rate of 9.8%. The increase in exports was a significant driver of growth during this period. Chinese companies became integrated into international value chains, while many Western companies initiated production within the country. The Chinese state invested heavily in infrastructure and innovation. In addition, rising household incomes underpinned rapid economic growth as consumption rose (Eichengreen et al. 2013, OECD 2024). China's real economic growth remained unaffected by the 2008 global financial crisis. The absence of toxic US assets in the Chinese financial sector meant that Chinese banks were not directly exposed to the crisis through their assets (Prasad−Ye 2012).

Brazil

The economies of Latin American countries differ significantly in structure, endowments, and performance. The most relevant economy in South America is Brazil. Prior to the 2008 crisis, the Brazilian economy was experiencing high growth. This trend prevailed in 2007 and 2008. Growth was driven by increasing household incomes and rising business investment. Low-interest loans were a growth driver. As a result of the 2008 crisis, Brazil's economic growth slowed in 2013. Furthermore, declines in consumption, investment, and exports slowed the economy (Arestis et al. 2016).

Macroeconomic characteristics of the countries and regions covered in 2014–2019

European Union

The global financial and economic crisis that started in 2008, followed by the eurozone crisis in 2010, posed significant challenges for some EU member states. However, since 2014, the economies of EU countries have stabilized, with the European Central Bank playing a crucial role (Angelidis−Koulakiotis 2022).

The EU economy grew at a moderate pace, averaging 2% per year between 2014 and 2019. However, growth across member states was not uniform. Germany, France, and Spain recorded the highest rates of economic growth over this period. Growth was primarily driven by increases in investment, consumption, and exports (Kuruczleki et al. 2022). During this period, Europe did not exhibit convergence in terms of technological capabilities, despite their paramount importance for future economic development (Tatay−Kazinczy 2023). In response to increasing polarization, it became necessary to enhance the economic capabilities of the European periphery and improve non-price competitiveness in these countries (Gräbner et al. 2020, Dosi et al. 2015).

Exports of goods and services in the EU grew by approximately 14%, driven by the expansion in global trade volumes and the growth of the EU's internal market. The unemployment rate fell from 10.2% in 2014 to 7.5% in 2019, the lowest in EU history. The highest rate was recorded in Greece (16.2%), while the lowest rate was observed in the Czech Republic (2.8%). Low energy prices and low wages kept inflation low, averaging 1.7% per year. The EU average government debt-to-gross domestic product (GDP) ratio fell to 83.9% in 2019 from 86.1% in 2014, while the average budget deficit-to-GDP ratio narrowed to 0.7% from 3.1% in 2014. However, public debt ratios were still high in some member states, exceeding 100% in Greece and Italy.

According to Naisbitt et al. (2018), equity markets worldwide continued to rise post-2014, after the financial crisis subsided, and some market analysts believe that

this may have led to an overvaluation of equities. Su et al. (2022) argued that improving stock market performance was observed not only in advanced European economies but also in Eastern European countries. Among the developed European economies, stock market efficiency notably increased in Germany and the Nordic countries, while other developed European countries experienced a decline in stock market efficiency (Bock−Geissel 2024). Overall, the EU economy grew at a moderate pace between 2014 and 2019, with low unemployment, low inflation, falling debt, and declining public deficits.

China

According to Andersson et al. (2024), the economies of Asian countries are clearly distinguishable from those of other countries and exhibit characteristics that have long been neglected. In Asia, regions and countries that have managed to catch up economically are those that have had a high resilience to economic downturns, not only a high growth intensity.

Despite the Asian "economic miracle", no major Asian economy has caught up with global leaders, such as the United States and Germany, in terms of GDP per capita and living standards. However, China, India, and Indonesia, with their huge populations, have the world's largest economies and have emerged as leading economic and political powers (West 2018). Bekkers et al. (2021) showed that the Chinese economy has undergone tremendous changes over the past 30 years, displaying spectacular GDP growth, achieving upper middle-income status, and shifting many resources from agriculture to manufacturing and services. Thus, China is the world's largest exporter, with a large share of its exports coming from commodities (manufacturing and agriculture). Inflation ranged between 2.1% and 2.9% in 2014–2019.

