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Risk vs Return: A Comparative Analysis Between a Developed and an Emerging Stock Market

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Master in Finance

Supervisor:
PhD Joaquim Paulo Viegas Ferreira de Carvalho, Invited Assistant Professor, ISCTE-IUL

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BUSINESS
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Department of Finance

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For all the people who inspire me, I dedicate this thesis.

Resumo

Os mercados bolsistas emergentes têm apresentado diversas oportunidades para os investidores internacionais ao longo das últimas décadas. Esta tese aborda o retorno ajustado ao risco de um mercado emergente ao comparar os retornos e volatilidade deste mercado com os de um mercado desenvolvido. Usando os Estados Unidos e China como os mercados representativos, a dissertação explora as oportunidades oferecidas pelo mercado emergente para os investidores internacionais. A maioria da literatura desenvolvida anteriormente destaca os benefícios da diversificação conseguida através dos mercados bolsistas emergentes. Neste estudo, inovo ao analisar estes mercados como um investimento alternativo, em vez de focar nos benefícios de diversificação. Para comparar o retorno ajustado ao risco dos dois mercados, calculo o Sharpe ratio semanal para o S&P 500 e para o SSE Composite durante um período de 18 anos. Realizo uma regressão linear múltipla, para os mercados emergente e desenvolvido, a fim de analisar os factores que afectam o Sharpe ratio calculado. Os resultados empíricos confirmam que as características dos mercados financeiros, os factores macroeconómicos, e a correlação/contágio têm um impacto no desempenho de ambos os mercados. No que diz respeito aos retornos ajustados ao risco, os resultados indicam que o índice representativo do mercado dos Estados Unidos apresenta um retorno superior, uma volatilidade menor, e consequentemente um Sharpe ratio mais elevado do que o calculado para o índice de mercado chinês. Estes resultados permitem concluir que o mercado bolsista desenvolvido apresenta um maior e mais sustentado retorno ajustado ao risco em comparação com o mercado emergente.

Palavras-Chave: Mercado Emergente, Risco Ajustado ao Retorno, Sharpe Ratio, Volatilidade
Classificação JEL: C58, G15

Abstract

Emerging stock markets have presented several opportunities for international investors over the last decades. This thesis addresses the risk-adjusted returns of an emerging stock market by comparing its returns and volatility with a developed stock market. Using the United States and China as the representative markets, the dissertation explores the opportunities offered by the emerging market for international investors. Most of the previous literature focuses on the diversification benefits of emerging stock markets. In this study, I innovate by looking at these markets as an alternative investment rather than the diversification potential. To compare the risk-adjusted returns of the two markets I calculate the weekly Sharpe ratio for the S&P 500 and the SSE Composite for 18 years. I perform multiple linear regression, for both the emerging and the developed markets, to analyze the factors that affect the Sharpe ratio calculated. The empirical results confirm that the financial market characteristics, the macroeconomic factors, and the correlation/contagion impact the performance of both the emerging and the developed stock markets. Regarding the risk-adjusted returns, the results show that in the period studied, the index representative of the US market presents higher returns, lower volatility, and consequently a higher Sharpe ratio than the one for the Chinese market index. Such results suggest that the developed stock market offers higher and more sustained risk-adjusted returns in comparison to the emerging stock market.

Keywords: Emerging Market, Risk-Adjusted Returns, Sharpe Ratio, Volatility

JEL Classification: C58, G15

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1. Introduction

Emerging markets, which are markets of developing countries characterized by its fast economic growth and development of the financial system, have received attention from investors and researchers in the past decades. Due to their different characteristics in comparison to the developed markets, these markets can be seen as an alternative or as a diversification investment.

When individuals take their investment decisions, they review several factors like the characteristics of each market and the risk-return tradeoff faced by them. Since both emerging and developed stock markets present different combinations of risk and returns, investors consider in which of these markets they want to allocate their investments.

The two main characteristics which differentiate emerging stock markets from developed ones are the returns and the volatility of these markets. The returns of the emerging stock markets are usually higher when compared with the returns of the developed markets (Barry et al., 1998; Salomons and Grootveld, 2003, Hadhri and Ftiti, 2019). In the case of volatility, it is also higher for the emerging markets (Harvey, 1995; De Santis and İmrohoroğlu, 1997; Andrade, 2009). There is a risk-return tradeoff in both markets which makes it difficult to assume in which of these markets the risk-adjusted returns are higher. Arora et al. (2009) compares the performance of both markets and concludes that the risk-adjusted returns of emerging stock markets are higher when compared with the ones of developed markets.

The main focus of this thesis is to compare the risk-adjusted returns of the emerging stock markets with the developed stock markets and understand which factors have an impact on the performance of both markets. To make this analysis I choose China as the emerging market representative, and the United States as the developed market. The interval of the analysis comprehends the period between the beginning of 2004 and the end of 2021. In this study, I want to find which of the two markets offers higher performance, since this is the main question investors want to know when choosing the market where to invest in. I also study the factors that most affect the risk-adjusted returns because this allows us to understand which market characteristics have a significant impact on the performance of both markets.

Even if there are some studies that directly compare the returns of emerging and developed stock markets, these papers focus more on the diversification benefits resulting from a portfolio composed of stock of both emerging and developed markets (e.g., Barry et al., 1998; Vedd and Lazarony, 2014; Hedström et al., 2020). As I analyze and compare both the emerging and developed stock markets separately, my study is different from most of the research previously done on the same theme. The goal is to conclude in which of the two countries the risk-adjusted returns are higher for the period analyzed, rather than assessing the diversification benefits of the emerging markets.

Another contribution of this dissertation for the emerging markets research concerns the factors which impact their risk-adjusted returns. Instead of analyzing the characteristics of the markets that affect the returns of the stock markets, I go a step forward and study the factors which have an impact not only on the returns but also on the volatility and the risk-free rate, in other words, the risk-adjusted returns of both the emerging and developed stock markets. The factors analyzed are the financial market characteristics, the macroeconomic factors, and the correlation/contagion. With this analysis, I expect to find which of the factors impact the overall performance of the stock of both markets, rather than just the returns themselves.

To answer which of the two markets has higher risk-adjusted returns and to conclude the factors that have an impact on the performance of the emerging and the developed stock markets, I divide the analysis into two parts. In the first part, I calculate the risk-adjusted returns of the two markets through the use of the Sharpe ratio, since this ratio considers the excess returns for each market and its volatility. I collect data on the returns of the S&P 500, which reflects the stock market of the developed market chosen, and the yield of the 10-year Treasury Notes for the United States. For the case of China, I gather data on the SSE Composite and the yield of the 10-year government bonds for this country. To calculate the volatility needed for the computation of the Sharpe ratio of both markets I use the GARCH model, since this model considers the volatility clustering and heavy tail returns, which improves the precision of the volatility calculated. In the second part, I perform two multiple linear regressions, one for each market, where I expect to find the factors influencing the performance of both indices. For both markets, I collect data related to the GDP, inflation, interest rates, price-to-earnings ratio, liquidity, the yield of the 10-year government bonds, VIX, and the returns on the S&P 500 and the SSE Composite.

The results obtained are not fully in accordance with the previous literature related to emerging markets. I conclude that the developed stock market has higher risk-adjusted returns than the emerging stock market. This conclusion is contrary to previous papers which suggest a better performance of the emerging stock markets (e.g., Arora et al., 2009; Conover et al., 2012). The developed market studied in this thesis, not only has a better risk-adjusted return during the 18 years, but also presents a notable difference in performance compared to the emerging stock market. Regarding the factors that affect the performance of the risk-adjusted returns of the markets, the conclusions reached by this study confirm what previous authors concluded: the financial market characteristics, the macroeconomic factors, and the correlation/contagion have an impact on the performance of both the emerging and developed stock markets.

This dissertation is structured as follows: Section 2 reviews the most important literature and introduces contextualization on the emerging markets subject; Section 3 presents the research hypotheses; Section 4 gives an overview of the methodology used throughout the study; Section 5 describes the data; Section 6 presents the results obtained and Section 7 concludes about the findings of this thesis and gives some suggestions for future research.

2. Literature Review

In the past years, a lot of authors have directed their research to emerging markets. Many papers (e.g., Harvey, 1995; De Santis and İmrohoroğlu, 1997; Arora et al., 2009; Atilgan and Demirtas, 2013; Hedström et al., 2020) focus on the performance of the stock market in the emerging markets, its risk-return trade-offs, its benefits, the diversification effects for international investors, and others. These studies, first written in the 90's, were and are crucial to the better understanding of the emerging markets, but also to the investors and the further development of these markets. The next subsections present the most important literature that has contributed to a better comprehension of the emerging stock markets and the consequences of investing in these markets.

2.1. Returns of Emerging Stock Markets

A review of the equity returns of the emerging markets is presented by Atilgan et al. (2015). They concentrate on and summarize some of the studies related to equity emerging markets present in the top journals specializing in finance and emerging markets. The importance of this topic is outlined by the fact that, at the end of the 80s, 15% of the world's GDP was held by the emerging markets, whereas in 2013 the percentage rose to more than 30%. However, compared to the advanced economies, the equity market capitalization in the emerging markets is low, only contributing to 12% of the world market capitalization (Bekaert and Harvey, 2014).

About the equity returns of the emerging markets, one of its determinants is the risk-return tradeoff. With the motivation to understand if diversifying a portfolio by investing in emerging markets would lower the portfolio risk, Harvey (1995) documents that diversifying into emerging markets improves the investment opportunities. However, about the risk exposure, the author does not find any relation with the expected returns. The reasons for these findings are that emerging markets are segmented from the world capital markets, or that the risk exposures are not constant in time. A study by De Santis and İmrohoroğlu (1997), shows whether the volatility of equity returns changes over time in a predictable way. For full market segmentation, the relation between expected return and volatility is positive only for a few countries. In addition to these two authors, many others studied the relation between risk and return in the emerging markets. These studies are broad since there is not a consensus in terms of the relation between the return and volatility of these markets being positive or negative. Even if most asset pricing models imply that the expected return and variance are positively related (Salvador, 2012; Atilgan and Demirtas, 2013), some works defend the opposite relationship, that is, a negative relation between the expected return and the variance (Al Janabi et al., 2010; Blitz et al., 2014).

