WHICH FACTORS IN BRICS?

Jyväskylä University
School of Business and Economics

Master's Thesis

2022

Author: Béla Papp
Subject: Banking and International Finance
Supervisor: Heikki Lehkonen

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

ABSTRACT

Author
Béla Papp

Title
Which Factors in BRICS?

Subject	Type of work
Banking and International Finance	Master's thesis
Date	Number of pages
26.4.2022	47

Abstract

Using several factors and anomaly variables, I examine the risk premiums and factor models for dominance in the BRICS countries from 2004 to 2020. In this study, I use factor spanning tests in the form of a linear regression to identify if there is a dominant factor model for the BRICS countries and if it deviates from the US. The linear regression is used to identify if the independent variables of a factor model can explain the dependant variable of another model's factor(s). The results reveal that there is no single factor model that can dominate in the BRICS countries, but rather model dominance is unique for each country. The explanatory power of the factors is found to deviate from the US. The results suggest that certain pricing information related to risk premiums and mispricing are covered within the common Fama and French factors in the BRICS countries, but not in the US. This means that in the BRICS countries the more common factors related to risk contain more pricing information about anomalies such as mispricing.

Key words
Factor Model; Risk Premium; Anomaly Variable; Mispricing; BRICS

Place of storage
Jyväskylä University Library

TIIVISTELMÄ

Tekijä
Béla Papp

Työn nimi
Which Factors in BRICS?

Oppiaine	Työn laji
Banking and International Finance	Pro gradu tutkielma
Päivämäärä 26.4.2022	Sivumäärä 47

Tiivistelmä

Tässä Pro gradu tutkielmassa käytetään erilaisia faktoreita ja anomaaleja, joilla tutkitaan faktorimalleja ja riskipreemioita. Tutkimuksen tarkoituksena on selventää, että onko BRICS maissa dominoivaa faktorimallia. Tutkimuksessa käytetään lineaarista regressio mallia, jolla voidaan todentaa, pystyykö tietty faktorimalli dominoimaan toisen faktorimallin faktoreita ja kuinka tulokset poikkeavat Yhdysvalloista. Tulosten mukaan BRICS maissa ei ole yhtä dominoivaa faktorimallia, vaan faktorimallien dominointi on maakohtainen. Tämän Pro gradun tuloksista selviää, että tiettyjen faktoreiden hinnoittelutiedot kohdistuen preemioihin ja väärinhinnoitteluun eroavat merkittävästi BRICS maiden ja Yhdysvaltojen välillä.

Asiasanat
Faktorimalli; Riski Preemio; Anomaali; Väärinhinnoittelu; BRICS

Säilytyspaikka
Jyväskylän Yliopisto

CONTENTS

LIST OF TABLES AND FIGURES

Tables and figures

1 INTRODUCTION

The topic of this master's thesis is based on asset pricing factor models that have experienced wide attention since the 1960s from both academics and practitioners. This has enabled the pursuit of explaining the average cross-sectional returns on equity investments. Empirical analysis has shown that different risk factors and anomaly variables used in asset pricing models have been able to give some explanation regarding the average cross-sectional returns in equities. Factor models containing these variables are valued by researchers due to their simplicity.

There exists a wide array of academic publications and studies regarding factor models and how they can explain the average cross-section of equity returns in developed economies. These empirical analyses have explored the explanatory powers of various factors and how they are able to give some explanation to the developed economies equity returns. There, however, exists a gap in literature when it comes to the explanation of equity returns in the emerging markets. Hence, the purpose of this master's thesis is to study and extend the current literature as it pertains to the dominance of factor models in the BRICS countries.

The research questions can be specified as:

- Which factors have the highest risk premiums in the BRICS countries and are they dependent on time?
- Is there a dominant factor model for the BRICS countries or is it country specific?
- Are the BRICS countries' factors and models correlated with the US in terms of their dominance and premium?

Emerging markets are becoming an increasingly important area for portfolio investors. Investors looking to diversify their current portfolios need to be able to understand the emerging market equities, how they function, and be aware of how they differ from developed economies to be fully informed. Factor models can give some explanation of the behaviour of these equities. This allows portfolio investors to examine which factors are best able to explain the cross-section of equity returns in these markets.

There are differences in the equity returns between the emerging and more developed markets. Harvey (1995) argues that the returns in the emerging markets are often more predictable than the developed market returns. Harvey (1995) also argues that the emerging market returns are more influenced by the local instead of global information variables. This pertains to the idea that the emerging markets are more divided from the world capital markets. It is also argued by Fama and French (1997) that the emerging market returns are more volatile compared to more developed economies in terms of the standard deviation of returns. In terms of anomaly variables studied in factor models, it has been

found by Cakici, Fabozzi and Tan (2013) that there is a stronger value effect in the emerging markets when compared to more developed markets such as the US. This suggests that portfolios of value stocks in the emerging markets have a higher magnitude in returns when compared to more developed markets. Cakici et. al (2013) also present data that suggests that there is a stronger momentum effect in the emerging markets.

The current economic climate around the globe surrounded by the Covid-19 pandemic also presents a crucial opportunity within the emerging markets. Ahmed and Zlate (2014) discuss the surge in net private capital flows to the emerging market economies after the global financial crisis. This further elaborates the importance of fully understanding how equities function and which factors can be used to determine the behaviour. This proposes the idea that more portfolio investors would look to the emerging markets following a crisis period. With an increased investment amount within the emerging markets, the knowledge of behaviour and information within these markets becomes even more valued.

This master's thesis is going to focus on the BRICS countries. BRICS is an acronym used for the emerging markets of Brazil, Russia, India, China, and South Africa. These countries are the fastest growing emerging market economies and are on the path to becoming developed economies. Figure 1 shows the annual percentage growth of each BRICS country's GDP growth for the last 10 years.

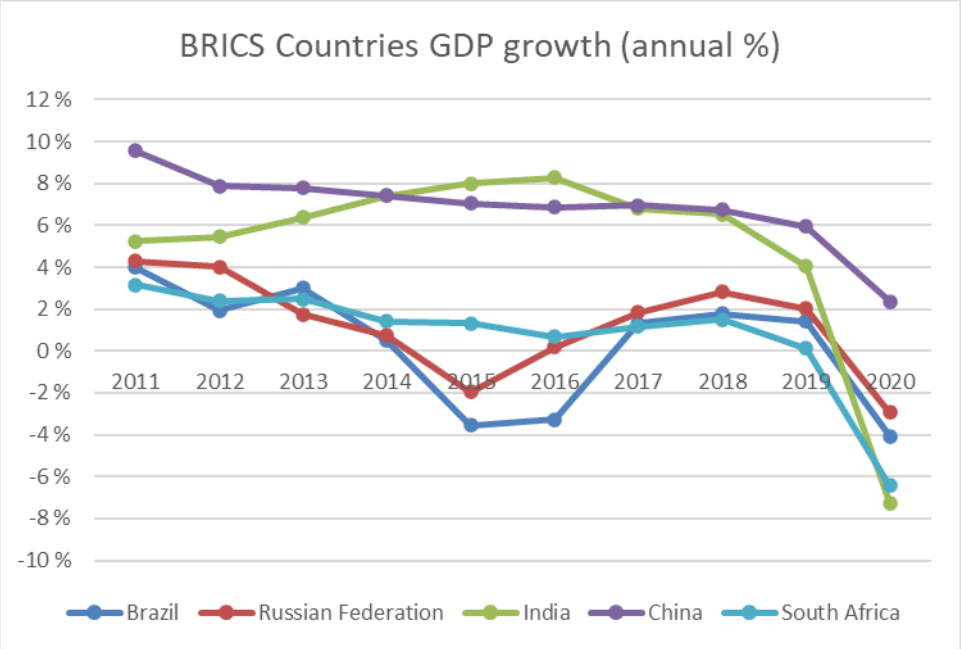

Figure 1. BRICS Countries GDP growth (annual %)
Source: World Development Indicators by World Bank Group.

It is evident that the Covid-19 pandemic has influenced each country's GDP growth. However, prior to the Covid-19 pandemic most of the countries experienced an upward and a stagnant growth in their GDP. A comparison of BRICS and other emerging market economies (EMEs) can be found in Figure 2. The other emerging market economies in this case consist of the average GDP growth for countries listed as EMEs by IMF (International Monetary Fund). In terms of the GDP growth, it becomes evident that the BRICS countries and other EMEs have a very similar trend. It is also noted that there is not much difference in terms of the annual GDP growth between the pair.

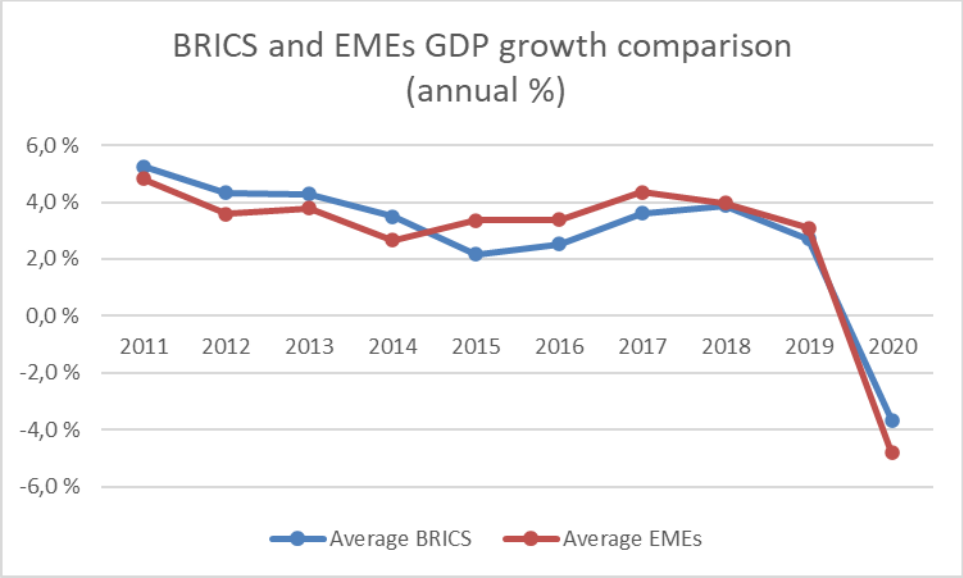

Figure 2. BRICS and EMEs GDP growth comparison (annual %)
Source: World Development Indicators by World Bank Group.