Despite impressive macroeconomic data, the Chinese economy has faced serious challenges, such as slowing economic growth, rising debt and deficits, an aging labor market, and environmental pollution. Jian–Yu (2019) found that excess capacity is a major challenge for the Chinese economy. We need to assess whether aggregate demand can be efficiently expanded. Only by expanding aggregate demand can aggregate supply expand without oversupply. It is a longer process to shift production from sectors with excess capacity to sectors with capacity shortages.

As China's capital markets have developed and internationalized at an unprecedented rate, it has become a major player in the global financial world, but it plays by its own rules. Active state control of capital markets through Chinese stock exchanges affects different parts of China's socio-economic system and aims to prevent the accumulation of excessive financial risks. State control over capital markets has thus been maintained, despite its increased openness to international investors (Petry 2020).

Brazil

There is a broad consensus to characterize Latin America as a Global South region specializing in supplying energy and materials to global metropolises. Among the peripheral regions of the world, Latin America is characterized by a high diversification of exported materials (Infante-Amate et al. 2022). Since the mid-2010s, the economic performance of the region has become more heterogeneous. The decline in GDP growth rates in Chile, Peru, and Colombia followed, to some extent, the slowdown observed in the emerging world. However, another group of countries, Argentina, Brazil, and Venezuela, experienced a sharp economic slowdown and recession (Manzi 2022). Brazil's economy grew by an average of 0.7% per year between 2014 and 2019, while it experienced recessions in 2015 and 2016. Between 2015 and 2016, Brazil's real GDP shrank by 7.5%, which represented a dramatic cumulative decline in per capita income of 9.2% over those 2 years (Nassif 2017). The 2-year GDP contraction in 2015 and 2016, resulting in the depression of the Brazilian economy without any major events, was mainly due to a combination of domestic factors. Distortions in the accumulation of factors of production and efficiency wedges were the drivers of output dynamics in 2014–2016 (Brinca–Costa-Filho 2021). According to Manzi (2022), Brazil is a country with lower external vulnerabilities, than most Latin American economies. Thus, the Brazilian economic recession can be mainly attributed to endogenous factors.

During the review period, Brazil experienced relatively low economic growth, which coincided with a significant increase in the unemployment rate (from 6.8% in 2014 to 12.3% in 2019) and rising inflation (from 6.7% in 2014 to 10.3% in 2019). Weak currency and rising fuel prices played the main role in the increase in inflation (Marquetti et al. 2020). Regarding public finances, there were worrisome signs. Brazil's debt-to-GDP ratio rose from 52.6% in 2014 to 86.4% in 2019, while the fiscal deficit-to-GDP ratio increased from 3.2% to 7.4% over the same period.

The Brazilian government decided on a long-term fiscal adjustment, freezing all primary public spending for 20 years. Nassif (2017) argued that in addition to being socially and politically unsustainable, this prevented subsequent governments from using fiscal policy as a relevant instrument of financial policy.

Quantification of risks

Since the middle of the last century, when quantitative risk analysis was established on a scientific foundation, several methods for measuring and optimizing risk have been developed. In our study, we use the variance of returns and the Sharpe ratio to assess the effects of geographical diversification.

Key elements of portfolio theory

In 1952, Harry Markowitz (1952) steered finance toward mathematics. He pioneered the quantification of risk. For example, looking at past data series, returns are not constant but fluctuate, and two values for a single stock can be calculated as constrained. One is the expected value of the return, and the other is the variance of the fluctuation of returns. The variance of the return is a well-established measure of risk. In addition to quantifying risk, Markowitz examined how an investor's risk would evolve if they invested in several different types of shares. Empirical evidence indicates that stock returns do not always move in perfect synchronization; in fact, they may even move in opposite directions. Investors can, of course, build portfolios of many stocks. The divergence in the returns of stocks may offset each other; thus, the return divergence of the overall portfolio may be smaller than that of any single stock in it. Concurrently, the return may exceed the return on the lowest-risk stock.