Two other important determinants for the equity returns of emerging markets are market anomalies and market liberalization. As Atilgan et al. (2015) state, when the markets are efficient, the stock returns cannot be predictable, and the assets should have the same risk-adjusted returns. Nevertheless, some authors show that there are market anomalies in developed markets (Banz, 1981; Fama and French, 1992; Jegadeesh and Titman, 1993; Lakonishok, Shleifer, and Vishny, 1994). The origin of these anomalies is not consensual yet. However, for some researchers the unobserved risk returns are compensated by higher returns; for others, these anomalies are simply market inefficiencies; the market anomalies can also be attributed to data snooping. These anomalies present in the developed markets are also studied in the emerging markets. The importance of the study of these anomalies derives from equity in emerging markets being low correlated to equity markets of developed countries. Some studies that support that the same conclusions taken for the developed markets apply also to the emerging ones are: Fama and French (1998), Rouwenhorst (1999), Gervais et al. (2001), Hatgioannides and Mesomeris (2007), Bekaert et al. (2007), Carvalhal and de Melo Mendes (2008), Chui et al. (2010), Griffin et al. (2010), Demirtas and Zirek (2011), Lee (2011), Bley (2011), Hou et al. (2011), Kaniel at al. (2012), and Cakici et al. (2013). Another factor that affects the expected return of equity in emerging markets is market liberalization. The international portfolio diversification has an important impact in the market liberalization on the emerging markets. Several authors investigate this topic. Bailey et al. (1999) measure how much extra cost foreign investors can afford to diversify their portfolio into other countries. The measurement of this extra cost is important because some countries have restrictions for foreign investors, which raises the cost of investments. Since foreign investments increase the market efficiency due to higher liquidity, Bekaert and Harvey (2000) study the impact of the liberalization of some emerging markets through the cost of capital. As expected, after market liberalization, the cost of capital tended to decrease. Other similar studies that reach identical conclusions about the decrease in the cost of capital when emerging markets liberalized were written by Henry (2000), De Jong and De Roon (2005), and Fernandes (2009).

Other return determinants are proposed by different authors. A study by Driesprong et al. (2008) investigates the relationship between the oil price and the stock returns in the emerging markets. It is concluded by the author that there is a negative relationship between stock returns and oil price. However, this relation can only be seen when there is a lag of some days between the returns and the oil price changes. Another determinant of equity returns is studied by Braun and Larrain (2009). This paper questions the impact of initial public offerings (IPOs) on the price of other equities on emerging markets. The study concludes that an IPO has a negative effect in the return of other equities due to the supply shock in these markets. Brana et al. (2012) investigate the impact of excess liquidity in asset prices of emerging markets. They conclude that the expansive monetary policy of advanced economies and the increase in financial mobility could bring capital inflows to emerging markets. The conclusion taken by this study is that the excess liquidity in the financial markets did not affect the equity returns in a significant way.

2.2. Volatility of Emerging Stock Markets

Some studies have been written about the characteristics of volatility in emerging markets. By analyzing monthly data from 20 emerging economies, Harvey (1995) suggests that the equity volatility of these markets is high. In a study using a GARCH (1,1) specification to analyze the characteristics of the conditional volatility, Hatgioannides and Mesomeris (2007) find that the conditional volatility of equity returns is more persistent than the conditional mean. Some authors test some asset pricing models to try to explain the characteristics of the volatility in the equity emerging markets. Engel and Rangel (2008) present a model for the volatility of equity markets where the macroeconomic effects are incorporated with the time series dynamics. Andrade (2009) suggests an asset pricing model where the sovereign yield is used as a measurement of the country risk.

Market liberalization can also influence the volatility of the equities in these economies. Among the research on this topic, Bekaert and Harvey (1997) study why volatility is different across the different emerging markets. They conclude that open markets have lower volatilities, and that market liberalization decreases volatility. The same conclusions are taken by Edwards et al. (2003). According to De Santis and İmrohoroğlu (1997), while in developed markets the volatility can be clustered and predictable, in emerging economies the volatility is higher, and the market liberalization does not increase volatility. The paper by Muguto and Muzindutsi (2022) has a distinct view on the volatility of the emerging and developed stock markets. For the authors, the differences between the two types of markets are less significant than between the countries in the same group. The development of the markets does not explain the nature of their volatility. In their analysis, Christoffersen et al. (2006) and Fernandes (2009) analyze financial liberalization and its relationship with volatility. They conclude that there is a significant decline in the volatility of the firms' stocks after market liberalization, and this decline is higher for large and liquid companies. According to Li et al. (2011), there is a negative relation between large foreign ownership in emerging markets and the stock return volatility. The stabilizing effect of these large foreign investors is due to a commitment made by the shareholders, and to a monitoring role of the investors in the firm management. The impact of investability in emerging markets' volatility is studied by Bae et al. (2004), according to whom there is a positive relation between the investability in stock in these markets and its volatility.

The volatility of the emerging markets is also impacted by local and global events. The studies which investigated the impact of major events in the emerging stock markets mostly agree with its results. Choudhry (1996), Aggarwal et al. (1999), Fernandez (2007), Griffin et al. (2011), and Hacihasanoglu et al. (2012) point out the fact that global news and events influence the market volatility. The local events also present a significant change in the volatility of the equity returns. Most of the time, regional news has a higher impact on volatility change.

The study by Nartea et al. (2013) focus on the idiosyncratic volatility in the emerging markets. According to the authors, idiosyncratic volatility is important for understanding these markets. There is no long-term trend for this type of volatility but there are some isolated episodes that can be related with market reforms. These findings suggest that diversification is needed but country selection is also a necessary factor.

2.3. Other Characteristics of Emerging Markets

One of the characteristics that distinguish emerging markets from other markets is liquidity. Usually, emerging markets are less liquid than developed markets and for this reason, the higher returns and diversification benefits can be decreased by the liquidity costs. According to Chowdhury et al. (2018), the factors that mostly affect the liquidity of these markets are the money supply, government expenditures the private borrowing. In addition, Batten and Vo (2014) state that there is a positive relation between liquidity and stock returns of these markets, opposite to the case of developed markets, where there is a negative relation. Bohl and Brzeszczynski (2006) try to study the impact of an institutional investors in an emerging stock market. They conclude that in the case of the country analyzed, the pension fund investors had a stabilizing effect in this market which reduced the volatility of the returns.

Every market has its types and degree of risks. However, emerging markets are characterized mostly by their currency risks, political risks, lack of liquidity, and others. Hauser et al. (1994) study the exchange rate risk to determine whether international diversification is benefic. Their paper concluded that a currency hedging is not beneficial in the emerging markets contrasting to the case of developed markets. This decrease in the benefits of diversification through investing in emerging markets is due to the negative correlation between the exchange rate and the stock returns. Similarly, Rios (2009) concludes that a fixed exchange rate in emerging markets would not decrease its volatility but would decrease the currency risk premia that international investors would demand as well as the cost of capital. Önder and Simga-Mugan (2006) study the impact of political and economic news in emerging markets. Using the example of two countries, they concluded that political and economic news influence the volatility and the liquidity of these markets. Both the domestic and the world news had an impact in volatility.

As I presented previously, the different characteristics of the developed and emerging stock markets can bring to investors various investment possibilities. Much of the literature focused on the diversification effects that emerging markets can bring when they are combined with developed markets in the same portfolio. Camilleri and Galea (2009) suggest that, due to the different characteristics, developed and emerging markets could bring diversification benefits and risk reduction. According to Patel (2021), investors can generate better returns and lower levels of risk, when diversifying an emerging stock market with an emerging one. The same findings are achieved by Hedström et al. (2020). This study has the particularity of finding a regional risk of contagion. Even if the regional trade integration of these emerging markets decreases the diversification between them, they still have diversification potential in the global markets. Coudert et al. (2015) also find that the regionalization of emerging markets has been increasing. For these authors, the correlation between emerging and developed markets has also been increasing. Nevertheless, the regional integration is higher than the global one. For Tai (2007), before emerging markets were liberalized, they used to be segmented. However, after the liberalization dates these are integrated with developed markets, which means that the diversification effects are not so strong. This author also states that the cost of capital and the volatility of these markets decreased after financial liberalization.

A paper by Kumar (2011) also addresses the correlation and diversification effects that emerging markets would bring when combined with developed markets. When comparing emerging markets with a volatility index (VIX) in the domestic market (US), the author found that the diversification effects are higher in the volatility index, which shows that emerging markets have been more correlated with the global markets. When analyzing the reason why emerging stock markets are integrated between themselves, Pretorius (2002), through an econometric analysis, concludes that bilateral trade and industrial production growth have an impact on the interdependence between emerging stock markets. As per other authors, contagion has an impact on this correlation. To test if diversifying a developed market portfolio by including assets from emerging markets would bring diversification benefits, Vedd and Lazarony (2014) setup a portfolio of Canadian shares together with shares of Latin American countries. When compared with a portfolio made of only Canadian shares, the diversified portfolio brought a higher weekly return and a lower standard deviation.

2.4. Investing in Emerging versus Developed Stock Markets

Investors choose to invest in emerging stock markets due to the different characteristics, namely returns and volatility, that such markets present compared with other markets, like the developed ones. According to Salomons and Grootveld (2003), the equity risk premium is different between the two types of markets. This study concludes that the equity return that exceeds the risk-free rate in the emerging markets is significantly higher than in the developed markets. However, the higher excess return in the emerging markets comes with an excess risk, which varies with the period of the analysis.

In one of the first studies that analyzed and compared emerging markets to developed markets, Barry et al. (1998) state that emerging markets have high returns and high volatility, and can bring greater diversification effects for international investors. When compared with the U.S. stock market for the period between 1975 and 1995, the emerging market index analyzed by the authors did not generate high levels of returns, as it is usually assumed for these markets. According to Salvador (2012), when using a GARCH approach to analyze the risk-return framework, there is a risk-return tradeoff in the emerging stock markets during low volatility periods. The risk-return analysis and other characteristics of emerging stock markets are also presented by Bruner et al. (2003). In their book, the authors state that emerging markets used to be good for diversification, but due to an increased correlation with the developed markets the diversification benefits have been decreasing.

Several authors have also focused their research on the risk of emerging markets. Atilgan and Demirtas (2013) use the VaR as a measure of risk to test if a risk-return tradeoff exists in emerging markets. They concluded that there is a positive relationship between the returns and the downside risk, and this relation is much higher than in the developed markets. In addition, Atilgan et al. (2020) state that downside risk can predict equity returns in emerging markets, as well as the market beta and book-to-market ratio. However, the most significant predictors for the returns in these markets are the short and medium-term returns momentums. The results in Conover et al. (2012) similarly suggest that emerging stock markets have a relatively low downside risk. The low downside risk of the emerging markets results in risk-adjusted returns which are higher in these markets, from where international investors can achieve lower risk and higher return portfolios through diversification. Arora et al. (2009) also conclude that the risk-adjusted returns of emerging markets are higher in comparison to the ones from developed markets. The authors suggest that emerging markets can be seen as an investment alternative and the benefits of investing in these markets are great even in adverse periods. According to Ghysels et al. (2016), people invest in emerging markets because of the higher expected upside volatility in contrast to the downside volatility. In these markets, the skewness is usually positive and is related to the openness of the country and with its balance of payments. Using a skewness-based analysis, the results presented by Hadhri and Ftiti (2019) suggest that investments in emerging markets outperform those of developed markets during different periods, including crisis. The conclusion that emerging markets still have a higher risk and higher expected returns than the developed ones is reached by Violi and Camerini (2016). Because emerging stock markets have now lower transaction costs and more liquidity, they are more and more interesting for the international investor. Nevertheless, the low transaction data of emerging markets is still poor when compared with the developed markets.