The fundamental difference between the BRICS countries and the other EMEs stems from the foreign direct investment, net inflows. This is illustrated in Figure 3, which shows the large difference in terms of the dollar amount that the BRICS countries receive in investment equity flows. To further illustrate this investment opportunity, Çepni, Gül, Hacıhasanoğlu and Yilmaz (2020) argue that there exists causality between the portfolio inflows and uncertainty in the BRICS countries that can provide both investment and diversification opportunities for investors.

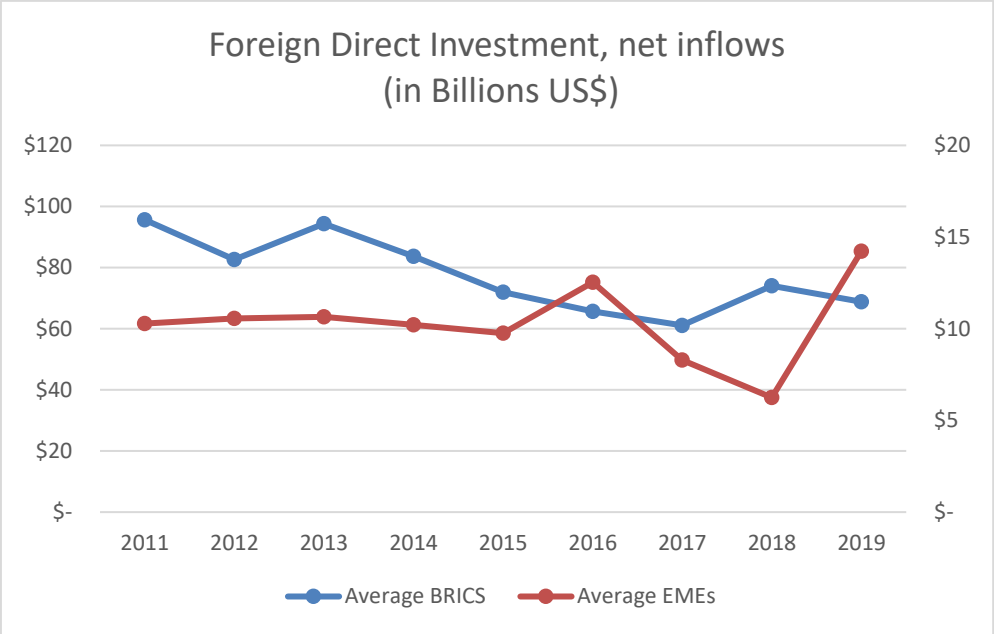

Figure 3. Foreign Direct Investment, net inflows (in Billions of US$)
Source: World Development Indicators by World Bank Group.

2 THEORETICAL FRAMEWORK

This topic belongs to the field of empirical finance. It is based on the modern portfolio theory by Harry Markowitz (1952). Markowitz (1952) theorized the concept that investors have certain beliefs when it comes to their choice of a portfolio. It summarizes how investors want to maximize their expected and or anticipated returns while minimizing the variance of their returns. This is something that can be achieved through diversification among the equities that are expected to yield the highest returns with the lowest variances. Investors therefore have a choice that allows them to choose various combinations of stocks with expected returns and variances for their portfolios. This theory of expected returns and maximizing utility is what led to the discovery of the famous capital asset pricing model (CAPM) by Sharpe (1964) and Lintner (1965).

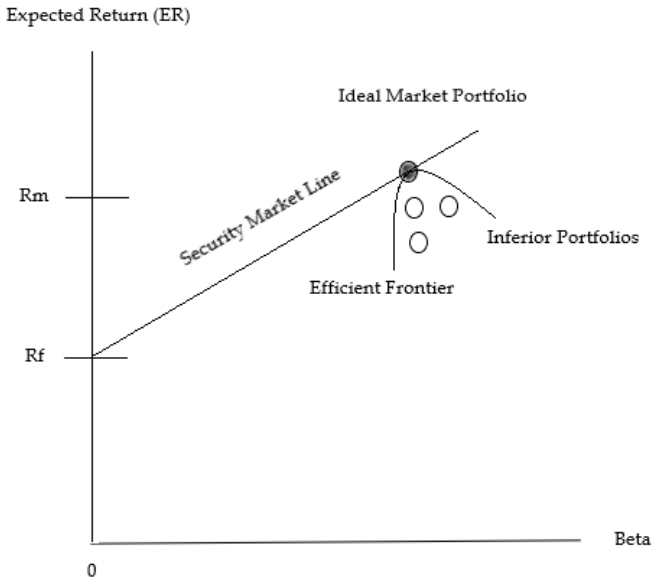

Figure 4. Capital Asset Pricing Model (CAPM)

Sharpe (1964) argues that if investors follow a rational procedure, then they can accomplish their preferred spot on the security market line. This means that investors can obtain a higher expected rate of return for their portfolio of stocks only by taking on additional risk. As the expected rate of return increases, so does the variance of their returns. This concept can be represented by an investor's total utility function. Sharpe (1964) describes the total utility function as the function that considers two parameters: the expected value and standard deviation. In this function the expected value is the wealth that the investor is expecting for the future and the standard deviation refers to the possible divergence of the actual future wealth from the expected. In simple terms, investors want to maximize their utility function to receive a desirable outcome. This theory of maximizing the total utility function ties in with Lintner´s (1965) argument that

the expected rate of return for any stock will be a linear function. The combination of Sharpe (1964) and Lintner (1965) publications formulated the most widely known asset pricing model of CAPM. The CAPM is a single factor model that calculates the expected rate of return in the following way:

$$(1) \qquad ER_i = R_f + \beta_i(ER_m - R_f)$$

Equation 1 shows that the expected return is based on the risk-free rate (R_f), Beta (β) of a stock, which is the slope of the regression of a stock´s return to the market return, as well as the risk premium (ER_m-R_f) defined as the difference between the expected market return and the risk-free rate. The CAPM also introduces the first factor, known as the market factor. CAPM, although good in theory and simplicity does have various limitations to it that prevent the function from explaining the average cross-sectional returns as it only describes the return based on the market factor. The theory received wide attention from both academics and practitioners that led to the findings of Fama and French (1992) and (1993) in the development of asset pricing factor models.

Fama and French (1992) found that on top of the market factor, factors that are related to firm size (market equity, ME) and value (ratio of book to market equity, BE/ME) are key components in explaining the average cross-sectional returns. The size factor in this case is based on the market equity, ME. It refers to the stock´s price which is multiplied by the number of outstanding shares of that company. Fama and French (1992) argue this by discussing that if assets are rationally priced, then the risks are multidimensional and one of these risks is the size factor. It is also important to remember that the size factor comes from the information that is already included in a stock´s price about risk.

The value factor on the other hand is based on the ratio of book (BE) to market equity (ME). This is the ratio of the book value of a company´s stock to that of the market´s judgement of the company´s value. Fama and French (1992) argue that the low BE/ME firms are strong performers, while firms with high BE/ME are constantly weak. Fama and French (1992) illustrate this by arguing that as companies are judged to have a low stock price with high BE/ME, they will then have higher expected returns.

Fama and French (1993) developed a three-factor model that considers the size and value factors. It was statistically shown that these two factors provide more empirically accurate results in explaining the average cross-sectional returns. Their famous and one of the most known factor models, the Fama French three-factor model (1993) can be illustrated by the below time series regression:

$$(2) \qquad R_{it} - R_{Ft} = \alpha_i + \beta_i (R_{mt} - R_{Ft}) + s_i SMB_t + h_i HML + e_{it}$$

The basis of the model still functions in a linear way, just with additional loadings and variables within the function. These additional variables: small minus big (SMB) and high minus low (HML) are the size and value factors.

Fama and French (2012) show that the CAPM leaves more variations in returns unexplained by the model, when compared to the Fama and French (1993) three-factor model. This was showcased by regressing both models with international portfolio returns. In the case of Global, North American, and European portfolio returns, Fama and French (2012) found that the R^2 is higher with the three-factor model. The results of the Fama and French (2012) regression show that the CAPM was able to capture: 0.81, 0.62, and 0.66 (Global, North America, and Europe) variations of returns in terms of the R^2 compared to the three-factor model capturing: 0.95, 0.74, and 0.76 (Global, North America and Europe) (Fama and French, 2012). These results display the added explanation given by the size and value variables that are added into the model and how they can improve the basic CAPM.

The development of adding more factors into a model brings in more economic reasoning as well as further avenues in the development of expected returns. By creating portfolios based on factors such as size and value, academics are better able to consider the effects that firm specific fundamentals have in their expected returns. Fama and French (2015) argue this concept through the dividend discount model. Fama and French (2015) argue that if stocks of two firms have the same expected dividends, with different prices, the stock that has the lower price then has a higher average expected return. These findings and theory have provided academics and practitioners with the tools needed to add various anomaly variables and risk factors to their own factor models.

3 LITERATURE REVIEW

3.1 Risk Factors and Anomaly Variables

3.1.1 Size and Value

Fama and French (1992) discovered that factors related to firm size (SMB) and value (HML) are key components in explaining equity returns. The size factor is based on the market equity, whereas the value factor is based on the ratio of book to market equity. The SMB factor refers to ''small minus big'' in terms of portfolios of small firms to those of big firms. Secondly, the HML factor refers to ''high minus low'' in terms of portfolios formed on high and low book to market equity ratios. The HML value and SMB size factors were initially the two additional factors on top of the market factor in the Fama and French (1993) three-factor model. This master's thesis will use another size factor on top of the SMB denoted as ME, which also refers to market equity. The ME is part of the q-factor model by Hou, Xue, and Zhang (2014). Although both size factors refer to market equity, their constructions differ, which yields to different returns for each factor. Hou et. al (2019) state that their size factor, ME, is the difference of small and big stocks between the simple average of the returns on 9 small size portfolios and the simple average of the returns on 9 big size portfolios. The difference between the factors is small, which results in high correlation between the pair.