The expected portfolio return and its standard deviation can be calculated as follows:

$$E(r_P) = \sum_{i=1}^{n} a_i E(r_i)$$

where $E(r_P)$ is the expected return on the portfolio; n is the number of shares; a_i is the proportion of share i in the portfolio; and $E(r_i)$ is the expected value of the return on share i.

$$\sigma(r_P) = \sqrt{\sum_{i=1}^{n}\sum_{j=1}^{n} a_i a_j \rho_{ij} \sigma(r_i)\sigma(r_j)}$$

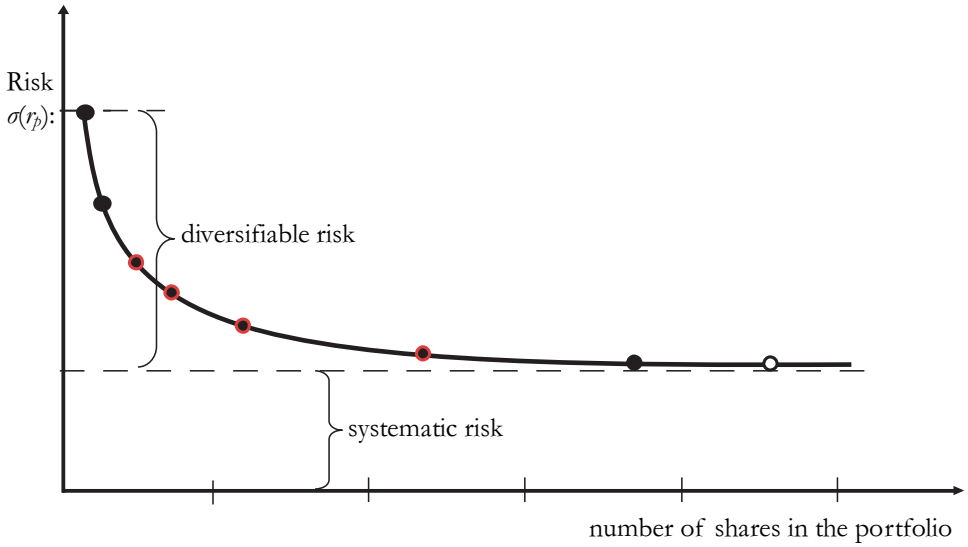
where $\sigma(r_P)$ is the portfolio return standard deviation; n is the number of shares in the portfolio; a_i is the proportion of share i in the portfolio; ρ_{ij} is the correlation coefficient between the returns on stocks i and j; and $\sigma(r_i)$ is the standard deviation of the return on equity i.

The return on a portfolio depends on the return and the proportion of the shares in it. The standard deviation of the portfolio varies depending on the weight of the stocks, their individual standard deviation, and the correlation between returns.

By broadening the portfolio, diversification can eliminate some of the risk. This fraction is called diversifiable risk. The other part of risk is non-diversifiable or systematic risk. Diversification does not eliminate it because stock returns are affected by certain factors in the same way, moving returns in the same direction.

Figure 1

Relationship between diversification and risk



Source: own editing based on Markowitz (1952).

Sharpe ratio

More than 50 years ago, Roy (1952) introduced the risk-return ratio for ranking risky investments, originally called profit volatility. Subsequently, Sharpe (1966) first applied this ratio to the valuation of portfolios (investment funds), and it became one of the most popular ratios in the world of academics and practitioners alike and is now known as the Sharpe ratio.

The Sharpe ratio is based on Markowitz's mean-variance paradigm, which assumes that the mean and standard deviation of the distribution of one-period returns are sufficient statistics to evaluate the prospects of an investment portfolio (Anelli 2023). Traditionally, the Sharpe, Sortino, Treynor, and Jensen ratios have been most commonly used to measure the performance of different financial portfolios (Mistry–Shah 2013).

The Sharpe ratio expresses the excess return per unit of risk (Mistry–Shah 2013). A higher value yields a more favorable investment or portfolio.

The formula for the Sharpe ratio is calculated as follows:

Sharpe ratio$= \frac{r_i - r_f}{\sigma(r_i)}$,

where r_i is the return of the security fund, r_f is the risk-free rate of return, and $\sigma(r_i)$ is the standard deviation of the return of the security fund *i*.