As Rouwenhorst (1999) presents, the factors that drive returns in emerging markets are similar to those that drive returns in developed markets. Like developed markets, emerging ones exhibit momentum, the small stocks tend to outperform the large stocks, and the value stocks have a better performance than the growth stocks. Investors can choose to value investing in the emerging stock markets instead of growth or momentum investing. Kargin (2002) suggests that a "value" portfolio in emerging markets generates higher investment returns with the risk not being higher. A similar conclusion is reached by Ramraika and Trivedi (2015). For these authors, choosing high-quality businesses as an investment in emerging markets brings better performance than investing in the overall market, and the volatility is lower. Also, Zeng (2010) suggests that quantitative investing in emerging markets is a good way to generate sustainable returns. Similar to the two authors mentioned previously, Zeng states that quantitative investing in emerging markets has a good impact on the returns of emerging markets equities, improving the alpha of the portfolio. The author even infers that for some periods, while this quantitative investing is positive in emerging stock markets, it is negative in the developed ones.

The investability in emerging markets can be determined by the "housekeeping" and the "plumbing" of these markets. Ladekarl and Zervos (2004) state that the decision of an investor to allocate its portfolio to a market depends on these two factors. If a market has good "housekeeping", like good macro policies, financial markets, and corporate governance, and if it has efficient "plumbing", like custody, clearing, and taxes, it can be considered an investable market by investors. While developed countries take care of these factors, in the case of the emerging markets, the development of these factors is essential to attract international investors. Another factor determining market efficiency and investability is financial liberalization. Rejeb and Boughara (2013) conclude that financial liberalization in emerging markets improves market efficiency, decreases the risk of crises, and makes these markets more attractive to international investors. The same findings are achieved by Arshad et al. (2019). In this study, the authors suggest that the stability and efficiency of the emerging stock markets are associated with the liberalization and development of the market.

3. Research Hypotheses

The different authors reach a consensus about the main aspects of the emerging and developed markets. They present similar results on the characteristics of the returns and volatility of these markets as well as the factors that have an impact on their performance. For this reason, it is now possible to elaborate on the hypotheses that will allow me to develop the study.

3.1. Risk-Adjusted Returns

The two main characteristics that differentiate emerging from developed stock markets are their returns and volatilities. As I presented in the literature review, the returns of the emerging stock markets are high compared with the returns of the developed markets (Barry et al., 1998; Salomons and Grootveld, 2003). There is a risk-return tradeoff in the emerging stock markets (Harvey, 1995; Santis and İmrohoroğlu, 1997), with the relation between risk and return being positive (Salvador, 2012; Atilgan and Demirtas, 2013). The anomalies of the markets have an impact on their returns. The inefficiencies of the markets, due to unobserved risk-returns and data snooping, are present in the developed markets (Banz, 1981; Fama and French, 1992; Jegadeesh and Titman, 1993; Lakonishok et al., 1994), as well as in emerging markets (Fama and French, 1998; Rouwenhorst, 1999; Gervais et al., 2001; Bekaert et al., 2007; Hatgioannides and Mesomeris, 2007; Carvalhal and de Melo Mendes, 2008; Chui et al., 2010; Demirtas and Zirek, 2010; Griffin et al., 2010; Bley, 2011; Hou et al., 2011; Lee, 2011; Kaniel at al., 2012; Cakici et al., 2013). Market liberalization is assumed as well to have an impact on the returns of the markets. The more liberal the market is, the lower the cost of investing in it and the higher the liquidity. Even if the developed markets are more liberal in comparison to emerging ones, the emerging markets have become more liberalized over the past years. (Bailey et al., 1999; Bekaert and Harvey, 2000; Henry, 2000; De Jong and de Roon, 2005; Fernandes, 2009).

Market liberalization also has an impact on the volatility of the markets. Some authors conclude that in emerging markets when the economy is more open, the volatility tends to be lower (Bekaert and Harvey, 1997; Christoffersen et al., 2006; Fernandes, 2009). However, volatility in emerging stock markets is usually higher than in developed markets (De Santis and İmrohoroğlu, 1997). Further studies also conclude about the high volatility of the equities of emerging markets (Harvey, 1995; Hatgioannides and Mesomeris, 2007; Engel and Rangel, 2008; Andrade, 2009). Other factors which affect the volatility of emerging stock markets are the global and regional events. The news impacts the volatility because of the contagion effect they have in the emerging markets (Choudhry, 1996; Aggarwal et al., 1999; Fernandez, 2007; Griffin et al, 2011; Hacihasanoglu et al., 2012).

As I just mentioned, the returns and volatility are usually higher in the emerging stock markets when compared with those of the developed markets. Nevertheless, when it comes to the risk-adjusted returns, the characteristics of the returns and volatility of the emerging and developed markets are not enough to conclude in which of these two markets the risk-adjusted returns are higher.

There are several studies focusing on the diversification effects of investing in emerging and in developed stock markets. However, I want to study and compare the volatility and the returns of both markets separately through the analysis of the risk-adjusted returns. In other words, I want to look to an emerging stock market as an alternative of investment to a developed market, and not just as a diversification investment.

When the risk-adjusted returns of the emerging and developed stock markets are analyzed separately, the emerging markets offer a higher performance when compared with the developed markets (Arora et al., 2009; Conover et al., 2012). According to the literature, and to test in which market the risk-adjusted returns are higher, I formulate the following hypothesis:

H1*: Emerging stock markets have higher risk-adjusted returns.*

3.2. Characteristics of the Markets

In addition to the returns and volatility, there are other characteristics that differ emerging to developed stock markets. The liquidity in emerging markets is usually lower than in developed ones (Bohl and Brzeszczynski, 2006; Batten and Vo, 2014; Chowdhury et al., 2018). About the risk premium of the emerging stock markets, the return that exceeds the risk-free rate of this market is higher than in developed stock markets, although, this higher return comes with higher risk (Salomons and Grootveld, 2003, Hadhri and Ftiti, 2019). The macroeconomic policies, which affect economic growth and inflation, as well as a stable financial market and a good corporate governance are important factors that emerging countries should take care to attract investors (Ladekarl and Zervos, 2004).

According to some authors (e.g., Kargin, 2002; Ramraika and Trivedi, 2015), value investing in emerging stock markets and investing in a quantitatively (Zeng, 2010) generates higher returns, not increasing the volatility of the portfolio. Another characteristic of the emerging and developed markets is the correlation and the diversification effects that can be obtained when combining the two markets. Even if there are diversification benefits when integrating emerging stock markets into an international portfolio (Barry et al., 1998; Camilleri and Galea, 2009; Conover et al., 2012; Vedd and Lazarony, 2014; Hedström et al., 2020; Patel, 2021), the correlation between the emerging and developed markets has been increasing (Pretorius, 2002; Bruner et al., 2003; Tai, 2007; Kumar, 2011; Coudert et al., 2015). The impact of political and economic news on the volatility of the markets (Önder and Simga-Mugan, 2006) and also the contagion effect (Pretorius, 2002) are characteristics that suggest that emerging stock markets have been more integrated with the developed markets.

Understanding which factors affect the performance of both markets is an important part of my research because it allows me to compare if the same factors have the same influence on the emerging and developed stock markets performances and if the relation is positive or negative. The liquidity of the market, the qualitative or quantitative investing, and an alternative of investment in other assets, are three characteristics that can affect the performance of the emerging and stock markets. These three characteristics can be described as financial market factors. The macroeconomic factors which affect the investability environment of the markets, like the economic policies, inflation, economic growth, and interest rates, also have an impact in the performance of the markets. As I also presented, the correlation and diversification between the emerging and developed stock markets, as well as the economic news and the contagion effects, impact the performance of the two markets. This being said, I formulate the following three hypotheses based on the characteristics highlighted in the literature as the factors that affect the risk-adjusted returns of the markets:

H2: *The characteristics of the financial market impact the performances of both the emerging and developed stock markets.*

H3: *Macroeconomic factors impact the performances of both the emerging and developed stock markets.*

H4: *Correlation and contagion impact the performances of both the emerging and developed stock markets.*

In the following sections, I describe the methodology and data which allows me to analyze the results and answer to the research hypotheses made above. The analysis is divided into two parts: in the first part, I test the first hypothesis; while in the second part, I test and compare, for the two markets, the second, third, and fourth hypotheses.

4. Methodology

As presented previously, to compare the performance of the emerging stock market with the developed stock market I calculate the risk-adjusted returns for both markets, through the Sharpe ratio. For the testing of the factors which affect the risk-adjusted returns of the two markets, I use multiple linear regression.

4.1. Sharpe Ratio

Sharpe (1966) introduced a measure of the mutual funds' performance. The author proposed a performance indicator as a *reward-to-variability ratio*. Other authors later named this indicator as to the Sharpe ratio, index, or measure, which became progressively more popular over time.

In Sharpe (1994), a distinction is made between the ex-ante and the ex-post version of the Sharpe Ratio. While the ex-ante version focuses on the decision-making for investments with supposed future values, the ex-post version focuses on the historical data to calculate the ratio. Due to the characteristics of my research and data, I use the ex-post version of this ratio.

Let $\mathrm{R_{Pt}}$ be the return of the portfolio at time t, and let $\mathrm{R_{Ft}}$ be the risk-free rate in period t. The differential return on time t ($\mathrm{D_t}$) is given by:

$$\mathrm{D_t} = \mathrm{R_{Pt}} - \mathrm{R_{Ft}} \tag{4.1}$$

Assuming $\overline{\mathrm{D}}$ as the average value of $\mathrm{D_t}$ within the historical period between t=1 and T:

$$\overline{D} = \frac{1}{T}\sum_{t=1}^{T} D_t \tag{4.2}$$

and considering σ_D as the standard deviation of the differential return ($\mathrm{D_t}$) for the period between t=1 and T:

$$\sigma_D = \sqrt{\frac{\sum_{t=1}^{T}(D_t - \overline{D})^2}{T-1}} \tag{4.3}$$

the ex-post, or historic Sharpe Ratio (S_h) is given by:

$$S_h = \frac{\overline{D}}{\sigma_D} \tag{4.4}$$

In this ex-post version of the Sharpe ratio, the ratio value suggests the historical average of the differential return per each unit of variability (standard deviation or volatility) of the differential return.

Since for my analysis I need the weekly Sharpe Ratio for both indices, the ex-post version proposed by Sharpe (1994) is not fully suitable for the calculation I need to perform. So, the Sharpe Ratio formula I use to compute the weekly risk-adjusted returns is the following:

$$S_t = \frac{\mathrm{D_t}}{\sigma_{D_t}}\,, \tag{4.5}$$

where $\mathrm{D_t}$ is the differential return between the return of the portfolio and the risk-free rate at week t, and σ_{D_t} is the standard deviation of the differential return in period t, which will be computed through a GARCH process.

4.2. GARCH

The Autoregressive Conditional Heteroskedasticity (ARCH) process presented by Engle (1982) introduced the difference between the unconditional and the conditional variance. This ARCH model allows the conditional variance to change through time depending on the past errors. A step forward is done by Bollerslev (1986) with its GARCH model. In this model, the author added the past conditional variances to the conditional mean to calculate the conditional variance.

The GARCH model is appropriate to calculate the volatility of financial data, like the one I will calculate in this thesis, because it considers the volatility clustering and heavy tail returns, which improves the precision of the volatility calculated, and it considers the short-term perseverance in the volatility.