Leite, Klotzle, Pinto and Silva (2018) investigate the factor models that contain the value and size factors. Leite et. al (2018) argue that the value factor is unnecessary when the profitability and investment factors are considered in the emerging markets. This would suggest that the three-factor model of Fama and French (1993) becomes redundant in explaining the emerging market returns after adding the profitability and investment factors. The value premium still exists however, as is argued by James Foye (2018) that there are large value premiums in Asia, Eastern Europe, and Latin America. These findings by Foye (2018) also align with those of Fama and French (2017) that there is marginal proof of the size premium. Cakici, Tang and Yan (2016) further illustrate that there exists a value effect in all the emerging markets, except in Brazil. The research agrees that there is evidence of the value premium in the emerging markets. This would suggest that in the emerging markets, firms with a lower book to market equity ratio (BE/ME) tend to perform better.

In terms of the size factor, literature has shown some different viewpoints when it comes to the emerging markets. Cakici et. al (2016) argue that the size along with the momentum strategy generally fail in the emerging markets and that there is no size effect in the markets, except in China. In a more recent study by Leite et. al (2018) it was presented and argued however, that there is clear evidence of the size effect in most of the emerging markets.

3.1.2 Profitability and Investment

The first profitability factor (RMW) was introduced by Fama and French (2015) in their five-factor model. The RMW refers to the difference of portfolios with robust and weak profitability (Fama and French 2015). Fama and French (2015) argue the logic behind the profitability factor in the sense that higher expected earnings often imply that a stock will have a higher expected return. If a company is expecting higher earnings, then its profit will also increase leading to a higher expected stock price. This provides the reasoning for adding the profitability factor within the five-factor model as it provides the reasoning to why the expected return of an equity may be affected by it. The other profitability factor is known as return on equity (ROE). The ROE factor was introduced by Hou et. al (2014) in their q-factor model to also capture profitability. The logic behind the ROE factor according to Hou et. al (2014) is that the ROE factor can forecast returns due to the nature of high expected ROEs relative to a small investment imply a higher discount rate. The ROE factor also directly looks at the link between equity returns and firm characteristics. In terms of the investment factors, there are the CMA and I/A factors. The CMA factor is also a part of the Fama and French (2015) five-factor model. Fama and French (2015) describe the factor as the difference between high and low investment firms in terms of their returns. This refers to the performance of firms that actively invest and those that do not invest as aggressively. The q-factor model by Hou et. al (2014) on the other hand includes the I/A investment factor. The I/A factor looks at portfolios constructed based on the asset growth of these firms.

The profitability and investment factors have been studied in the emerging markets. Foye (2018) argues that there exists marginal profitability and investment premiums in Asia and that there is weak correlation between the investment and value factors in Asian, Latin American, and Eastern Europe's emerging markets. Foye (2018) claims that the addition of the profitability and investment factors to the three-factor model of Fama and French (1993) does improve the description of equity returns in Eastern Europe and Latin America, but not in Asia. Similar findings are supported by Hanauer and Lauterbach (2019) as they argue that valuation, profitability, and investment factors are all priced in the emerging markets.

3.1.3 Momentum

Carhart (1997) introduced the momentum factor (MOM) discovered by Jegadeesh and Titman (1997) into the Fama and French (1993) three-factor model. The purpose of the momentum factor is to show that stocks that have had an upward trend in price usually continue to move in that same direction and vice versa. The momentum factor is often included in the factor models as an additional anomaly variable, and it will be used in this master's thesis as well.

Literature pertaining to the momentum factor in the emerging markets has shown that it exists. Cakici et. al (2016) argue that there exists a marginal momentum effect in the emerging markets.

3.1.4 Mispricing Factors: Management and Performance

Stambaugh and Yuan (2017) took parsimony among factor models to a new extent. Stambaugh and Yuan (2017) constructed a four-factor model, in which the mispricing factors denoted as management (MGMT) and performance (PERF) are comprised of information from 11 prominent anomalies. According to Stambaugh and Yuan (2017) this process provides a less noisy data set to measure a stock's mispricing.

The first of the two mispricing factors is the management (MGMT) factor. This factor includes the anomalies: net stock issues, composite equity issues, accruals, net operating assets, asset growth, and investment to asset. (Stambaugh and Yuan 2017). These are values that are related to a company's management, which can be directly affected. The other mispricing factor of performance (PERF) is comprised of the following factors: O-score, momentum, gross profitability, and return on assets. (Stambaugh and Yuan 2017). According to Stambaugh and Yuan (2017) these factors are less related to management activities and more with the performance of a company.

These mispricing factors provide a different approach to the standard factor construction. As the other mentioned factors are all based on a single element, the mispricing factors by Stambaugh and Yuan (2017) include multiple factors aggregated into one factor.

3.2 Factor Models

It has become evident from literature review that there are a few common factor models that have been used to analyse factors in the emerging markets. Most of the research and literature has focused on the below mentioned factor models, when studying the emerging market equities.

3.2.1 Three-Factor Model by Fama and French (1993)

$$(2) \qquad R_{it} - R_{Ft} = \alpha_i + \beta_i(R_{mt} - R_{Ft}) + s_i SMB_t + h_i HML + e_{it}$$

The three-factor model of Fama and French (1993) was introduced earlier in section 2 – Theoretical Framework. In the emerging markets it is used to study the value (HML) and size (SMB) effects.

3.2.2 Five-Factor Model by Fama and French (2015)

$$(3) \qquad R_{it} - R_{Ft} = \alpha_i + \beta_i(R_{Mt} - R_{Ft}) + s_i SMB_t + h_i HML_t + r_i RMW_t + c_i CMA_t + e_{it}$$

Fama and French (2015) introduce a five-factor asset pricing model. Its goal is to be able to capture the size, value, profitability, and investment factors. The five-factor asset pricing model adds profitability and investment factors to the three-factor model of Fama and French (1993). The reason for adding these two additional factors is that the size and value factors of the three-factor model left unexplained some of the aspects of the equity returns. In the five-factor model, Fama and French (2015) add RMW (robust minus weak) and CMA (conservative minus aggressive) factors to their three-factor model. The RMW considers the differences in returns of diversified portfolios with both robust and weak profitability, whereas the CMA factor considers the differences between the returns of low and high investment firms.

Leite et. al (2018) compared the Fama and French three and five-factor models in their performance in the emerging markets. A key notion that Leite et. al (2018) argue is that the alphas of the models were reduced when adding the RMW and CMA factors into the three-factor model. This would suggest that the five-factor model of Fama and French would be a "better fit" for describing the equity returns in the emerging markets. Leite et. al (2018) also argue that by adding these two additional factors, the ability of the model improves cross-sectionally as the pricing errors are reduced especially with the Latin American and Asian market data. Overall, this shows that in the emerging markets, adding factors to the RHS of the model improves the fit. Similar findings are argued by Foye (2018) that the five-factor model of Fama and French (2015) can outperform their three-factor model in Eastern Europe and Latin America's emerging markets.

3.2.3 Four-Factor Model by Carhart (1997)

$$(4) \quad R_i(t) - R_f(t) = \alpha_i + \beta_i [RM(t) - R_f(t)] + s_i SMB(t) + h_i HML(t) + m_i MOM(t) + e_{it}$$

Carhart (1997) created a four-factor asset pricing model that adds the momentum anomaly, originally identified by Jegadeesh and Titman (1993) into the three-factor model of Fama and French (1997). The momentum anomaly by Jegadeesh and Titman (1993) is computed by a stocks 10-week average relative price by its one-year average relative price. The momentum factor can be thought of in a similar way as the hot hand's fallacy that if the price trend of a stock is increasing it will be maintained in the future.

It was found and argued by Cakici et. al (2014) that there is a strong momentum effect present in Asia and Latin America, but not in Eastern Europe and that the momentum is mostly driven by small stocks in the emerging markets.

3.2.4 Q-factor Model by Hou, Xue, and Zhang (2014)

$$(5) \quad R_i(t) - R_f(t) = \alpha_i + \beta_i MKT(t) + m_i ME(t) + i/a_i I/A(t) + roe_i ROE(t) + e_{it}$$

Hou et. al (2014) contributed to the asset pricing literature by establishing a four-factor model that is built to enhance the Fama and French (1993) three-factor model. The above q-factor model considers some of the same factors as the Fama and French (2015) five-factor model such as: market, size, and investment, but adds a fourth factor of profitability measured by return on equity (ROE). Hou et. al (2014) argue that the addition of the ROE factor in their q-factor model yields to more accurate descriptions of returns compared to the Fama and French three and five-factor model and the Carhart four-factor model.

3.2.5 Mispricing Model by Stambaugh and Yuan (2017)

$$(6) \quad R_i(t) - R_f(t) = \alpha_i + \beta_i [RM(t) - R_f(t)] + s_i SMB(t) + m_i MGMT(t) + p_i PERF(t) + e_{it}$$

Stambaugh and Yuan (2017) argue that their model with two mispricing factors (MGMT and PERF) can accommodate the alternative four and five-factor models such as the Fama and French (2015) five-factor model and the q-factor model by Hou et. al (2014). The Stambaugh and Yuan (2017) four-factor mispricing model includes the two mispricing factors that are comprised of multiple different factors.

3.3 The Relation of Factors

Literature has shown that a lot of the factors and factor models are closely related. This can be seen for example in the way that the models are constructed. A lot of the same factors are present in multiple different models. For example, the Fama and French (2015) five-factor model includes all the Fama and French (1993) three-factor model's factors, and the Carhart (1997) four-factor model includes the Fama and French (1993) three-factor model. Hou et. al (2019), Barillas and Shanken (2018), and Jensen et. al (2021) investigate the model relationships and their factors significance.