As the standard deviation of a portfolio's return is a measure of the portfolio's risk, the Sharpe ratio looks at the risk-adjusted return. If the Sharpe ratio is positive, then the portfolio has been able to generate excess returns relative to the risk assumed (Farinelli−Tibiletti 2008). Therefore, the Sharpe ratio can indicate whether the higher return achieved by a portfolio was because of good investment decisions or simply the result of a riskier investment strategy. Mistry–Khatwani (2023) successfully applied the indicator to measure performance on portfolios of stocks of mid-capitalization (i.e., riskier) Indian companies. Gardenier et al. (2021) compared the risk-adjusted returns of European sustainable and conventional portfolios using the Sharpe ratio. The previous authors concluded that sustainable investment portfolios generate higher risk-adjusted returns. Kuhle–Lin (2018) used the indicator to measure the performance of real estate investment funds over a 10-year period between 2008 and 2016. The previous authors found that the reliability of Sharpe's index outperforms the previously mentioned Treynor index, which can be used to measure risk-adjusted returns, and the Sortino index in determining the performance of real estate investment funds. Nuzula–Darmawan (2019) investigated which of the aforementioned indicators is the most tangible to measure portfolio performance in the Indonesian stock market. Their regression analysis revealed that Sharpe's method is the most suitable to measure portfolio performance.

The abovementioned examples illustrate why we considered it tangible to use the Sharpe ratio in our study to compare the risk-adjusted returns of geographically diversified and non-diversified portfolios. The Sharpe ratio solves most of the technical difficulties of previous portfolio models and is extremely useful for individual investors and portfolio managers worldwide to build optimal portfolios and compare and benchmark portfolio performance.

Methodology

We built our portfolio for this study using only ETFs, taking advantage of their many benefits. In comparison with alternative investment options, such as individual stocks or traditional funds, ETFs are more affordable owing to their lower cost and vast diversification across regions or sectors. ETFs provide for easy comparison between various investment products and reliable risk-return assessments because they are transparent, highly liquid, and offer a representative sample of market performance.

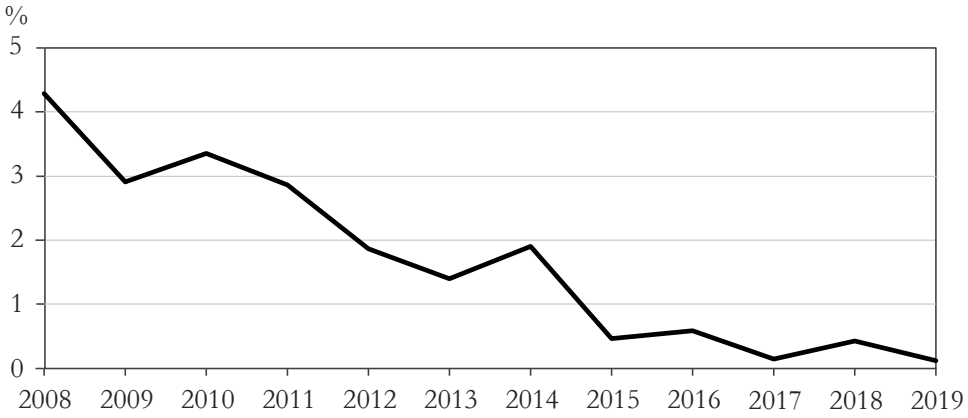
We constructed two distinct portfolios for our study: one geographically diversified and another focused exclusively on European markets. The geographically diversified portfolio includes IEV (iShares Europe ETF), EWH (iShares MSCI Hong Kong ETF), and EWZ (iShares MSCI Brazil ETF), which offers exposure across multiple continents and diverse market conditions. By contrast, the European-focused portfolio comprises IEV, along with EWG (iShares MSCI Germany ETF) and EWU (iShares MSCI United Kingdom ETF). Our analysis spans two distinct

time periods, 2008–2013 and 2014–2019, to examine how different market environments influence risk-adjusted returns.

For our analysis, we adopted a Monte Carlo simulation-based approach. To avoid extreme asset weights, as evident in traditional Markowitz models, random weights were generated for each asset ranging from 0 to 1, which were then normalized. These random weights followed a uniform distribution, ensuring each asset had an equal probability of being included in the portfolio. Daily returns were calculated using simple returns for each asset, and the daily portfolio returns were determined by summing the products of the normalized random asset weights and their respective daily returns. This approach effectively captured the performance of the constructed portfolios based on the randomly generated weightings.