The conditional variance given by the GARCH (p,q) model can be defined as:

$$\sigma_t^2 = \omega + \sum_{i=1}^{q} \alpha_i\, \varepsilon_{t-1}^2 + \sum_{i=1}^{p} \beta_i\, \sigma_{t-1}^2\,, \tag{4.6}$$

Where ω, α_i, β_i are parameters with $\omega > 0$; $\alpha_i \geq 0$ with i = 1, …, q; $\beta_i \geq 0$ with i = 1, …, p; p ≥ 0; q > 0; and $\varepsilon_t \sim N(0, \sigma_t^2)$.

When p = 0, the process is reduced to an ARCH (q) process. For this case, the conditional variance is defined as a linear function of past sample variances, while for the case of GARCH (p,q), the process allows for the integration of the lagged conditional variances. This said, a popular and simple variation of the GARCH process which is believed to describe the volatility of financial data in an accurate way is the GARCH (1,1).

For the GARCH (1,1) process, the conditional variance is given by:

$$\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2 , \qquad (4.7)$$

where $\omega > 0$; $\alpha \geq 0$; $\beta \geq 0$; and $\alpha + \beta < 1$.

The constraints ensure that the conditional variance is positive and the process is stationary. The parameters for the GARCH process are estimated by the maximum likelihood.

4.3. Multiple Linear Regression

Regression analyses can be performed to find out the existing relationship between a dependent variable and one or more independent variables. To determine the relation between the dependent and more than one independent variable, I use multiple linear regression. Thus, I estimate the parameters to evaluate the relation between the risk-adjusted returns of the indices from the US and China (dependent variable) and the chosen independent variables.

A multiple linear regression is given by:

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \ldots + \beta_p X_{ip} + \varepsilon_i , \qquad (4.8)$$

where *i* stands for each observation with *i* = 1, …, n; n the number of observations; *p* the number of independent variables; Y_i is the *i* observation of the dependent variable; X_{ij} is the *i* observation of the *j* independent variable with *j* = 1, …, p; β_j represents the parameters that will be estimated; and ε_i is the normally distributed error of the model.

The most relevant components of the equation are the coefficients and the statistics which will be computed. The estimated coefficients and their statistics give information about the relationship and the marginal relevance of each of the independent variables, they explain the changes in the endogenous one. Despite the different estimation methods that can be used to calculate the parameters of the linear regression, in this thesis, the estimation is done with the ordinary least squares (OLS) estimator.

5. Data

To estimate the risk-adjusted returns and perform the regression for the emerging and developed stock markets, I collect data from the Chinese market, which represents a major emerging market, and from the United States, the most important developed market. The right choice and collection of data is important for this study since it allows me to achieve trustworthy results which are needed for analyzing and establishing a comparison between the two markets.

Since my analysis is focused on the period between January 2004 and December 2021, I collect weekly data for this period, which equals a total of 939 observations. For some of the variables the weekly values are not available, for this reason the data has to be adjusted. As the time series collected are not related to the same day (some data is the weekly value on Friday, while other is on Wednesday, …), I use Mondays as the reference dates for each week.

For the risk-adjusted returns analysis, I collect data for the indices of each market and on the risk-free rate of each country. The value of the closing prices of the indices allows for the calculation of the returns of the indices and the volatility which are used in the computation of the Sharpe ratio. The risk-free rate is also required for this calculation. In the case of the US market, I collect data on the weekly closing prices of the S&P 500 and for the Chinese market, I get the closing prices for the SSE Composite. I gather the weekly prices for the period that I mentioned before and also for the last week of 2003 because I need to compute the return for the first week of 2004. The information is taken from Yahoo Finance, and for the missing values existing in the historical data of the SSE Composite I perform an interpolation. In the case of the risk-free rate, I gather data on the government bonds for both countries. I use the 10-year government bond yield as the risk-free rate because of its maturity period, which is expected to be similar to the long-term period that many investors expect to hold their investments in the stock market. For this reason, in the case of the US, I collect, from the Federal Reserve website, the data for the yield of the 10-year US Treasury securities. The historical data for the 10-year government bond yield of China is taken from Investing website.

Apart from the closing prices and the risk-free rate, I collect macroeconomic data and information related to the financial market of both countries, so I can perform my econometric analysis. For the economic growth of the two countries, I gather the historical data on the GDP. In the case of the United States, I get the GDP percentage change quarterly from the Federal Reserve Bank of St. Louis website. Since I need weekly observations for my study, I convert the quarterly data into weekly data. To get the weekly values for each quarter, I use the quarterly GDP percentage change data and calculate each value to the power of one-twelfth. For the case of the economic growth of China, I get the quarterly percentage change of the GDP from 2011 until 2021 from the National Bureau of Statistics of China. However, because there is not enough information before 2011, I collect the annual GDP variation from 2004 to 2010 from the Federal Reserve Bank of St. Louis website. As for the GDP of the US, I similarly convert the annual and the quarterly data into weekly data. When it comes to the inflation data, I collect the data for both countries from the OECD website. I gather monthly data, in other words, the percentage change of the Consumer Price Index (CPI) from the previous month. Since I need weekly data for my analysis, I convert the monthly percentage change into weekly variation using a similar process as the one described for the GDP. Other information that I also need to collect is the historical data on the interest rates for the United Sates and for China. In the case of the interest rates for the US, I gather information on the Federal Funds Effective Rate. I collect the weekly values for this reference interest rate from the Federal Reserve website. With regards to the information on the Chinese interest rate, I collect data for the discount rate of this country. I took this discount rate information from the International Monetary Fund website on a monthly frequency.

Besides the macroeconomic data, I gather historical information on the liquidity for each of the markets. For the US market, I collect the volume of the S&P 500 index weekly from Yahoo Finance. Similarly, for the Chinese market, I collect the volume of the SSE Composite from Yahoo Finance on a weekly frequency. For some of the weeks, there are some missing values; in these cases, I interpolate the data. The information about the price-to-earnings (P/E) ratio in both markets is also needed in the econometric analysis that I perform. This being said, I gather data on the P/E for the S&P 500 index. I take this monthly information from Nasdaq website. For China, I get the information about the P/E ratio for the SSE Composite from MacroMicro website. I have the daily information on this ratio, but I establish Wednesday as the weekly observation to be used. For my econometric analysis, I also need the data on the government debt of both countries. The data that I use (10-year government bonds) is the same that I collected and mentioned above for the case of the risk-free rate.

When it comes to the information related to the possible correlation between the American and the Chinese markets, I need data on the closing prices for both the S&P 500 and SSE Composite. The data I use is the same that I already collected for the risk-adjusted returns analysis. For this case, I also use the weekly data including the last week of 2003 to calculate the returns of the two indices. Finally, the last type of information needed for my analysis is the closing prices for the VIX index. The historical prices of this index are used in the regression for the emerging as well as the developed market. I take the data of the closing prices of the VIX on a weekly frequency from Yahoo Finance.

6. Results

The discussion of the results is divided into two subsections so that I can clearly test the research hypotheses.

With the risk-adjusted returns analysis, I compare the performance of the emerging and developed stock markets, through the analysis of the main market indices of the United States (S&P 500) and China (SSE Composite). Using the Sharpe Ratio to compare the performance of the two countries, I answer the first research hypothesis.

To identify the factors that have a significant impact in the performance of the indices of both the emerging and developed stock markets, I use multiple linear regression which helps me to test the remaining hypotheses presented in the third section.

6.1. Risk-Adjusted Returns

To analyze the risk-adjusted returns and compare the performance of the indices of both the emerging and developed stock markets, I calculate the weekly Sharpe ratio. By computing this weekly indicator, I obtain the weekly returns the indices had on top of the risk-free rate (alternative risk-free investment) considering the volatility of that excess return. I also calculate the historical Sharpe ratio between different periods in time, between 2004 and 2021, to compare and better understand the differences between the two markets.

6.1.1. S&P 500

To calculate the weekly Sharpe ratio, I compute the returns of the S&P 500 from the historical closing prices of this index. After having the returns for the S&P 500, I subtract the risk-free rate (weekly adjusted rate on the 10-year Treasury Notes) from the index returns to get the differential return (excess return).

The weekly volatility of the excess returns is also needed to calculate the weekly Sharpe ratio. Since a simple standard deviation from the differential returns is not the best measure to calculate the volatility, as it does not consider the impact of extraordinary events where volatility is not constant, I calculate the volatility through a GARCH process, using equation (4.7). To estimate the parameters of the GARCH model and compute the conditional variance for the excess returns of S&P 500, I use Stata. Table 6.1 presents the parameters and statistics of the GARCH model.

Table 6.1
GARCH Model Summary for the S&P 500 Excess Returns

Model Parameters	Estimates	
	Coefficient	Standard Error
ARCH (1)	0.2865324 ***	0.0410374
GARCH (1)	0.6668396 ***	0.0350032
Constant	0.0000355 ***	0.0000062

Note. ***, **, * denote statistically significant at 1%, 5%, and 10% level.

When calculating the parameters of the GARCH (1,1), the conditions described in the fourth section are respected, that is, all coefficients are positive ($\omega > 0$; $\alpha \geq 0$; $\beta \geq 0$) and the ARCH and GARCH parameters are lower than 1 ($\alpha + \beta < 1$). I also confirm that all estimates are statistically significant. Following the estimation of the parameters of the GARCH model, I calculate the conditional variance in Stata, so that I can use it in the calculation of the weekly Sharpe Ratio. The average value of the volatility for the 939 weeks calculated through this conditional variance is 2.15%. The volatility is higher in the week starting on 29/09/2008, with a value of 11.18% and has its lowest value in the week of 02/10/2017, with a value of 1.11%.

With the weekly differential return between the return of the S&P 500 and the 10-year Treasury Notes, as well as with the weekly conditional variance for the excess return, I have the necessary information to compute the weekly Sharpe ratio. Hence, to calculate the weekly Sharpe ratio from 2004 to 2021, using equation (4.5) I divide the differential return of each week by the conditional variance of the related week. Figure 6.1 displays the weekly Sharpe ratio for the S&P 500 between 2004 and 2021.

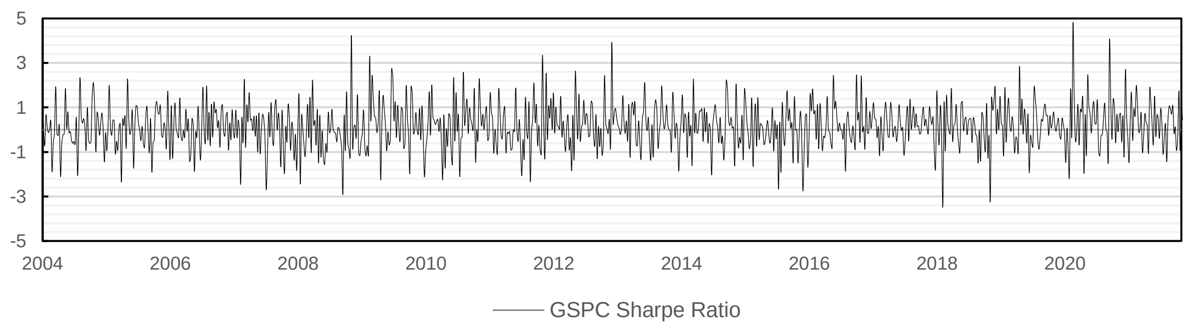

Figure 6.1. Weekly Sharpe Ratio for S&P 500

The weekly Sharpe ratio calculated for S&P 500 presents significantly different values between 2004 and 2021. While during some periods this indicator is positive, in some weeks the value of the ratio is negative. There are some changes between a positive and negative Sharpe ratio very often. The main reason for the negative Sharpe ratios is due to the negative returns of the S&P 500, which have a significant impact on the value of the ratio. Even if there is an alternance between positive and negative values for the ratio, it can be seen that a positive trend for the Sharpe Ratio is more common, which means that most of the time, the return of the index is positive and higher than the yield on the 10-year Treasury.