Hou et. al (2019) argue that many different factor models are closely related and able to subsume one another. Hou et. al (2019) argue that some factor models can subsume others through a factor spanning regression. In their study, Hou et. al (2019) argue that in the US, the q-factor model can subsume the Fama and French five-factor model. This would mean that the q-factor model is able to explain the Fama and French five-factors. Hou et. al (2019) also argue that there is high correlation between the factors of the Stambaugh and Yuan (2017) mispricing model and the q-factors.

Barillas and Shanken (2018) investigate the relative performance of various models in order to complete thorough model comparison. Barillas and Shanken (2018) test these models by analysing which model does the best job in pricing a certain set of test assets. In their results, Barillas and Shanken (2018) argue that all the top 7 models include the ROE, HML, and MOM factors. Barillas and Shanken's (2018) results therefore suggest that the models containing the above-mentioned factors perform better than the Fama and French (2015) five-factor model and the four-factor model by Hou et. al (2014).

In addition, Jensen et. al (2021) contribute to this literature by testing the economic significance of factors. Jensen et. al (2021) argue that when using world data, the alphas are often economically large and highly significant compared to just using the US factor data.

This master's thesis will look at the dominance and significance in the BRICS countries to answer the research questions: *''Is there a dominant factor model for the BRICS countries or is it country specific?''*.

4 DATA AND METHODOLOGY

4.1 Data

In this master's thesis the analysis will be done by using various country specific factor data for the BRICS countries (Brazil, Russia, India, China, and South Africa) as well as for the United States. The factor data for all the factors: MKT, SMB, ME, HML, RMW, CMA, I/A, ROE, MOM, MGMT and PERF are gathered from the Jensen, Kelly, and Pedersen (2021) database. The sample runs from January 31st, 2004 until December 31st, 2020. The sample period therefore includes the global financial crisis (GFC) and the start of the Covid-19 pandemic. This means that there are 204 monthly observations of return data. The data is gathered in monthly frequencies and are capped value weighted returns. Capped value weighted returns indicate that there is an upper limit for the weight, which limits the influence that large companies have. According to Jensen et. al (2021) this ensures that stocks with different weightings will not have an overbearing effect on the portfolios. All the returns are measured in US dollars as mentioned by Jensen et. al (2021). The reason for not using data before 2004 is that some of the countries were missing return data for certain time periods. This is common when studying the emerging markets as they are more divided from the world capital markets and data may be limited for some countries. The risk-free rate is from the Kennet R. French data library.

4.2 Methodology

The methodology section will include all the calculations done for this master's thesis to derive conclusions and discussion. This will include calculating descriptive statistics for the sample countries and factors such as: average returns, standard deviation of returns, correlation, and Sharpe ratio. To test the factor models for dominance, a factor spanning test will be done.

Factor Spanning Test

The factor spanning test is done by conducting a linear regression for the factors. It is used in this study to test the different factors against each other. This will show if certain factors in factor models are able to explain factors from other models. For example, by testing the q-factor model against the Fama and French five-factor model. This will provide the necessary detail if the q-factor model is able to explain the Fama and French factors and therefore dominate the model. As an example, the test can be conducted by regressing the ROE factor against

the Fama and French factors and then analysing the intercept and loadings of the factors. This is a common method used in analysing factors for dominance. Hou et. al (2019) argue that it is all that is required to complete model comparison and that it is an informative and concise way of doing the required analysis. The factor spanning test is done through a linear regression. The mathematical equation for the regression is as follows:

$$Y = \alpha + \beta X_1 + \beta X_2 + \cdots + \beta X_n + \varepsilon$$

In the equation the Y represents the dependent variable and the βs are the coefficients that capture the effects of the independent variable(s) denoted as X. The alpha (α) is the intercept of the model and ε refers to the error term of the regression.

The model will function in the following way for the regressions done in this master's thesis. The following example shows the regression, where the Fama and French factors along with the momentum anomaly are used as independent variables to explain the dependent ROE factor from the q-factor model.

$$ROE_i(t) = \alpha_i + \beta_i MKT(t) + \beta_i SMB(t) + \beta_i HML(t) + \beta_i RMW(t) + \beta_i CMA(t) + \beta_i MOM(t) + e_{i(t)}$$

In the above equation the Fama and French factors of market, size, value, profitability, investment, and momentum are used to explain the ROE factor of the q-factor model. This methodology of the regression is used for all the regressions in this master's thesis.

5 RESULTS AND ANALYSIS

5.1 Summary Statistics

The summary statistics can be found in Appendix 1. The summary statistics contain the following: mean, standard deviation, min, max and Sharpe ratios for all the sample countries and factors. The mean represents the monthly sample mean in percent(s), the standard deviation is the variation in returns for the sample period and the Sharpe ratio is annualized. The annualization is done by taking the monthly Sharpe ratio of the factors and then multiplying the monthly ratio by the square root of 12.

Looking at the mean monthly returns, the market (MKT) returns were the highest for the sample period for all countries. Brazil had the highest mean monthly return with the MKT factor (2.346) and China's investment factor (I/A) had the lowest return (-0.240). The I/A factor had the lowest mean monthly returns for most of the countries (Russia, China, South Africa, and the US). In these countries, the second lowest mean monthly return was the CMA factor, which is also an investment factor. The volatility in terms of the sample period's standard deviation is larger for all the BRICS countries, when compared to that of the US. This variation in returns was also observed by Fama and French (1997) in which they argue that the emerging markets have a higher volatility, when measured with the standard deviation and compared with the developed markets. To give perspective in terms of the MKT factor; the US's standard deviation is 4.411 and the closest to it was South Africa with a standard deviation of 7.492. Figure 5 shows the development of investing $1 in the MKT factor in the BRICS countries and in the US to illustrate the difference. The US is the green line at the bottom and moves at a steadier pace, when compared to the BRICS countries. As the standard deviation in returns is much higher for the BRICS countries, the movement of the $1 investment becomes more volatile.

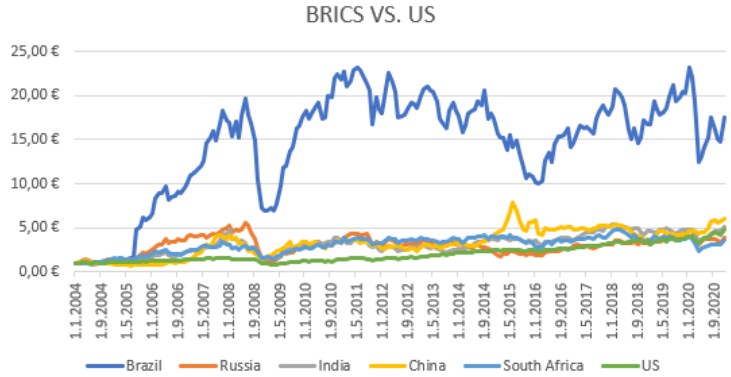

Figure 5. Development of $1 invested in the MKT factor

The Sharpe ratio considers the average return that is earned in excess of the risk-free rate per the standard deviation of the return. The Sharpe ratio varied significantly between the countries and factors. The highest annualized Sharpe ratio was achieved with Russia's value (HML) factor of 6.380 and the lowest with China's investment (I/A) factor of -3.377. The factors that produced the highest Sharpe ratios varied across the sample countries. The highest Sharpe ratios were achieved with the following factors in each country: Momentum (Brazil), Value (Russia), Market (India), Market (China), Performance (South Africa) and Market (US). It becomes evident that there is some country separation in terms of the factors that produce the highest Sharpe ratios in each individual country. When comparing the US market (MKT) Sharpe ratio to the BRICS countries, it becomes evident that the US MKT Sharpe ratio is higher. Zaremba and Maydybura (2019) studied the Sharpe ratios in the frontier, emerging, and developed markets and their results argue that the MKT factor also produces the highest Sharpe ratios in the developed markets. However, when using the other factors, Zaremba and Maydybura (2019) show that most of the other factors produce higher Sharpe ratios in the emerging and frontier markets. This result aligns with the findings of this master's thesis as the BRICS countries show higher Sharpe ratios for most of the factors aside from the MKT factor, when compared to that of the US.

5.2 Risk Premiums

Risk premium can be defined as the return of an investment on top of the risk-free rate. The risk premium for the MKT factor is calculated by taking the excess return of the factor. All the other factors will be presented as their returns as these factors are already compensated for risk. The risk premiums are also tested for statistical significance by using a standard t-test. Table 1 shows the risk premiums for all 11 factors used in this master's thesis for the sample period.

The factor risk premiums are divided into three different time periods to show how they change during times of economic uncertainties. The periods are as follows: monthly risk premium for the sample period (including the GFC and the start of the Covid-19 pandemic), the GFC period and the start of the Covid-19 pandemic. The GFC period ranges from June 30th, 2007 until January 31st, 2009. It therefore contains 20 monthly observations of data. The period is defined to start from the moment that the global financial markets began to show signs of stress. The Covid-19 period starts on November 30th, 2019 and ends with the sample on December 31st, 2020 containing 14 monthly observations. The starting period for the Covid-19 pandemic begins on the same month that the first human case of the virus was identified in Wuhan, China. Table 2 shows the risk premiums during times of economic uncertainty. This section will answer the first research question *''Which factors have the highest risk premiums in the BRICS countries and are they dependent on time?''*

Table 1 – Risk Premiums (%) – Sample Period

Sample	Brazil	Russia	India	China	SA	US
MKT-rf	2,24	1,05	1,12	1,19	0,86	0,79*
SMB	0,11	0,82	0,17	0,64*	-0,09	0,02
ME	0,27	0,04	0,01	0,06	-0,03	-0,01
HML	0,25	0,62*	0,18	0,26	0,17	0,00
RMW	0,08	0,40*	0,15	0,18	0,39*	0,05
CMA	0,11	0,06	0,20	-0,03	-0,11	-0,03
I/A	0,27	-0,05	-0,06	-0,24	-0,26	-0,06
ROE	0,21	0,26	0,48	0,12	0,45	0,06
MOM	0,82*	0,76*	0,33	0,01	0,65*	0,09
MGMT	0,16	0,19	0,44*	0,13	0,05	0,11
PERF	0,65	0,76*	0,39	0,29	0,90*	0,28