Figure 2

Long-term German bond yield (10-year maturity)



Source: authors' construction based on Bundesbank.de (2024).

Subsequently, we calculated the annualized mean and standard deviation of the daily portfolio returns. The risk-free rate was determined by averaging the yields of German 10-year government bonds at the beginning of each year within the respective periods: 2.82% for the first period and 0.65% for the second period. The calculated rates were subtracted from the annualized mean return, and the resulting excess return was then divided by the standard deviation to calculate the Sharpe ratio for each scenario. Metrics were annualized using the 252 trading day approach, and we conducted 10,000 iterations to ensure the robustness and reliability of our model.

Results

Descriptive statistics

In this section, we will present a descriptive analysis of the assets analyzed in the quantitative model.

During the first period, the average daily returns were relatively low, ranging from 0.0001 to 0.0003. EWZ exhibited the highest volatility with a standard deviation of 0.0265, suggesting greater fluctuation in daily returns than in other ETFs. Skewness measurements revealed that IEV had nearly zero skewness, suggesting a more symmetrical distribution. By contrast, EWH had the highest positive skew (0.6456), suggesting a distribution skewed toward higher returns. When compared with a normal distribution, kurtosis values >11 for EWH and EWZ indicated distributions with heavier tails and more extreme outcomes.

Table 1

Descriptive statistics of simple returns during period 1

ETFs	Mean	Standard deviation	Skewness	Kurtosis
EWG	0.0003	0.0214	0.3952	8.8461
EWU	0.0002	0.0191	0.1260	10.4994
IEV	0.0002	0.0195	0.0121	6.1181
EWH	0.0003	0.0196	0.6456	11.5935
EWZ	0.0001	0.0265	0.2346	12.2837

During the second period, the average daily returns ranged from 0.0001 to 0.0004, suggesting a similar performance to the first period. EWZ stood out with the highest standard deviation of 0.0208, which showed greater volatility than others. Skewness values were all negative, with EWU showing the most negative skewness (−1.3101), implying a distribution skewed toward lower returns. Kurtosis values were significant, with EWU showing the highest kurtosis (15.4467), suggesting a distribution with substantially heavy tails and extreme outcomes.

Table 2

Descriptive statistics of simple returns during period 2

ETFs	Mean	Standard deviation	Skewness	Kurtosis
EWG	0.0001	0.0108	−0.6176	5.6557
EWU	0.0001	0.0099	−1.3101	15.4467
IEV	0.0002	0.0095	−1.2163	12.6758
EWH	0.0003	0.0105	−0.1840	2.9950
EWZ	0.0004	0.0208	−0.2710	3.1089

After the descriptive statistics, we constructed a correlation matrix for the yield of assets for both periods.

In the correlation matrix for the first period, EWG (Germany) and EWU (United Kingdom) exhibited a strong positive correlation of 0.8985, suggesting that their movements were closely aligned. IEV (Europe) showed robust correlations ranging from 0.9489 to 0.9595 with all other ETFs (EWG, EWU, EWH, and EWZ), reflecting strong synchronicity within European markets. EWH (Hong Kong) and EWZ (Brazil) demonstrated a moderate positive correlation of 0.7923, suggesting some commonality in their market movements despite geographical distance. Overall, the matrix underscores the interconnectedness of global markets and provides insights into potential diversification benefits or risks when constructing portfolios containing these ETFs.

Table 3

Correlation matrix of the returns of the instruments tested in period 1

ETFs	EWG	EWU	IEV	EWH	EWZ
EWG	1				
EWU	0.8985 ($p < 0.001$)	1			
IEV	0.9595 ($p < 0.001$)	0.9489 ($p < 0.001$)	1		
EWH	0.7611 ($p < 0.001$)	0.8041 ($p < 0.001$)	0.7993 ($p < 0.001$)	1	
EWZ	0.7905 ($p < 0.001$)	0.8296 ($p < 0.001$)	0.8301 ($p < 0.001$)	0.7923 ($p < 0.001$)	1

In the correlation matrix for the second period, EWG (Germany) and EWU (United Kingdom) showed a strong positive correlation of 0.8135, while IEV (Europe) exhibited robust correlations ranging from 0.9352 to 0.9371 with all other ETFs (EWG, EWU, EWH, and EWZ), highlighting strong synchronization within European markets. EWH (Hong Kong) and EWZ (Brazil) demonstrated a moderate positive correlation of 0.4198, suggesting some shared market dynamics between these geographically distant regions, although this correlation is weaker than the first period. Based on these results, we can conclude that the interconnectedness of global markets observed in the first period persists in the second period as well.