The historic Sharpe ratio calculated using equation (4.4) for the period between 2004 and 2021 is 0.06. As already mentioned, the negative returns of the S&P 500 during some weeks are the main cause for the negative values of the excess returns. For this reason, the historic Sharpe ratio has an average value close to 0.

The week which had a higher risk-adjusted return is the week of 06/04/2020 with a value of 4.81. Since this value is much higher than 1, it suggests that the S&P 500 is presenting significant excess returns relative to its volatility. On the other side, the lower value for this ratio is -3.47 and is observed in the week of 19/03/2018. The main reason for this low value is the negative return of the S&P 500 (-5.95%) and relatively low volatility (1.73%).

To achieve a more global view of the risk-adjusted returns for the developed stock market, I compute the annual Sharpe ratios for the 18 years of my analysis. So, I first compute the cumulative differential returns for each year. As for the volatility measure, I use the weekly volatility calculated before through the GARCH process and I calculate the average value for the year desired. For instance, to calculate the annual Sharpe ratio for 2021, I calculate the cumulative excess return between the S&P 500 and the risk-free rate, from the first week until the last of 2021, and I use the average value of the volatility for this year, calculated by the GARCH process. Given these two constituents, the Sharpe ratio is easily calculated, by dividing the cumulative differential return by the volatility. Table 6.2 contains a summary with the average values of the annual Sharpe ratios for different intervals of my analysis.

Table 6.2
Average of Annual Sharpe Ratios for S&P 500

	Period				
	2004-2021	2004-2008	2009-2014	2015-2019	2020-2021
Differential Returns	6.58%	-5.85%	11.43%	7.71%	20.25%
Volatility	2.1550%	2.1110%	2.2002%	1.8330%	2.6846%
Sharpe Ratio	**3.05**	**-2.65**	**5.20**	**4.21**	**7.54**

For the total period of the analysis (from 2004 to 2021), the average value of the annual Sharpe ratio for the US market is 3.05. The average differential returns between the S&P 500 and the risk-free rate for this period is 6.58% while the average volatility calculated through the average of the weekly volatilities is 2.16%. I notice that the returns of the market index are much higher than the risk-free rate given by the 10-year Treasury Notes, and the volatility for the excess returns is low. Both factors combined result in high annual Sharpe ratios for most of the period of the analysis.

To get a more detailed and isolated historical view of the risk-adjusted returns for the S&P 500, I divide the analysis into 4 periods and calculate the average of the annual Sharpe ratio for each of these intervals. In the first period, from 2004 to the end of 2008, the average of the annual excess returns is -5.85% and the volatility is 2.11%. Since the excess return is negative, the value of the Sharpe ratio is -2.65. From the 4 different periods analyzed within the 18 years, the first interval is the only one where the Sharpe ratio is negative. From 2009 until 2021, despite the lows and downs in the performance of the S&P 500 returns, the annual trends for the Sharpe ratio remains positive, revealing high values. In the period between 2009 to 2014, the average value of the annual ratio is higher, when compared with 2015-2019, but lower than in 2020 and 2021.

6.1.2. SSE Composite

To compute the Sharpe ratio for the SSE Composite I calculate the excess returns of the Chinese market index and I obtain the volatility for this excess returns.

I compute the differential returns by subtracting the yield on the 10-year maturity government bonds from the returns of the SSE Composite. When it comes to the volatility of the excess returns, I also calculate it through the GARCH process given by equation (4.7). To estimate the parameters of the GARCH model which gives me the conditional variance, I use again Stata, which provides the information present in Table 6.3:

Table 6.3
GARCH Model Summary for the SSE Composite Excess Returns

Model Parameters	Estimates	
	Coefficient	Standard Error
ARCH (1)	0.1168618 ***	0.0192300
GARCH (1)	0.8725752 ***	0.0190875
Constant	0.0000185 ***	0.0000069

Note. ***, **, * denote statistically significant at 1%, 5%, and 10% level.

When looking at the significance of each of the coefficients, I assume that all the variables are statistically significant to the model. Since the restrictions given by the GARCH (1,1) model are respected, that is $\omega > 0$; $\alpha \geq 0$; $\beta \geq 0$, and $\alpha + \beta < 1$, there is no reason to believe that the model is not correct and does not accurately calculate the conditional variance. Following the estimation of the parameters, I calculate the conditional variance in Stata. The average value for the volatility calculated through this conditional variance for the 939 observations is 3.14%. The maximum value for the volatility is 7.63%, being observed in the week of 08/06/2015, while the lowest value is observed in the week of 01/05/2017, with a value of 1.50%.

After calculating the weekly differential returns and the weekly volatilities, to calculate the weekly Sharpe ratio from 2004 to 2021, a simple division between the differential return and the volatility of each week is necessary. Figure 6.2 shows the weekly Sharpe ratio calculated for the SSE Composite.

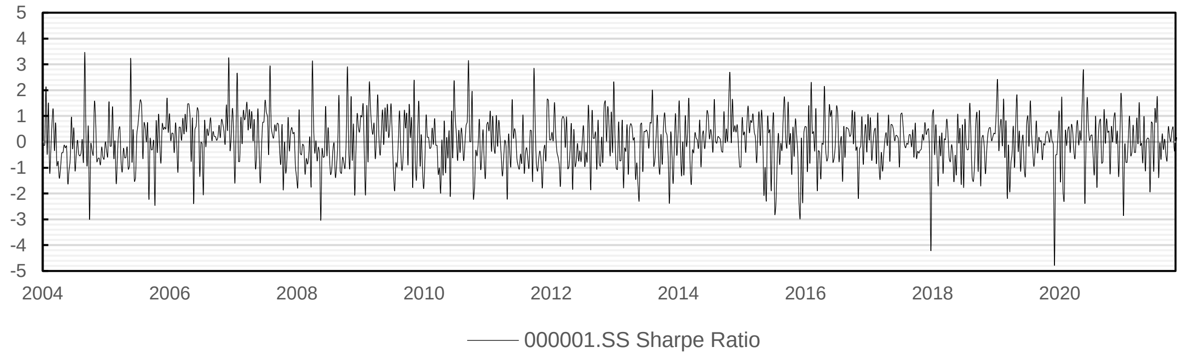

Figure 6.2. Weekly Sharpe Ratio for SSE Composite

As it can be seen, the trend for the Sharpe ratio is not constant through the period analyzed. During the 18 years, the ratio alternates between positive and negative values. For some intervals, like from 2006 to the end of 2007, the ratio has a positive trend, while during some periods the ratio has a negative tendency, for instance in the year 2008. However, most of the time the ratio varied very often between high positive values and negative values. The high variation of values is mostly due to the positive and negative returns of the SSE Composite which affects the excess return and consequently the Sharpe ratio.

To check whether the global trend of the Sharpe ratio for the SSE Composite is negative or positive, I compute the ex-post, or historic Sharpe ratio given by equation (4.4). In accordance, the value of the historic Sharpe ratio from 2004 to the end of 2021 is 0.02. This value, being close to 0, reveals that the average of the excess returns is low due to some negative returns of the market index, as well as the high value of the risk-free rate during some periods. Since volatility has an average value of 3.14%, it also has an impact on the value of the Sharpe ratio. The Sharpe ratio achieved its higher value in 13/09/2004, with 3.45, while the lowest value is -4.79, observed on 20/01/2020.

Similar to the case of the S&P 500, I also calculate the annual Sharpe ratios of the SSE Composite for the full period of the analysis. Table 6.4 presents the average of the annual Sharpe ratios for the SSE Composite for different intervals. I compute the average of the annual Sharpe ratios for the same periods used in the American index, and the process used is the same already described in the previous subsection.

Table 6.4
Average of Annual Sharpe Ratios for SSE Composite

	Period				
	2004-2021	2004-2008	2009-2014	2015-2019	2020-2021
Differential Returns	9.43%	23.40%	11.59%	-2.79%	-1.44%
Volatility	3.1446%	3.8926%	2.8556%	2.9838%	2.5403%
Sharpe Ratio	**3.00**	**6.01**	**4.06**	**-0.94**	**-0.57**

The average value of the annual Sharpe ratios for the entire period of the analysis is 3. When it comes to the differential returns for the full period, the 9.43% value means that in average, the returns of the SSE Composite are higher than the 10-year Chinese government bonds weekly returns. The average volatility of the 939 weekly observations is 3.14%. Since the excess return has a positive value, the Sharpe ratio for the 18 years is also positive.

Looking at the intervals where the average of the annual Sharpe ratios is separately calculated, I observe for which periods the annual risk-adjusted returns have a positive or negative trend, or even where it is higher or lower. For the first period, between 2004 and 2008, the average of the Sharpe ratio is 6.01. The average of the differential returns during this period is 23.4%, which is a relatively high value, and the volatility is 3.89%. Since the excess returns are high, caused by much higher returns of the SSE Composite when compared with the risk-free rate for China, and the volatility is low (compared with the differential returns), the Sharpe ratio has a relatively high value. In contrast to the positive average of the risk-adjusted returns for the first two periods, the next periods present a negative Sharpe ratio. The average value of -0.94 for the years between 2015 and 2019, and an average value of -0.57 for the last two years is mostly due to the negative differential returns. Despite the negative average of the annual ratios in the intervals between 2015 and 2021, the positive averages from 2004 to 2014 are high enough to present a positive value for the average of the annual Sharpe ratio of the SSE Composite for the full period of the analysis.

6.1.3. Sharpe Ratio Comparison: S&P 500 vs SSE Composite

Looking at the weekly Sharpe ratio calculated for the indices in the emerging and developed stock markets, there are some similarities between them but also some differences in performance and behavior. Even though both the S&P 500 and the SSE Composite have a positive average of the Sharpe ratio for the weekly observations between 2004 to the end of 2021, the historic Sharpe ratio of the S&P 500 is 0.06, while the value for the Chinese index is 0.02. The different characteristics of the volatility and the excess returns of both markets originated the distinct results in the historic and weekly values of the Sharpe ratio.

The differential returns for the American index and the SSE Composite are both positive but present different values. The average of the weekly excess return of the S&P 500 is almost double the excess returns of the SSE Composite (0.13% vs 0.06%). Despite the average returns of the American market index (0.18%) not being too high when compared with the returns of the SSE Composite (0.15%), the risk-free rate for China has a weekly average value of 0.08%, contrasting with the 0.05% for the United States. Then, the lower mean returns for the index and the higher mean returns of the risk-free rate is the reason for the lower weekly differential return in China.