Factors marked with ''*'' have statistically significant risk premiums at the 5% level

Table 2 – Risk Premiums (%) – GFC and Covid-19 Period

GFC	Brazil	Russia	India	China	SA	US
MKT-rf	-2,82	-5,04	-2,18	-1,88	-2,76	-2,92
SMB	-1,47	0,08	-0,24	0,64	-0,97	-0,35
ME	-1,81	-0,18	-1,51	0,33	-1,31	-0,68
HML	1,55	2,02	0,81	0,48	0,01	-0,27
RMW	1,57	0,99	-0,22	0,20	-0,14	0,92
CMA	1,30	1,18	2,00	-0,29	0,64	-0,09
I/A	2,43	2,50	2,55	-0,56	0,63	-0,16
ROE	0,68	1,58	0,03	0,17	-0,98	0,89
MOM	1,98	2,03	1,72	-1,30	0,60	1,35
MGMT	1,84	2,51	2,75	0,04	0,15	0,28
PERF	0,93	2,58	-0,33	0,11	0,26	1,98
Covid-19	Brazil	Russia	India	China	SA	US
MKT-rf	0,72	0,51	1,56	2,88	1,08	2,20
SMB	-0,05	-0,65	0,93	-1,19	-0,34	0,48
ME	0,30	0,29	1,44	-0,89	-0,89	0,79
HML	-0,76	-0,94	-0,32	-1,03	-0,83	-2,17
RMW	-0,45	-0,20	-0,13	1,19	0,46	-1,64
CMA	-1,43	-0,87	-0,65	-1,27	-0,24	-1,05
I/A	-1,08	-0,97	-0,89	-1,71	-0,02	-1,56
ROE	-0,63	-0,62	-0,50	1,34	-1,02	-2,00
MOM	1,14	0,80	-0,34	1,55	0,93	0,00
MGMT	-1,27	-0,49	-0,55	-1,39	-0,05	-1,75
PERF	0,00	-0,01	-0,43	2,00	1,55	-0,82

5.2.1 Overall Sample Period

Starting with the excess market returns for the BRICS countries for the entire sample period. The highest excess market return is observed in Brazil (2.24%) that is also marginally significant at the 10% level (t-stat 1.90). The excess market return is higher in all the BRICS countries when compared to that of the US, which yields 0.79% (t-stat 2.53). This is due to the larger volatilities that are present in the BRICS countries and therefore investors demand a higher premium for the given risk level. The excess market returns are statistically significant in all countries, except Russia and South Africa.

In terms of the size premium, South Africa differs from the other BRICS countries. In South Africa, the SMB risk premium is -0.09% which suggests that small firms have on average higher returns than larger firms. The risk premium, however, is not statistically significant in South Africa. South Africa deviates from the other BRICS countries and the US, where the SMB is positive, suggesting that large firms perform better on average. The same result is also evident when using the ME size factor. This entails that in South Africa firms that are large based on both SMB and ME have lower returns on average when compared to smaller firms. The opposite is present for all the other sample countries. This is especially the case in China, where the SMB factor is statistically significant at the 5% level and the ME factor is marginally significant at the 10% level.

All the BRICS countries have higher HML risk premiums related to value than the US. In the BRICS countries, companies with high BE/ME ratios tend to perform better than firms with low BE/ME ratios. The result in the US is slightly different as the US's HML risk premium is marginally zero (-0.001%), however, with the negative sign it would suggest the opposite in terms of the ratios when compared to the BRICS countries. The only country that shows statistical significance in respect to the HML value factor is Russia (t-stat 3.77), which would mean that in Russia the high BE/ME firms outperform on average firms with low BE/ME ratios.

In terms of profitability, the same positive signs are present for both profitability factors of RMW and ROE for the BRICS countries and the US. This suggests that firms with robust profitability perform better on average than those with weak profitability. This is logical as profitability is seen as a positive sign in a firm and therefore the higher profitability firms beat the lower ones. This is especially the case in India (ROE t-stat 1.77), Russia (RMW t-stat 2.03), and South Africa (RMW t-stat 2.54), which all have statistically significant profitability risk premiums. The same is not true for the investment factors. In China, South Africa and the US, firms with aggressive investment outperform on average firms with conservative investment strategies. The factor risk premiums are also lower in China, South Africa, and the US, when compared to those found in Brazil, Russia, and India. The investment factors for all the sample countries are insignificant.

In terms of momentum, it is not surprising that firms with higher momentum outperform those with lower momentum. All the sample countries show a

positive risk premium for the momentum factor of which Brazil (t-stat 2.71), Russia (t-stat 2.48), and South Africa (t-stat 2.50) are highly significant. As the price of an equity increases it can signal investor confidence and an upward trend in price. This is also the case with the PERF factor as it already includes the momentum anomaly within its construction. Similarly, to the momentum factor, the PERF factor is marginally significant in Brazil (t-stat 1.76) and significant in Russia (t-stat 2.21), and South Africa (t-stat 3.27). The other mispricing factor of MGMT also shows signs of positive risk premium for all countries of which the only statistically significant one is India at the 5% level.

5.2.2 Times of Economic Uncertainty

During times of economic uncertainty, it is not surprising that the excess market return dropped significantly from the overall sample period. This is due to the heavy selling of securities in the markets resulting in gains that are lower than the risk-free rate. Larger differences can be seen with the factors. In the case of size, during both the GFC and the start of the Covid-19 pandemic, the size factor behaves differently. As was noted earlier, the SMB was positive for all countries except South Africa for the sample period. During the GFC the sign of the SMB changes to negative in Brazil (-1.47%), India (-0.24%), and the US (-0.35%). A change in the sign was also noticed during the start of the Covid-19 pandemic when Brazil, Russia, China, and South Africa were negative. This would suggest that in Brazil, Russia, India and China, large companies would perform better on average than smaller firms during times of economic uncertainty. This is logical as smaller firms tend to have higher volatility than larger companies and are not as established. Times of economic uncertainty, therefore, affects these companies more when compared to those of larger companies. The US is not as affected as the BRICS countries. During the start of the Covid-19 pandemic the risk premium has the same positive sign, and the only difference was noted during the GFC period when the sign turned negative, which can be explained by the heavy selling of equities. Similarities can be seen in terms of the ME factor showing more negative signs for countries, especially during the GFC period.

In terms of value, there are differences during the GFC and the start of the Covid-19 pandemic. During the GFC, all the BRICS countries and the US show the same signs, signaling that firms with high BE/ME perform better on average than those with low BE/ME. A key difference is noted at the start of the Covid-19 pandemic, when the risk premium turns negative in all the BRICS countries. This suggests that firms with robust profitability perform better than those with weak profitability. This, however, is not the case in India and South Africa during the GFC period and in Brazil, Russia, India, and the US during the start of the Covid-19 pandemic. A change in trend can be explained by the lack of profitability that firms are able to achieve due to the decline in the market ultimately af-

fecting firm profitability. The Covid-19 pandemic also shows a difference in Brazil, Russia, and India in terms of the CMA investment factor as during this time, firms with more aggressive investment tend to perform better.

No significant differences are seen with the momentum and performance factors. The management (MGMT) factor, however, declined significantly during the start of the Covid-19 pandemic. As the MGMT factor is a clustered factor including both asset growth and investment to asset ratio, it makes sense that there is a negative risk premium due to the decline in both asset and investment growth.

Overall, the risk premiums do change from the sample period to times of economic uncertainties. This signals that the risk premiums are dependent on time as was evident in the above discussion. In terms of the percentage, the excess market return has the highest risk premium in the BRICS countries for the sample period on average. It changes, however, as during the GFC the I/A factor has the highest risk premium on average for the BRICS countries. During the Covid-19 pandemic, the excess market return is still the highest in terms of the risk premium. There are, however, significant changes in the signs of the risk premiums, when analyzing the overall sample period and comparing it to times of economic uncertainty. Due to the limited data for the uncertain period, it is important to note that the sample size only provides an illustrative viewpoint of the factor's risk premiums during times of economic uncertainty.

5.3 Factor Correlations

The factor correlation section begins with the analysis of each country's factors against one another. The factor correlations can be found in Appendix 2. In all the countries, it became evident that factors that represent similar economic theory and background are highly correlated with one another. These are for example the two investment factors (CMA and I/A). The analysis will focus on factors with different economic theories and analyze their correlations.

In Brazil, the highest positive correlation pairs are the MGMT & CMA (0.776) and PERF & RMW (0.714). The management (MGMT) and investment (CMA) pair also keep consistency in terms of the correlation regardless of the country being analyzed. It can be observed in Russia (0.741), China (0.825) and in the US (0.854). The MGMT mispricing factor seems to be aligned across the countries with the investment factors. This is a logical pair as the management factor is based on the decisions that a company's management can influence. The other mispricing factor of performance (PERF) and the profitability factor (RMW) are another commonly observed factor pair with high positive correlation. The correlations are as follows for the PERF & RMW pair: Brazil (0.714), Russia (0.684), and India (0.825). The PERF factor considers the performance of a company and

therefore directly affects the profitability factor. If a company performs well, it can be assumed that then it will also have higher profitability levels. The sample set also includes another profitability factor, ROE. The ROE factor similarly to the RMW is correlated with the performance factor. In Russia the correlation between the PERF and ROE is 0.620 and in India 0.829.

Another notable factor pair that was evident in multiple countries is the PERF and momentum (MOM) pair. This pair looks at the performance of an equity and its momentum. The correlation is again logical, as with increasing performance we can assume that an equity is also having an upward trend in price in terms of the momentum and vice versa. The correlation can also be explained due to the construction of the factors, as MOM is part of the PERF factor. The PERF and MOM factor pair is most correlated in the following countries: India (0.726), South Africa (0.679) and the US (0.765).