Table 4

Correlation matrix of the returns of the instruments tested in period 2

ETFs	EWG	EWU	IEV	EWH	EWZ
EWG	0.8135 ($p < 0.001$)	1			
EWU	0.9352 ($p < 0.001$)	0.9371 ($p < 0.001$)	1		
IEV	0.5684 ($p < 0.001$)	0.5981 ($p < 0.001$)	0.6081 ($p < 0.001$)	1	
EWH	0.4482 ($p < 0.001$)	0.4895 ($p < 0.001$)	0.5058 ($p < 0.001$)	0.4198 ($p < 0.001$)	1
EWZ	0.8135 ($p < 0.001$)	1			

Simulation results

In this section, to analyze and compare the risk-adjusted performance of the portfolios constructed, we will present the summary statistics of simulated Sharpe ratios, including the mean, standard deviation (volatility), minimum, and maximum values.

In the first period, the geographically diversified portfolio was significantly more volatile (0.0245) than the non-geographically diversified one (0.0071). The mean and extreme values suggest that the non-geographically diversified portfolio is generally more stable in terms of risk-adjusted return and may consistently outperform the geographically diversified portfolio when it comes to overall performance in the long run. This suggests that in some situations, the geographically diversified portfolio may perform better than the non-geographically diversified one, but overall, geographical diversification appears to be a less successful strategy in the first period.

Table 5

Summary of simulated Sharpe ratios for geographically diversified and non-geographically diversified portfolios in periods 1 and 2

Statistical indicators	Geographical diversification		Non-geographical diversification	
	1st period	2nd period	1st period	2nd period
Mean	0.0629	0.3323	0.0944	0.1394
Standard deviation	0.0245	0.0341	0.0071	0.0189
Minimum	−0.0048	0.2146	0.0688	0.0980
Maximum	0.1339	0.4096	0.1109	0.2086

In the second period, we could see considerably different outcomes. Although not to the same extent as in the first period, the geographically diversified portfolio was still more volatile (0.0341) than the non-geographically diversified one (0.0189). According to the mean values, the geographically diversified portfolio (0.3323) had the potential to consistently outperform the non-geographically diversified portfolio (0.1394). Even the worst case scenarios of the geographically diversified portfolio were better than the best case scenarios of the non-geographically diversified one, according to the extreme values. Despite the fact that the risk-free rate is significantly lower in the second period (0.65%), we can conclude that geographical diversification is unquestionably a more effective strategy than in the first period.

Figure 3

Sharpe ratio for geographically diversified and non-geographically diversified portfolios in period 1