Comparing the volatility of both markets, I conclude that the volatility of the excess returns of the American market is lower than the volatility of the Chinese market. While the mean value for the weekly volatility of the S&P 500, calculated through the conditional variance given by the GARCH process, is 2.15%, for the case of the SSE Composite the average value for the volatility of the excess returns is 3.14%. Figure 6.3 graphs the conditional volatilities of the excess returns for the indices of both markets.

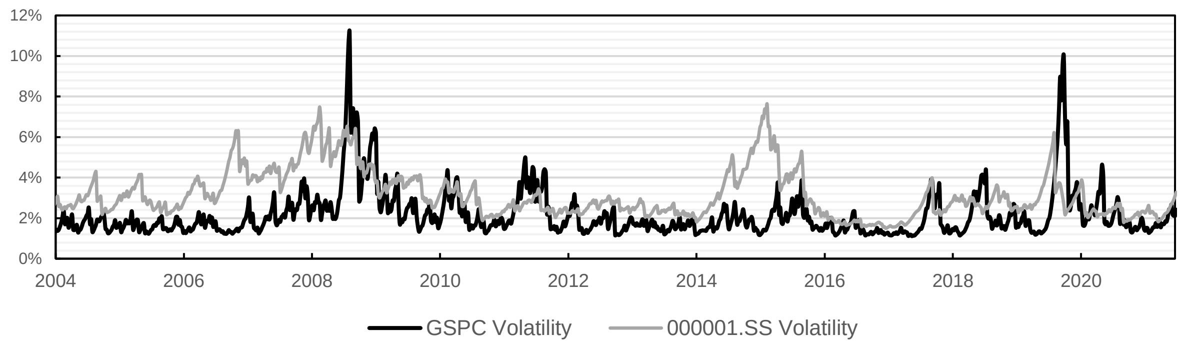

Figure 6.3. Conditional Volatility for S&P 500 and SSE Composite

The intervals where the volatility of the excess return had higher values is similar for the emerging and developed stock markets. Most of the time the volatility for China is higher when compared with the one from the excess returns of the S&P 500. However, during extremely high volatile periods, like in 2008 and in 2020, the volatility of the American excess returns is higher than the one of the SSE Composite. For the remaining periods, the volatility for the United States is more stable at a lower level when compared with the one from China. As it is presented in the literature review (e.g., Harvey, 1995; De Santis and İmrohoroğlu, 1997; Barry et al., 1998; Christoffersen et al., 2006; Andrade, 2009; Fernandes, 2009; Violi and Camerini, 2016), I confirm that the volatility in the emerging market is high compared to the volatility of the developed country.

When it comes to the historical Sharpe ratio for the S&P 500 and the SSE Composite, calculated using the cumulative excess returns for the period analyzed, the performance of the two indices during the period between 2004 to 2021 is significantly different. Table 6.5 presents the historical Sharpe ratios for both the S&P 500 and SSE Composite.

Table 6.5
Historical Sharpe Ratio for the US and Chinese Markets

Sharpe Ratio	Period				
	2004-2021	2004-2008	2009-2014	2015-2019	2020-2021
S&P 500	**74.13**	**-14.51**	**40.33**	**22.03**	**16.52**
SSE Composite	**3.52**	**-0.21**	**14.99**	**-6.43**	**-1.17**

Note. The historical Sharpe ratio is calculated using cumulative differential returns and the average of the weekly conditional volatilities for the period specified.

While the Sharpe ratio for the S&P 500 for the full period analyzed is 74.13, the performance of the SSE Composite is considerably lower, having a value of 3.52. Looking at the differential returns and the volatility for the two market indices it can be understood why the differences in the risk-adjusted returns are high. While the cumulative excess return for the full period of the S&P 500 is 159.75%, for the case of the SSE Composite it is only 11.07%. Just in this factor, there is a huge contrast between the two countries. For the case of the volatility, even if the contrast is not as significant as the excess returns, while the volatility is 2.15% for the American excess returns, for China the value is slightly higher, with a 3.14% volatility. Therefore, even if the differential return for the S&P 500 is much higher than the one from the SSE Composite, the volatility is lower for the American index. These two characteristics the S&P 500 showed in the 18 years confirm why its Sharpe ratio is high when compared with the one calculated for the Chinese market index. It can then be said that the developed stock market presents higher returns and a lower risk, that is, a higher risk-adjusted return, in comparison to the emerging stock market.

The historical Sharpe ratios calculated for the smaller intervals of time within the 18 years are not always positive or constant. For the first interval, between 2004 and 2008, the Sharpe ratio of the S&P 500 is negative, with a value of -14.51, due to the negative returns of the S&P 500. For the same period, the Sharpe ratio of the SSE Composite is also negative with a value of -0.21. In this first period of the analysis, the excess return for the American market index is -32.08%, while the differential return for the SSE Composite is -0.81%. In contrast to the first period, in the interval between 2009 and 2014, the Sharpe ratios for both markets have high values, with 40.33 for the S&P 500 and 14.99 for the SSE Composite.

However, for the following 2 intervals of the analysis, the trend of the Sharpe ratio is different for each of the market indices. While the S&P 500 has a positive Sharpe ratio of 22.03 and 16.52 for the periods between 2015-2019 and 2020-2021, the SSE Composite presents a distinct performance. Due to the negative excess returns of the SSE Composite, the Sharpe ratios for the periods between 2015-2019 and 2020-2021 were negative, with -6.43 and -1.17

respectively. The volatility of the S&P 500 was lower in the third period, while for the SSE Composite, the volatility had it lowest value in the period between 2020-2021.

Even if in the interval of time between 2004 and 2008 the Sharpe ratio for the S&P 500 is negative, the sustained high cumulative returns for this index between 2009 and 2021 generated high values for the Sharpe ratio which compensate for the negative returns of the first period. A different case is presented for the risk-adjusted returns of the SSE Composite, where, even if the Sharpe ratio presents a high value in the second interval, the negative returns of the index and the consequent negative values for the Sharpe ratio in the next periods decreases the value of the Sharpe ratio for the total period of the analysis. The period which mostly affects the overall performance of both the emerging and the developed stock markets is the period between 2009 and 2014, since it is during this period that the Sharpe ratio has high positive values for the S&P 500 and the SSE Composite.

Due to the higher differential returns and because of the lower volatility of the excess returns, the S&P 500 presents a higher Sharpe ratio in contrast to the one of the SSE Composite. As I already referred, previous literature about emerging markets agree that volatility is higher in these markets, but the returns are also higher when compared with the developed markets (e.g., Barry et al., 1998; Salomons and Grootveld, 2003; Violi and Camerini, 2016; Hadhri and Ftiti, 2019). Whilst in my analysis I find that the volatility of the Chinese market is higher than the one from the American market, for the case of the returns of the indices of both markets, the return is higher for the S&P 500, the index for the developed market.

Even if the results that I achieved are not in accordance with some studies done before (e.g., Arora et al., 2009; Conover et al., 2012), I have to conclude that the developed stock market has a higher risk-adjusted return in comparison to the performance of the emerging stock market. For this reason, I reject the first hypothesis formulated in this thesis which suggests that emerging stock markets have higher risk-adjusted returns than developed stock markets.

6.2. Regression Analysis

To better understand the factors that affect the Sharpe ratio of the S&P 500 and the SSE Composite, I use multilinear regression analysis for both indices, and I interpret the output obtained.

The dependent variable of the multilinear regressions considered for both countries is the weekly Sharpe ratio of each market index. The chosen independent variables are sustained in the literature review presented in the second section. As I identified previously in this thesis, there are three main types of determinants that affect the performance of both emerging and developed stock markets: the macroeconomic factors; financial market factors; and the contagion and correlation. The macroeconomic factors used as independent variables are: the economic growth (GDP percentage change); the inflation, based on the CPI for each country; and the interest rates, which is the federal funds effective rate for the US, and the discount rate for the case of China. The financial market factors included in the regression as explanatories are also three: the yield on the 10-year government bonds of each country; the liquidity of each market, through the volume of transactions in the index analyzed; and the P/E ratio. The VIX index for the two markets; and the SSE Composite returns, for the case of the US regression, and the returns of S&P 500 for the case of China, are the other two factors added in the regression analysis, representing the contagion and the correlation factors.

6.2.1. Developed Stock Market: United States

Using the weekly Sharpe ratio calculated from 2004 to 2021 for the S&P 500 and using the data collected for the previously mentioned explanatory variables related to the United States, I calculate the information related to the regression analysis. The estimations and statistics are in Table 6.6.

Table 6.6
Multiple Linear Regression Results Summary for the United States Market

Observations	939	R-Squared	0.1000
Prob > F	0.0000	Adjusted R-Squared	0.0922

Explanatory Variables	Estimates	
	Coefficient	Standard Error
GDP	-39.429020 *	23.709180
Inflation	-108.03230 ***	34.932200
Interest Rates	-0.8228787	2.8808020
10-year T-bonds	-441.89420 **	221.35200
Liquidity	0.0000000 *	0.0000000
P/E Ratio	0.0067877 ***	0.0020935
VIX	-0.0363929 ***	0.0051835
SSE Composite Returns	4.3906860 ***	0.9941325
Constant	0.7609824 ***	0.1632277

Note. ***, **, * denote statistically significant at 1%, 5%, and 10% level.

When looking at the F statistic, I confirm that the model is statistically significant. Since the value for this statistic is almost 0, the independent variables have enough explanatory power in the model. However, looking at the R-squared, it can be seen that this value is low, since 0.1 is much smaller than 1. This low value means that the explanatory variables chosen only account for 10% of the variation of the Sharpe ratio, with the other 90% not explained by the model. The low value for this statistic is due to the fact that the stock market has other factors which affect its returns that cannot be explained, like human behavior. For this reason, the low R-squared value has not a significant impact on the interpretation of the weak or strong goodness of fit of the model.

With regards to the independent variables which are relevant to the explanation of the Sharpe ratio of the S&P 500, I look at the p-values of each variable. As seen in Table 6.6, all the variables, except for the Interest Rates, are significant at the 10% significance level. The variable which refers to the 10-year Treasury Notes is significant with 95% confidence too, while the variables related with the Inflation, P/E, VIX and the SSE Composite returns are all significant also at 1% significance level.

To confirm if the model is statistically significant and if all the explanatory variables, except the Interest Rate, are relevant for the explanation of the S&P 500 Sharpe ratio, it is important to check if there is autocorrelation in the model. To check for autocorrelation in the residuals of the linear regression, I have performed the Durbin-Watson statistic. The value obtained for this statistic is 2.15. Since this value is close to 2, which is the value that detects no autocorrelation in the model, I conclude that no significant autocorrelation exists in the model.