Factors that are like each other in terms of construction and theory such as RMW and ROE are heavily correlated as is witnessed in the US (0.930) and China (0.958). Negative correlations were also present with certain pairs of factors. This was often the case with a profitability and a size factor. Evidence of the negative relationship was found in Brazil and China with the RMW and SMB factors.

Comparing the BRICS countries to the US in terms of the country specific factor correlations, it became evident that regardless of the country, the factors tend to follow a similar pattern in terms of correlation. A key notion can be made from the factor correlation analysis regarding the mispricing factors and especially the performance (PERF) factor. The PERF factor is the most common factor that shows correlation with another factor in all the BRICS countries as well as the US. The fundamental principles of the factors are present for the countries despite their geographic location and economic status. There are, however, some differences in terms of the correlations when comparing factors from other countries together.

5.4 Country Correlations

The correlations for the factors between the countries showed that there are two factors that are the most correlated amongst the sample countries. The MKT factor showed positive correlation between India and Russia (0.537), South Africa and Russia (0.682), US and Russia (0.651), US and India (0.606) and US and South Africa (0.701). It becomes evident that Russia's, India's, and South Africa's market returns are positively correlated with the US market returns. This may be because the markets in Russia, India and South Africa react to the various events and movements that take place in the US markets. This relationship shows that especially Russia, India and South Africa are dependent on the market behavior of the US as it seems to function as a leading indicator. The momentum (MOM) factor is another factor that showed similar correlation among the countries. The correlations were as follows: US and Brazil (0.565) and US and India (0.551). This

follows the notion that the BRICS countries follow a similar trend in terms of the price momentum and market behavior that is observed in the US. Besides the MKT and MOM factors that show the most consistency in terms of correlation with the US, other notable pairs were also found. China has a lot of factors with very little positive correlation and mainly negative correlation in respect to the US factors. China's size (SMB & ME) and profitability (RMW & ROE) factors are negatively correlated with the US. The size factors in all the BRICS countries show very low correlation with that of the US. This could entail that the BRICS countries have differences in terms of the performance of both small and large firms, when compared to those in the US. Brazil shows the most correlation excluding the market factor with the US. This could be due to the strong trade relations that the US and Brazil experience. In addition to the positive spillover to Brazil that was caused by the removal of trade policy uncertainty in 2001 between the US and China as is argued by Suwanprasert (2022). Table 3 shows the correlation of BRICS factors to US factors.

Table – 3 Correlation of BRICS Factors to US Factors

	Brazil	*Russia*	*India*	*China*	*SA*
MKT	0,161	0,602	0,622	0,376	0,723
SMB	0,152	0,083	0,108	-0,056	0,051
ME	0,129	0,197	0,032	-0,045	0,098
HML	0,187	0,112	0,167	0,178	0,409
RMW	0,216	0,077	0,150	-0,051	0,023
ROE	0,148	0,068	0,177	-0,010	0,143
CMA	0,286	0,107	0,068	0,136	0,214
I/A	0,227	-0,029	-0,004	0,054	0,129
MOM	0,565	0,440	0,551	0,109	0,394
PERF	0,372	0,368	0,407	0,004	0,314
MGMT	0,237	-0,003	0,041	0,169	0,171

5.5 Factor Spanning Tests

5.5.1 Q-Factors and the Fama and French Factors in the US

The factor spanning test will be initiated by testing the Fama and French factors with the momentum anomaly against the q-factors and vice versa. The regression is first done by using the US factors to get a baseline result to compare with the BRICS countries. Tables 4 and 5 present the regression results in the US.

Table 4 – Explaining the Q-Factors (US)

α is the intercept of the regression and R^2 is the measure of fitness. MKT, SMB, HML, RMW, CMA and MOM are the market, size, value, profitability, investment, and momentum factors of the Fama and French 5 plus momentum factor model. The first rows show the factor coefficients and the rows beneath it the corresponding t-statistic.

	α	MKT	SMB	HML	RMW	CMA	MOM	R^2
ME	-0,04	-0,02	1,26	0,20	-0,17	-0,21	0,14	0,93
	-0,86	-1,54	28,24	3,74	-2,58	-3,86	5,38	
I/A	-0,03	0,00	-0,03	0,15	0,01	1,04	-0,03	0,91
	-0,68	-0,11	-0,89	3,43	0,15	23,34	-1,60	
ROE	0,01	-0,01	0,07	0,10	1,23	-0,06	0,00	0,87
	0,24	-0,69	1,61	1,78	18,09	-1,12	0,09	

Table 5 – Explaining the Fama and French plus Momentum Factors (US)

α is the intercept of the regression and R^2 is the measure of fitness. MKT, ME, I/A, and ROE are the market, size, investment, and ROE factors of the q-factor model. The first rows show the factor coefficients and the rows beneath it the corresponding t-statistic.

	α	MKT	ME	I/A	ROE	R^2
SMB	0,02	0,03	0,66	0,08	-0,11	0,93
	0,56	3,23	33,12	4,00	-4,14	
HML	-0,07	0,09	0,14	0,77	0,47	0,68
	-0,84	4,52	3,33	18,35	8,81	
RMW	0,02	-0,02	-0,16	-0,01	0,57	0,91
	0,70	-2,31	-9,19	-0,60	25,63	
CMA	0,04	-0,02	0,02	0,74	-0,06	0,90
	1,28	-2,64	0,97	39,92	-2,44	
MOM	0,29	-0,26	-0,33	-0,51	-0,16	0,36
	1,71	-5,85	-3,63	-5,52	-1,39	

From the regressions, it becomes evident that the size factor of the q-model (ME) can be captured by the Fama and French factors. This is observed as the alpha of the regression yields -0.04 (t-stat -0.86). The Fama and French size factor (SMB) carries a statistically significant (t-stat 28.24) factor loading of 1.26, which plays a crucial role in the model's ability to capture the ME factor. This means that the SMB factor of the Fama and French model can estimate the q-model's size factor (ME). Both SMB and ME behave similarly to each other, which is due to both factors being risk factors related to firm size.

The investment factor of the q-model (I/A) is also captured by the Fama and French factors. The Fama and French model contains their own respective investment factor (CMA), which largely pulls the weight of the regression with a 1.04 coefficient that is highly significant. The alpha of the regression is -0.03 and is statistically insignificant, meaning that the Fama and French factors can capture the q-model's I/A factor.

In terms of explaining the profitability (ROE) factor of the q-model, the alpha produced is closer to zero, when compared to the ME and I/A factors at 0.01. The alpha of the regression also shows an insignificant t-statistic meaning that the ROE factor is also captured by the Fama and French model in the US, with a large and statistically significant loading on the RMW factor of 1.23.

It has become evident that the Fama and French factors with the addition of the momentum anomaly are able to capture the q-model factors in the US. To complete a thorough analysis of the two models, a regression is also done in the other direction.

Regressions for the size (SMB), value (HML), profitability (RMW) and investment (CMA) factors all produce insignificant alphas of 0.02 (t-stat 0.56), -0.07 (t-stat -0.84), 0.02 (t-stat 0.70), and 0.04 (t-stat 1.28) respectively. This shows that the q-factors can capture the size, value, profitability, and investment factors of the Fama and French model. An important note here is that the previously mentioned factors are the original factors of the Fama and French model. When it comes to the addition of the momentum anomaly to the Fama and French five-factor model, the q-factors are unable to explain it. The momentum factor has the largest alpha of the regression (0.29) with a t-statistic of 1.71 referring to marginal significance at the 10% level. This means that the q-factors leave the momentum factor partially unexplained. Large factor loadings are present as in the previous regressions for factors with similar economic theory, such as the I/A & CMA pair and the ROE & RMW with very high t-statistics.

Comparing the two regression tests, it has become evident that in the US, the Fama and French factors with the addition of the momentum anomaly are better able to explain the q-factors than the other way around. This means that for the sample period used in this study in the US, the Fama and French five plus momentum model dominates the q-model. The momentum factor is the key indicator for this result as the alpha of the regression is marginally significant at the 10% level and therefore is partially left unexplained by the q-factors. The fit of the model as per the R^2 is also substantially lower with the momentum factor

dropping to 36% suggesting poor fit by the independent q-factors in its explanation.

The results of this regression differ from those of Hou et. al (2019) in which it is argued that the Fama and French factors are unable to explain the q-factors. To investigate this deviation, a regression was also done by using the original Fama and French factors from the Kenneth R. French data library as well as the original q-factors from the global q-factor database. With the different data set, the results align with this master's thesis for the sample period used. The alphas are larger, however, still insignificant, meaning that the Fama and French factors can capture the q-factors. Therefore, the deviation in results to those found by Hou et. al (2019) is due to the different sample sizes that are used in the studies. In this master's thesis, the data had to be limited due to the involvement of the BRICS countries, which do not have as much available return data for the studied factors.

5.5.2 Q-Factors and the Fama and French Factors in BRICS

From the factor regressions in the US, it becomes apparent that the Fama and French factors with the momentum anomaly can better explain the q-factors than the other way around. The momentum factor was the only partially significant alpha that was left unexplained by the q-factors in the regressions. The following section will look at the results of the same regressions in the BRICS countries. Table 6 presents the alphas, t-statistics and the R^2 values for the BRICS countries. Full tables and results can be found in Appendix 3.

Table 6 – Explaining the Q and the Fama and French Five plus Momentum Factors in the BRICS countries

α is the intercept of the regression and R^2 is the measure of fitness. ME, I/A, and ROE are the size, investment and return on equity factors of the q-factor model. SMB, HML, RMW, CMA, and MOM are the size, value, profitability, investment and momentum factors of the Fama and French five plus momentum model. The first row shows the alphas and the rows beneath it the corresponding t-statistic and R^2.