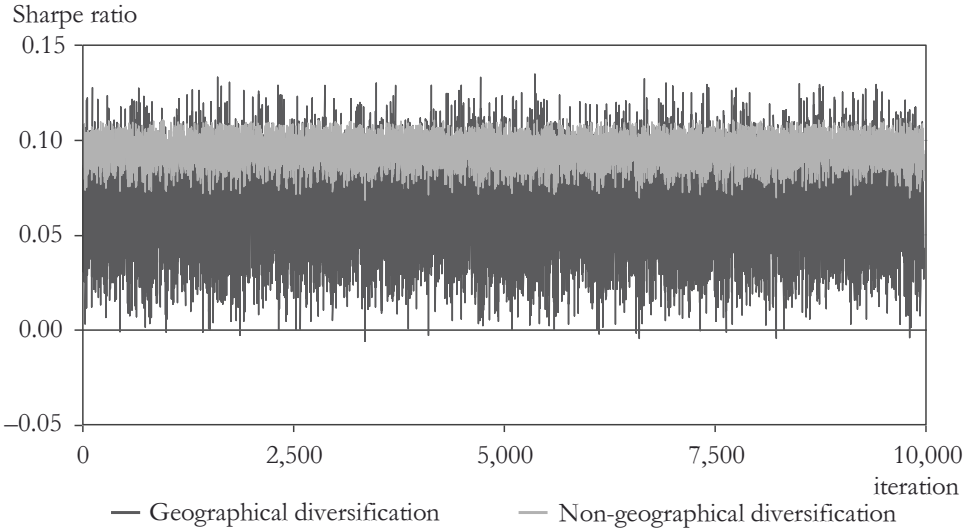
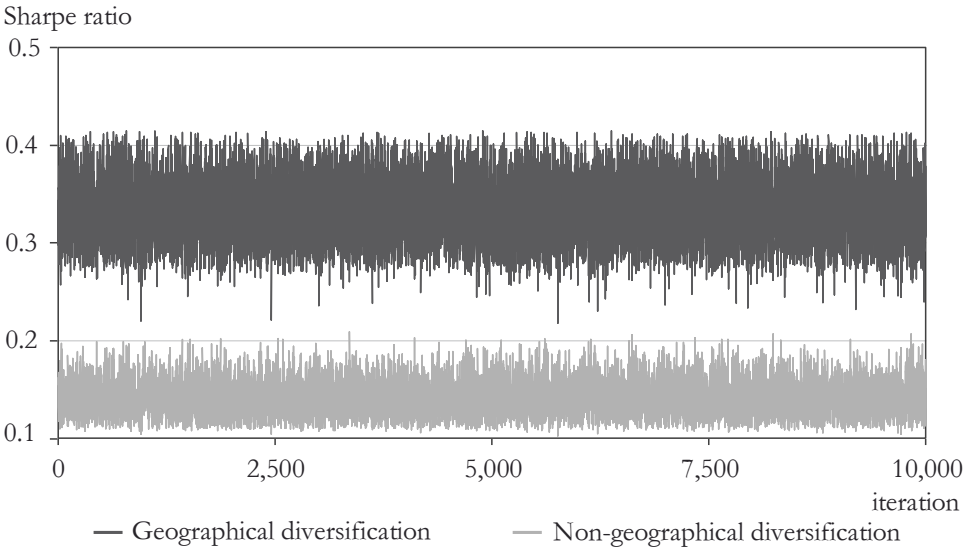


Figure 4

Sharpe ratio for geographically diversified and non-geographically diversified portfolios in period 2



Conclusions

Our study revealed that the effectiveness of geographical diversification varies significantly across different market periods and conditions. During the first period (2008–2013), which was characterized by the aftermath of the 2008 global financial crisis, we found that a geographically diversified portfolio exhibited higher volatility and generally lower risk-adjusted returns than a non-geographically diversified portfolio focused on Europe. This suggests that a regional focus provided more stability and consistent performance during a time of global financial instability and economic downturn. Descriptive statistics indicated that certain ETFs, particularly those representing emerging markets, experienced higher volatility and more extreme outcomes, whereas European ETFs showed more symmetrical distributions of returns.

During the second period (2014–2019), characterized by a bull market and the stabilization of the EU economy, the geographically diversified portfolio outperformed the non-geographically diversified portfolio in terms of risk-adjusted returns, despite its higher volatility. This indicates that geographical diversification can be more beneficial in certain market environments, especially during periods of economic growth. Descriptive statistics for this period showed a shift toward negative skewness and high kurtosis across ETFs, with emerging markets continuing to show higher volatility. The correlation matrix revealed strong interconnectedness among European markets during both periods, with moderate correlations observed between geographically distant markets. These correlations weakened in the second period. During this period, we witnessed sustained high growth in the Chinese economy along with Brazil, which experienced a cycle of recession and recovery, highlighting diverse macroeconomic trends across different regions.

The research results ultimately confirm that while using geographical diversification offers potential for higher returns, it may result in higher volatility. The decision between geographically diversified and regionally focused portfolios should consider current market conditions and the investor's risk tolerance. The findings underscore the importance of adjusting investment strategies to different market conditions to maximize risk-adjusted returns. The macroeconomic conditions observed during the periods studied illustrate how global financial crises and subsequent recoveries can influence the comparative performance of geographically diversified and regionally focused investment strategies.

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