For the case of the economic growth, the liquidity, and the 10-year Treasury Notes, the statistical significance is not as high as for the remaining variables. Nevertheless, for the economic growth, represented by the GDP percentage change, the coefficient estimated for the model is -39.43. This negative value means that economic growth negatively impacts the performance of the Sharpe ratio. When it comes to the liquidity, represented by the data collected on the weekly volume traded in the S&P 500, the coefficient estimated for this variable is very close to 0, but still positive. The liquidity of the market has a positive effect on the risk-adjusted returns of the S&P 500. For the estimation of the coefficient of the 10-year Treasury Notes, it is obtained -441.89. The negative value suggests that the higher the value of the Treasury Notes is, the lower the Sharpe ratio. This value makes sense since the higher is the risk-free rate (calculated through the yield on the 10-year Treasury Notes), the lower is the differential returns and the lower is the Sharpe ratio.

Analyzing the estimations for the inflation variable, calculated with data for the Consumer Price Index of the US, I observe that the coefficient given is -108.03. The negative value reflects the negative impact that inflation has on the risk-adjusted returns. Looking at the price-to-earnings ratio, the value of the coefficient for this explanatory variable is positive, which means that the price-to-earnings ratio has a positive impact on the S&P 500 risk-adjusted returns.

When it comes to the correlation and contagion explanatory variables, the p-values for these two variables are very low, meaning that they have a significant impact in the performance of the S&P 500. The coefficient estimated for the VIX, which measures the expectations of volatility for the US market, is negative, with a value of -0.04. The negative relation between the VIX and the Sharpe ratio can be explained by the fear of investors towards the markets, which increases volatility and decreases the risk-adjusted returns. The coefficient estimated for the last variable, which is the weekly returns of the SSE Composite, is 4.39. The coefficient given by the model suggests that the returns of the Chinese stock market had a positive influence on the Sharpe ratio of the S&P 500.

As a result of the coefficients and the p-values estimated for the independent variables of my model, I conclude that economic growth and inflation are two macroeconomic factors that affect the risk-adjusted returns of the developed stock market. The 10-year Treasury Notes, the liquidity, and the price-to-earnings are three factors of the financial market that are important to explain the Sharpe ratio of the S&P 500. I also conclude that the VIX and the SSE Composite are two factors that explain the contagion and correlation of the developed stock market and impact its performance.

6.2.2. Emerging Stock Market: China

I now calculate the coefficient and statistics of the multilinear regression using the weekly Sharpe ratio of the SSE Composite as the dependent variable and using as independent variables the factors that I already described. Table 6.7 contains the information related with the estimations and statistics of the multilinear regression.

Table 6.7
Multiple Linear Regression Results Summary for the Chinese Market

Observations	939	R-Squared	0.0866
Prob > F	0.0000	Adjusted R-Squared	0.0787

Explanatory Variables	Estimates	
	Coefficient	Standard Error
GDP	40.166640 **	19.39044
Inflation	43.685270 *	23.19808
Interest Rates	-12.739130	10.87983
10-year Bonds	-36.441520 ***	7.931855
Liquidity	0.0000001 ***	0.000000
P/E Ratio	0.0019750	0.0035235
VIX	-0.0053846	0.0036551
S&P 500 Returns	7.9014260 ***	1.3635310
Constant	0.2578415	0.3515642

Note. ***, **, * denote statistically significant at 1%, 5%, and 10% level.

As seen from the output given by the software used to calculate the information related to my regression, the F-statistic value is quite near zero, which states that the model is statistically significant. Like in the case of the previous regression, I conclude that the independent variables have a solid explanatory power in the model. Nevertheless, the R-squared is 0.0866, which means that the independent variables of the model only explain 8.66% of the variation of the Sharpe ratio of the SSE Composite.

It is important to check if in the model there is autocorrelation and heteroscedasticity. Using the Durbin-Watson statistic to check for autocorrelation, the value obtained is 2.03. Since this value is very close to 2, I conclude that significant autocorrelation exists in the model. To check for heteroscedasticity in the model, I perform the Breusch-Pagan test. The p-value given by this test is 0.90, which means that the null hypothesis of homoscedasticity is not rejected. It can then be assumed that the model is not heteroscedastic, so I can rely upon the information calculated for the model.

Regarding the 8 independent variables included in my multilinear regression, some of them are not statistically significant for the model, while others have significant explanatory power. For the case of the interest rates, given by the discount rate for China, the Price-to-earnings ratio of the SSE Composite, and the VIX, which shows the fear of investors and the expected volatility in the US market, the p-value of these three variables is higher than 0.1. For this reason, these factors are not statistically significant for the explanation of the Sharpe ratio of the SSE Composite. For the remaining 5 variables, the p-value is lower than 0.1, and for that reason, I assume that these variables are statistically significant at a 10% significance level. While the economic growth (GDP) indicator is also significant with 95% confidence, the 10-year government bonds, the liquidity and the S&P 500 returns are also significant at a 1% significance level.

This being said, the value of the coefficient estimated by Stata for the independent variable inflation is 43.69. This positive value for the coefficient reveals that inflation has a positive impact on the Sharpe ratio of the SSE Composite. The higher the inflation, the higher the Sharpe ratio tends to be. For the other macroeconomic factor, namely the GDP percentage change, the value of the coefficient estimated is also positive. It can then be concluded that economic growth also has a positive impact on the variation of the risk-adjusted returns of the SSE Composite. The positive values calculated for the coefficients of these two macroeconomic factors reflect that they have a higher impact on the returns of the SSE Composite than they have on the risk-free rate for China.

According to the information given by the multilinear regression, the coefficient calculated for the 10-year government bonds of China has a negative value of -36.44. This negative relation between the government bonds and the Sharpe ratio for China suggests that the lower the yield for the government debt is, the higher the risk-adjusted return. This conclusion is in accordance with the fact that the risk-free rate for China is calculated using the yield on the 10-year government bond. Since a lower risk-free rate generates a higher excess return, the Sharpe ratio varies in the opposite direction to the risk-free rate. As depicted in Table 6.7, the coefficient calculated for the liquidity variable, measured by the trading volume of the SSE Composite, is very close to zero but it is a positive value. The reason for the low value of this coefficient is due to the high values of the data collected for the weekly transactions of the market index. It can be concluded that the liquidity of the SSE Composite has a positive impact on the Sharpe ratio of the Chinese market index. Finally, even if the VIX variable is not statistically significant for the model, the S&P 500 returns is an explanatory variable that can prove if there is a correlation and contagion effect on the Chinese stock market. Since the coefficient calculated for the S&P 500 returns is positive, the returns of the American market have a positive impact on the performance of the SSE Composite.

With this analysis, I conclude that the economic growth and the inflation in China are two macroeconomic factors that affect the Sharpe ratio of the SSE Composite positively. When it comes to the financial market factors, I deduce that the government bonds for China and the liquidity of the market are significant to the performance of the Sharpe ratio. Even if the VIX does not have a relevant impact in the Chinese market index, the returns of the S&P 500 impact positively the risk-adjusted returns of the SSE Composite, showing a correlation and a contagion effect. These results are in accordance with some papers which studied the factors that affect the returns and the volatility of the emerging stock markets (e.g., Ladekarl and Zervos, 2004; Önder and Simga-Mugan, 2006; Coudert et al., 2015; Ramraika and Trivedi, 2015; Chowdhury et al., 2018).

6.2.3. Regression Analysis Comparison: Unites States vs China

As I just presented in the two previous subsections, the two different multilinear regressions introduce different results for the case of the developed and the emerging stock markets. While similarities exist in some of the factors affecting the Sharpe ratio for the S&P 500 and the SSE Composite, in other factors the significance and the relation of the independent variables with the dependent variable of both regression analyses vary.

Looking at the GDP explanatory variable calculated for both regressions, it can be seen that for the US model, the coefficient of the value is negative while the coefficient calculated for the regression related to the SSE Composite is positive. It is possible to see that the impact that the economic growth has on the Sharpe ratio on both markets is different. For the case of the inflation variable, the results given by the model are similar to those of the economic growth. While the inflation in the US has a negative impact on the Sharpe ratio of the S&P

500, the inflation in China has a positive impact on the Sharpe ratio of the SSE Composite. For both multilinear regressions, the interest rates for both countries are not statistically significant for the two models. I then assume that the economic growth and the inflation are the only two macroeconomic important variables to the performance of the market indices, even if the impact that they have on the Sharpe ratio of the S&P 500 is the opposite of the SSE Composite.

When it comes to the financial market factors, the results presented by the two models are similar for the developed and the emerging stock markets. The coefficients calculated for the two multilinear regressions are negative for the case of the 10-year government bonds. The 10-year Treasury Notes of the US, as well as the 10-year government debt of China, have a negative impact in the Sharpe ratio of the two markets; the lower the yield of the 10-year government debt is, the higher is the Sharpe ratio. The liquidity variable has a positive impact on the performance of the risk-adjusted returns of both the S&P 500 and the SSE Composite. Even if the coefficient calculated for the two regressions is low, the value is positive, indicating a positive impact of the volume of transactions on the Sharpe ratios. For the case of the price-to-earnings explanatory variable, while in the regression related to the US market it is a statistically significant variable for the model, for the Chinese market this variable is not statistically significant. It can be said that the price-to-earnings ratio has a positive impact on the Sharpe ratio of the S&P 500 since the coefficient calculated for this variable is positive. I conclude that the three financial market factors integrated with my model are important for the explanation of the performance of the S&P 500, while only the 10-year government debt and the liquidity have a significant impact on the variation of the Sharpe ratio for China.

For the variables which could suggest correlation and contagion effects between the two markets, I chose the VIX and the returns of the S&P 500, for the case of the SSE Composite Sharpe ratio, and the SSE Composite returns, for the case of the performance of the US market. As seen in the results presented above, the VIX is only statistically significant in the US market. With a negative coefficient, it is expected that the higher the VIX is, the lower the Sharpe ratio of the S&P 500. Looking at the explanatory variable which reflects the impact of the SSE Composite returns on the performance of the S&P 500, the coefficient computed for this variable is positive. I assume that there is a positive impact on the Sharpe ratio of the S&P 500 derived from the returns of the Chinese market index. The relation between the returns of the S&P 500 and the performance of the SSE Composite is similar to the one described for the US regression analysis. Since the coefficient of the S&P 500 returns is positive, I conclude that the returns of the American index market have a positive impact in the risk-adjusted returns of the SSE Composite.

As concluding remarks, for both the emerging and the developed stock markets, the macroeconomic factors, the financial market factors, and the correlation and contagion effects have an impact on the Sharpe ratios of the S&P 500 and the SSE Composite. Even if not all the variables chosen for the models are statistically significant, for all the three types of factors there is at least one explanatory variable which is important to explain the variation of the performance of the market indices of the two countries. As I presented, the macroeconomic factors have an opposite impact in the Sharpe ratio of the US market than they have on the Sharpe ratio of China. However, in the case of the financial market and the correlation and contagion effects, the relation between these factors and the risk-adjusted returns is very similar.

I conclude that the factors which have a significant impact on the risk-adjusted returns of the developed and the emerging stock markets are the macroeconomic factors, the financial market characteristics, and the correlation and contagion effects. Since my analysis shows that the macroeconomic factors, the characteristics of the financial market and the correlation between the markets are important to explain the performance of both the S&P 500 and the SSE Composite, I have to conclude that the second, third and fourth hypothesis suggested in this thesis are accepted.