Panel A: Explaining the q-factors			
Brazil	ME	I/A	ROE
α	0,18	0,00	0,10
	0,88	0,05	0,51
R^2	0,57	0,72	0,59
Russia	ME	I/A	ROE
α	0,48	-0,09	-0,34
	2,05	-0,47	-1,72
R^2	0,59	0,65	0,71
India	ME	I/A	ROE
α	-0,03	-0,40	0,29
	-0,34	-3,06	2,66
R^2	0,91	0,76	0,86
China	ME	I/A	ROE
α	0,10	-0,13	-0,27
	0,72	-1,37	-3,11
R^2	0,91	0,83	0,93
SA	ME	I/A	ROE
α	-0,16	-0,14	-0,06
	-1,54	-0,96	-0,32
R^2	0,83	0,61	0,60

Panel B: Explaining the FF 5 plus Momentum factors					
Brazil	SMB	HML	RMW	CMA	MOM
α	-0,06	0,17	0,09	0,03	0,96
	-0,32	1,07	0,74	0,26	3,29
R^2	0,58	0,17	0,67	0,73	0,12
Russia	SMB	HML	RMW	CMA	MOM
α	-0,16	0,42	0,34	0,10	1,00
	-0,87	2,87	3,51	0,88	3,40
R^2	0,53	0,24	0,77	0,63	0,14
India	SMB	HML	RMW	CMA	MOM
α	0,11	0,25	0,00	0,31	0,15
	1,73	1,77	-0,04	4,64	0,61
R^2	0,90	0,24	0,86	0,75	0,40
China	SMB	HML	RMW	CMA	MOM
α	0,39	0,57	0,22	0,19	0,06
	3,62	3,82	4,26	2,90	0,26
R^2	0,87	0,42	0,95	0,78	0,22
SA	SMB	HML	RMW	CMA	MOM
α	0,09	0,11	0,14	0,06	0,68
	1,12	0,68	1,49	0,56	2,64
R^2	0,82	0,32	0,65	0,60	0,04

There are both similarities and differences, when it comes to the results found in the BRICS countries compared to the US. South Africa showed the most similar results to those witnessed in the US. In South Africa, the Fama and French factors along with the momentum anomaly can explain all the q-factors. The factor sensitivities are also similar and have the same positive signs as was the case in the US. When using the q-factors to explain the Fama and French plus the momentum anomaly, the same result was again evident in the case that the q-factors left unexplained the momentum anomaly. The momentum anomaly's risk premium in South Africa is significant at the 2% level (t-stat 2.50) as was discussed earlier. The momentum anomaly was left unexplained at a higher significance than in the US, this time at the 1% level (t-stat 2.64) for the alpha of the regression. When looking at the R^2 and the fit of the model, the R^2 is much higher for all the regressions in the US, suggesting that the factors acting as independent variables in the US provide a better model fit than in South Africa. This shows that in the US, the independent variables can cover more of the variance of the dependent variable than in South Africa.

Brazil is another country that showed similarities to the results found in the US. The Fama and French plus momentum factors were better able to capture the q-factors than the other way around. Similar factor sensitivities were also present; however, the sensitivity of the SMB factor is lower in capturing the ME factor in Brazil than it is in the US. The q-factors on the other hand capture all the common Fama and French factors but leave a highly significant alpha (t-stat 3.29) for the momentum factor. The risk premium of the momentum factor is also statistically significant in Brazil at the 1% level. This means that the q-factors leave a large portion of the momentum factor unexplained and therefore are unable to capture it. Larger differences in results are observed in Russia, India and China as these countries deviate from the results found in Brazil, South Africa, and the US.

In Russia, the Fama and French factors along with the momentum anomaly leave unexplained the size (ME) and the profitability (ROE) factors of the q-model. The alphas for both regressions produce significant t-statistics at the 5% and 10% levels respectively. The only factor that is captured in the regression is the investment (I/A) factor, which is carried by a large (1.29) and highly significant (t-stat 16.82) factor loading on the CMA factor. The ROE factor is also left unexplained in both India and China. In India, both the ROE and I/A factors are unexplained with highly significant alphas with t-statistics of -3.06 and 2.66 respectively. Similarly, in China, the ROE alpha yields a t-statistic of -3.11.

Russia, China, and India also deviate in the q-models ability to explain the Fama and French plus the momentum factors. In Russia, the q-model leaves unexplained the RMW, HML and the MOM factor all with highly significant and large alphas. All the three factors have statistically significant risk premiums in Russia. In India, the q-model leaves unexplained the SMB, HML, and CMA factors. A change in trend in the inability to explain the momentum factor happens, when using the q-factors in India and China. In both countries, the q-model can

capture the momentum factor, which was largely left unexplained in South Africa, Brazil, Russia, and the US. In India, the momentum factor, yields an alpha of 0.15 (t-stat 0.61) and in China an alpha of 0.06 (t-stat 0.26). There, however, is no statistical significance in the risk premium of the momentum factor in India and China. The factor coefficients are also vastly different for the momentum factor in these countries. In India and China, the ROE has a positive coefficient, whereas in the US it is negative and smaller, meaning that the ROE factor is more sensitive in explaining the momentum anomaly in India and China. Another interesting find related to this result is that most of the factors in the US showed a negative coefficient, but in India and China, most of the coefficients are positive in the momentum regression. This is a major difference in the q-model's ability to explain the momentum factor, when compared to the other sample countries and especially the US.

It has become evident that the similarity between the countries is in the inability of the q-factors to explain the momentum anomaly. The momentum factor has statistically significant risk premiums in South Africa, Brazil, and Russia. In the other BRICS countries, China and India, the momentum factor was captured, however, it does not have a statistically significant risk premium. This would suggest that the q-factors do not contain enough pricing information about the momentum anomaly within the sample period to capture it. This shows the inability of the q-factors in the BRICS countries to capture the phenomenon of rising (lowering) price momentum in forecasting returns in the future.

5.5.3 Mispricing and the Q-Factors in the US

The Stambaugh and Yuan mispricing factors can aid in capturing information that researchers have difficulties in explaining rationally. The mispricing factors of MGMT and PERF include multiple different anomalies connected to management and performance. The following section will discuss the results of the factor spanning regressions between the Stambaugh and Yuan mispricing model and the q-factor model. The discussion will begin with the US results, which will serve as a baseline for model comparison. Tables 7 and 8 show the regression results for the US.

Table – 7 Explaining the Q-Factors with the Stambaugh and Yuan Model (US)
α is the intercept of the regression and R^2 is the measure of fitness. MKT, SMB, MGMT and PERF are the market, size, management, and performance factors of the Stambaugh and Yuan mispricing model. The first rows show the factor loadings and the rows beneath it the corresponding t-statistic.

	α	MKT	SMB	MGMT	PERF	R^2
ME	-0,05	-0,02	1,32	-0,05	0,07	0,92
	-1,01	-1,20	33,89	-1,76	2,75	
I/A	-0,10	-0,01	0,03	0,80	-0,15	0,75
	-1,43	-0,30	0,53	20,32	-4,39	
ROE	-0,05	0,00	-0,36	0,38	0,29	0,63
	-0,52	-0,20	-5,52	7,55	6,43	

Table – 8 Explaining the Stambaugh and Yuan Model (US)
α is the intercept of the regression and R^2 is the measure of fitness. MKT, ME, I/A, and ROE are the market, size, investment and return on equity factors of the q-factor model. The first rows show the factor loadings and the rows beneath it the corresponding t-statistic.

	α	MKT	ME	I/A	ROE	R^2
SMB	0,02	0,03	0,66	0,08	-0,11	0,93
	0,56	3,23	33,12	4,00	-4,14	
MGMT	0,15	-0,02	0,05	0,81	0,33	0,80
	2,59	-1,26	1,74	25,47	8,13	
PERF	0,34	-0,16	-0,32	-0,56	0,52	0,64
	2,65	-4,69	-4,69	-8,07	5,97	

The Stambaugh and Yuan model can capture all the q-model factors in the US. All the alphas are insignificant in the regressions. The alphas of the regressions are, however, negative, which suggests that the Stambaugh and Yuan mispricing model overestimates the q-factors. Large factor loadings and highly significant t-statistics are present for the SMB & ME pair, which comes as no surprise as both are factors related to firm size. The MGMT mispricing factor largely captures the I/A factor of the q-model with a coefficient of 0.80 that is highly significant (t-stat 20.32). This is due to the information that is contained in the MGMT mispricing factor as it directly relates to the investment decisions that are made by firms. The PERF factor can aid the MGMT factor in capturing the ROE factor.

The PERF factor is a mispricing factor related to firm performance, which already includes information about profitability and is therefore able to capture it and play a large role in the regression.

The results of the regressions show some differences in terms of the Stambaugh and Yuan model's ability to explain the q-factors, when compared to that of Hou et. al (2019). Hou et. al (2019) argue that the original Stambaugh and Yuan model can capture the size and investment factors of the q-model, but not the ROE factor. In this master's thesis, the Stambaugh and Yuan model can similarly capture the size and investment factors of the q-model. The difference in results stems from the results found for the ROE factor. This is due to the way in which the factors are constructed in the studies. In Hou et. al (2019) the factor construction is done by using the original q-factors, whereas in this study the data is gathered from the Jensen et. al (2021) database. Hou et. al (2019) also argue that the factors are sensitive to their construction, which further supports that the deviation in results is largely due to the construction, in addition to the lower sample size that is used in this master's thesis.

The q-factors are largely unable to explain the two mispricing factors of MGMT and PERF. The q-factors produce alphas that are highly significant at the 2% and 1% levels for MGMT and PERF respectively. The I/A and ROE factors do have high coefficients, which are statistically significant, but are unable to bring down the alphas. Therefore, the Stambaugh and Yuan model largely subsumes the q-factor model and hence can dominate it in the US. Similarities in results for this regression are found from Hou et. al (2019). Hou et. al (2019) results argue that the q-factor model is unable to fully capture both the original and replicated Stambaugh and Yuan factors. This was also the case in this master's thesis. However, Hou et. al (2019) argue that when using the q^5-factor model where the expected growth rate is added to the standard q-factor model, the q^5-model can subsume the Stambaugh and Yuan model. The reason for not adding the q^5-model to this master's thesis is that there is no suitable data available for the BRICS countries at the moment.