7. Conclusions

Emerging stock markets is an important topic in the world of finance that has been studied in the past years. In this thesis, I give my contribution to the study of this theme by comparing the risk-adjusted returns of the emerging with the developed stock markets, and by analyzing the factors which affect the performance of each market.

Since a significant part of the literature has focused on the diversification benefits of integrating emerging markets into an international portfolio, my study takes a different direction by evaluating the performance of both the emerging and the developed stock markets separately. When it comes to analyzing the factors that affect the performance of the two markets, the main goal is to establish similarities and find the different characteristics of the markets that impact the risk-adjusted returns. The two markets analyzed are the Chinese market, which represents the emerging stock market, and the American market, which represents the developed stock market.

When comparing the risk-adjusted returns of both the emerging and the developed stock markets, I conclude that, for the period between 2004 and 2021, the risk-adjusted returns of the S&P 500 are higher than those of the SSE Composite. By calculating the weekly Sharpe ratio for each of the market indices, the empirical results show that the US market index has a better performance for the total period of the analysis, mostly due to the higher returns and the lower volatilities compared with those of the Chinese market index. Even if for some intervals the SSE Composite has a higher Sharpe ratio than the S&P 500, for the total period of the analysis, the risk-adjusted return of the developed stock market is significantly higher. These results are not in accordance with previous studies which suggest that the risk-adjusted returns of the emerging stock markets are higher than those of the developed markets (e.g., Arora et al., 2009; Conover et al., 2012).

Regarding the factors affecting the performance of both the emerging and the developed stock markets, I find that the financial market characteristics, the macroeconomic factors, and the correlation/contagion have an impact in the risk-adjusted returns of the two markets. These findings are in accordance with the results presented by other authors. By performing a multilinear regression for each of the markets, where the dependent variable is the weekly Sharpe ratio of the market index, I deduce that all the three types of factors influence the performance of the S&P 500 and the SSE Composite.

These results underline some aspects of the emerging and the developed stock markets. First, the developed stock market has higher risk-adjusted returns than the emerging stock market. Second, the factors which impact the performance of the stock market are the same for both emerging and developed markets. This dissertation gives a contribution to the study of the emerging stock markets by analyzing the risk-adjusted returns of this market with a developed one separately. Even if most of the previous studies conclude that the emerging stock markets offer better performance than the developed stock markets, this study presents a different conclusion: during the 18-year analyzed, the S&P 500 has a higher and more sustained risk-adjusted return than the SSE Composite.

Considering that this study uses as representatives for the emerging and developed markets, China and the United States respectively, the conclusions taken do not allow generalizations about the better performance of all the developed stock markets compared to the emerging ones. Even if these are the world's largest economies, it should not be forgotten that specific circumstances in the world's markets and within these two countries could have an impact on the performance of the stock market during certain periods.

For future research on the emerging stock markets topic, I suggest that the indices chosen to compare the emerging and the developed stock markets include more countries or regions since it would decrease the presence of specific events in the analysis. A larger data sample could also provide more robust results. It would be interesting to see future studies integrating other variables in the regression analysis of the risk-adjusted returns of both markets, by adding other factors like the influence of news, and political stability, instead of only including financial and economic factors.

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Annexes

Annex A – Complementary Graphs

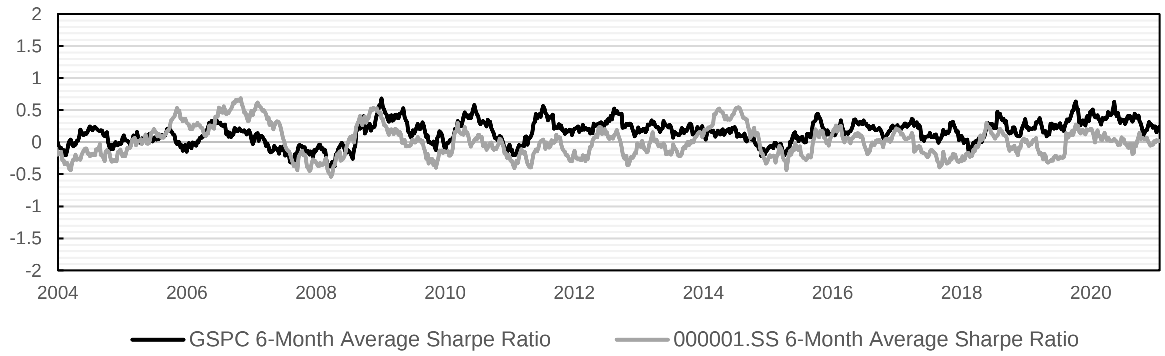

Figure A.1. Sharpe Ratio for S&P 500 and SSE Composite

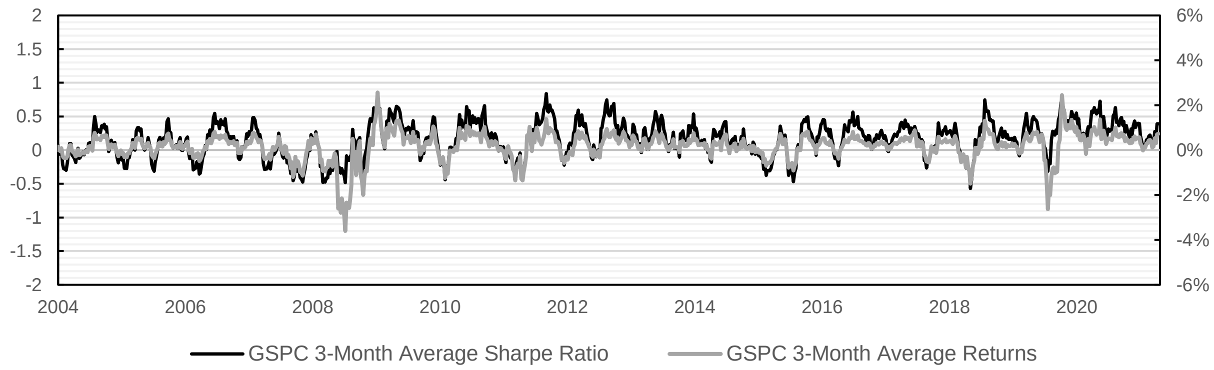

Figure A.2.Sharpe Ratio and Returns for S&P 500

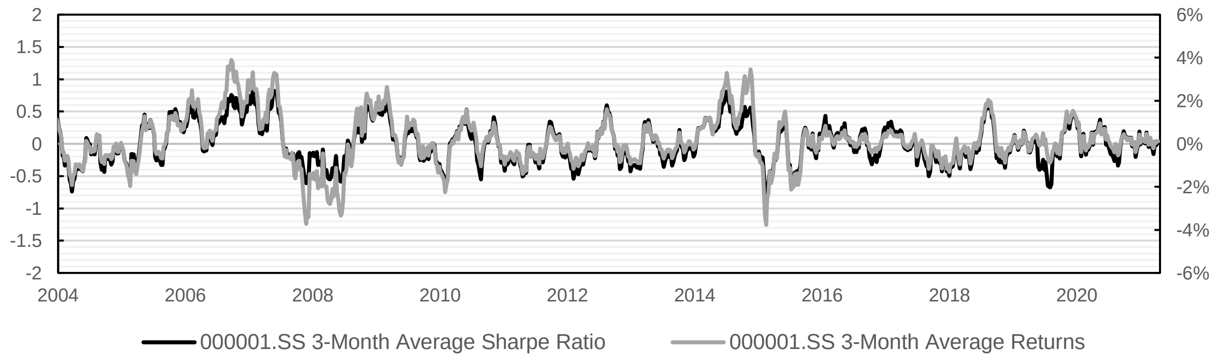

Figure A.3. Sharpe Ratio and Returns for SSE Composite

Figure A.4. Sharpe Ratio and Volatility for S&P 500

Figure A.5. Sharpe Ratio and Volatility for SSE Composite

Annex B – Complementary Tables

Table B.1
Historical Sharpe Ratio for S&P 500

	Period				
	2004-2021	2004-2008	2009-2014	2015-2019	2020-2021
Differential Returns[a]	159.75%	-32.08%	88.70%	40.42%	44.34%
Volatility[b]	2.1549%	2.2108%	2.1990%	1.8349%	2.6846%
Sharpe Ratio	**74.13**	**-14.51**	**40.33**	**22.03**	**16.52**

Note. [a] The differential returns for the periods indicated are calculated with the cumulative weekly excess returns. [b] The volatility is calculated using the average value of the weekly conditional volatilities for the period specified.

Table B.2
Historical Sharpe Ratio for SSE Composite

	Period				
	2004-2021	2004-2008	2009-2014	2015-2019	2020-2021
Differential Returns[a]	11.07%	-0.81%	42.80%	-19.19%	-2.97%
Volatility[b]	3.1446%	3.8926%	2.8556%	2.9838%	2.5403%
Sharpe Ratio	**3.52**	**-0.21**	**14.99**	**-6.43**	**-1.17**

Note. [a] The differential returns for the periods indicated are calculated with the cumulative weekly excess returns. [b] The volatility is calculated using the average value of the weekly conditional volatilities for the period specified.

Table B.3
Annual Sharpe Ratio for S&P 500

	Period																	
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Differential Returns[a]	4.8%	-1.2%	8.4%	-4.9%	-36%	15.9%	9.2%	-2.7%	14.5%	22%	9.6%	-2.7%	7.5%	16.7%	-8%	25%	15%	25.4%
Volatility[b]	1.71%	1.62%	1.56%	2.16%	4%	3.02%	2.27%	2.77%	1.82%	1.57%	1.75%	2.1%	1.65%	1.33%	2.34%	1.75%	3.56%	1.81%
Sharpe Ratio	**2.84**	**-0.76**	**5.4**	**-2.3**	**-9.08**	**5.27**	**4.09**	**-0.99**	**7.96**	**14**	**5.48**	**-1.32**	**4.58**	**12.6**	**-3.43**	**14.37**	**4.24**	**14.03**

Note. [a] The differential returns for each year are calculated with the cumulative weekly excess returns. [b] The volatility is calculated using the average value of the weekly conditional volatilities for the year specified.

Table B.4
Annual Sharpe Ratio for SSE Composite

	Period																	
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Differential Returns[a]	-20%	-11.7%	124%	92.6%	-67.4%	74.2%	-17.2%	-24.6%	-0.02%	-11.9%	49.1%	5.8%	-14.8%	2.8%	-26.7%	18.8%	-4.6%	1.71%
Volatility[b]	2.81%	2.91%	3.73%	4.35%	5.66%	3.75%	2.98%	2.56%	2.52%	2.45%	2.88%	5.1%	2.14%	1.89%	2.73%	3.07%	2.8%	2.29%
Sharpe Ratio	**-7.11**	**-4.05**	**33.16**	**21.29**	**-11.9**	**19.77**	**-5.77**	**-9.63**	**-0.01**	**-4.85**	**17.06**	**1.14**	**-6.92**	**1.52**	**-9.78**	**6.13**	**-1.64**	**0.75**

Note. [a] The differential returns for each year are calculated with the cumulative weekly excess returns. [b] The volatility is calculated using the average value of the weekly conditional volatilities for the year specified.