5.5.4 Mispricing and the Q-Factors in the BRICS Countries

The factors that make both the q and the Stambaugh and Yuan models behave differently in the BRICS countries than they do in the US. In the US, the q-factors left unexplained both the MGMT and PERF factors, however this is not the case in the BRICS countries. Table 9 shows the results for the BRICS countries. Full results can be found in Appendix 4.

Table 9 – Explaining the Q and the Mispricing Model in the BRICS countries

α is the intercept of the regression and R^2 is the measure of fitness. ME, I/A, and ROE are the size, investment and return on equity factors of the q-factor model. SMB, MGMT, and PERF are the size, management, and performance factors of the mispricing model. The first row shows the alphas and the rows beneath it the corresponding t-statistic and R^2.

Panel A: Explaining the q-factors				Panel B: Explaining Mispricing			
Brazil	ME	I/A	ROE	Brazil	SMB	MGMT	PERF
α	0,19	0,18	-0,04	α	-0,06	0,08	0,70
	0,89	0,69	-0,19		-0,32	0,31	2,34
R^2	0,54	0,52	0,37	R^2	0,58	0,51	0,38
Russia	ME	I/A	ROE	Russia	SMB	MGMT	PERF
α	0,60	-0,12	-0,19	α	-0,16	0,13	0,87
	2,65	-0,58	-0,71		-0,87	0,67	3,53
R^2	0,56	0,52	0,39	R^2	0,53	0,57	0,55
India	ME	I/A	ROE	India	SMB	MGMT	PERF
α	-0,05	-0,37	0,47	α	0,11	0,39	-0,09
	-0,64	-2,08	3,08		1,73	2,83	-0,48
R^2	0,91	0,51	0,72	R^2	0,90	0,55	0,79
China	ME	I/A	ROE	China	SMB	MGMT	PERF
α	-0,20	-0,52	0,43	α	0,39	0,44	0,00
	-1,44	-4,52	2,76		3,62	4,09	0,02
R^2	0,89	0,73	0,74	R^2	0,87	0,64	0,58
SA	ME	I/A	ROE	SA	SMB	MGMT	PERF
α	-0,14	-0,07	-0,11	α	0,09	0,06	0,72
	-1,33	-0,35	-0,41		1,12	0,36	2,99
R^2	0,82	0,27	0,31	R^2	0,82	0,45	0,27

Similar observations are made again with Brazil and South Africa behaving more like the US, when compared to the other BRICS countries. In Brazil, the Stambaugh and Yuan model can subsume the q-factor model as was the case in the US. A notable difference is witnessed in the signs of the alphas. In Brazil, both the ME and I/A factors produce positive alphas, whereas in the US the alphas of the regressions are negative. This would suggest that in Brazil, the q-factors of ME and I/A are more correlated with the factors of the Stambaugh and Yuan model, whereas in the US they seem to move in the opposite directions. In explaining the Stambaugh and Yuan model, the q-factors can capture both the size and management factors of the mispricing model with insignificant and low alphas. The q-factors, however, are not able to capture the PERF factor at the 5% level (t-stat 2.34) leaving it unexplained. The PERF factor in Brazil also has a marginally significant risk premium at the 10% level.

South Africa has the same signs for all the regressions in terms of the alphas as the US. The Stambaugh and Yuan mispricing model is also able to capture all the q-factors. Similarly, to Brazil, the PERF factor is left unexplained in South Africa, this time at the 1% level. The PERF factor in South Africa also carries a highly significant premium with a t-statistic of 3.27. In terms of the model fit as measured by the R^2, the US has higher R^2 values for all the regressions, when compared to those of Brazil and South Africa. This suggests that the models used in the regressions provide a better fit in the US than in Brazil and South Africa. This is due to the larger volatility in return data that is observed in all the BRICS countries, when compared to that of the US.

In both India and China, the Stambaugh and Yuan model leaves largely unexplained both the I/A and ROE factors. In India the I/A factor is left unexplained at the 5% level (t-stat -2.08) and the ROE factor at the 0.5% level (t-stat 3.08) of which the ROE factor has statistical premium. The I/A factor in China is left unexplained at the 0.1% level (t-stat -4.52) and the ROE at the 1% level (t-stat 2.76). For the I/A factor in both countries, the MGMT factor has the highest coefficients that play the largest role in the regression with significant t-statistics, however, it is unable to bring down the alphas. The PERF factor on the other hand has the largest coefficient in India for the ROE factor. Surprisingly, in China the SMB carries the most weight. This suggests that in China, the SMB coefficient (-0.58) is explaining that the ROE factor would behave more like large companies in terms of profitability. It is a surprising result, due to the inclusion of the PERF factor in the regression as it already includes pricing information about profitability within its construction. In terms of the q-factors explaining the Stambaugh and Yuan model, in both India and China, the SMB and MGMT factors are left unexplained. This result deviates from what was found in South Africa and Brazil, where the PERF factor was the one left unexplained. In both India and China, the I/A factor has the largest coefficient for the MGMT factor at 0.55 (India) and 0.92 (China) but are still unable to capture it. The R^2 is also larger in India and China for most of the regressions, when compared to those of South Africa and Brazil, but lower than in the US.

As was the case in the Fama and French plus momentum and the q-factors regressions, Russia deviates from the findings of the US and the BRICS countries. In Russia, the Stambaugh and Yuan model can capture both the I/A and ROE factors, but not the ME size factor. The ME factor yields an alpha of 0.60 (t-stat 2.65) leaving it unexplained at the 1% level. This result is surprising, because the Stambaugh and Yuan model does have the SMB factor also related to size. The SMB factor in this regression carries the most weight with a highly significant coefficient of 0.73. The R^2 of the regression is also low at 56% suggesting that the regression model does not do an outstanding job in fitting the return data in Russia. The q-factors also leave one factor unexplained, which is the PERF factor. The factor is left largely unexplained by the q-factors at the 0.1% level (t-stat 3.53). The ROE coefficient is very close to what was witnessed in the US with the same positive sign.

5.5.5 Mispricing and the Fama and French plus MOM Factor in the US

The next section will look at the Stambaugh and Yuan mispricing factors and how they compare against the Fama and French five plus momentum model. The discussion will start with the results found in the US. Tables 10 and 11 show the regression results for the US.

Table 10 – Explaining the Mispricing Factors (US)

α is the intercept of the regression and R^2 is the measure of fitness. MKT, SMB, HML, RMW, CMA, and MOM are the market, size, value, profitability, investment, and momentum factors of the Fama and French five plus momentum model. The first rows show the factor loadings and the rows beneath it the corresponding t-statistic.

	α	MKT	SMB	HML	RMW	CMA	MOM	R^2
MGMT	0,14	-0,02	0,04	0,02	0,42	1,04	-0,06	0,84
	2,55	-1,31	0,78	0,32	5,92	17,82	-2,16	
PERF	0,16	0,02	0,06	-0,76	1,48	0,24	0,32	0,86
	2,28	1,15	0,94	-10,32	15,89	3,10	8,72	

Table 11 – Explaining the Fama and French plus Momentum Factors (US)

α is the intercept of the regression and R^2 is the measure of fitness. MKT, MGMT and PERF are the market, management, and performance factors of the Stambaugh and Yuan mispricing model. The first rows show the factor loadings and the rows beneath it the corresponding t-statistic.

	α	MKT	MGMT	PERF	R^2
SMB	0,09	0,07	-0,09	-0,43	0,55
	0,92	2,55	-1,71	-11,40	
HML	-0,02	0,00	0,69	-0,21	0,61
	-0,21	-0,01	13,67	-6,14	
RMW	-0,04	-0,04	0,23	0,35	0,62
	-0,55	-2,24	5,83	12,89	
CMA	-0,05	-0,01	0,66	-0,13	0,79
	-1,03	-0,59	23,12	-6,91	
MOM	0,00	-0,09	-0,21	0,68	0,60
	0,02	-2,37	-2,65	12,47	

In the US, the Fama and French five plus momentum model is unable to capture the mispricing factors of MGMT and PERF. The MGMT factor is left unexplained at the 2% level (t-stat 2.55) and the PERF at the 5% level (t-stat 2.28). Although the model is unable to explain the mispricing factors, it becomes evident that there is a decent fit in terms of the R^2 sitting at 84% (MGMT) and 86% (PERF). For the MGMT factor, all the coefficients are positive besides the MKT factor. CMA has the largest factor coefficient (1.04) with a very large t-statistic (17.82). In the US, the regression for the MGMT factor is mainly covered by the RMW and CMA loadings, which are both in the same direction. In terms of the PERF factor, the RMW carries a significant coefficient (1.48) for the regression. The momentum anomaly is the second largest with a 0.32 coefficient. Both are logical as the PERF factor's construction includes elements related to both profitability and momentum.

The mispricing factors can capture all the Fama and French factors and the momentum anomaly in the US. All the regressions produce insignificant alphas. The R^2 is, however, lower as compared to the earlier regression. This suggests that the fit is not as good, when the mispricing factors act as independent variables in the US. The MGMT factor is largely able to explain both the HML and CMA factors of the Fama and French model with high and statistically significant coefficients. The PERF factor on the other hand can explain the momentum factor with a coefficient of 0.68 (t-stat 12.47) that is highly significant. This plays to the construction of the PERF factor as it already contains the momentum anomaly within it as has been previously mentioned.

Comparing the result with the q-factors, it becomes evident that in the US, the mispricing factors are better able to explain the Fama and French plus momentum model. This is due to the momentum anomaly being covered in the pricing information of the mispricing factors. This is largely due to the inclusion of the PERF factor, which already contains momentum in its construction and is therefore better able to capture it compared to the ROE factor in the q-model.

5.5.6 Mispricing and the Fama and French plus MOM Factor in BRICS

Compared to all the other regressions done in this master's thesis, the results in the following regressions separate the BRICS countries from the US. Table 12 presents the results for the BRICS countries. For full results, see Appendix 5.

Table 12 – Explaining the Mispricing and the Fama and French plus Momentum factors in the BRICS countries

α is the intercept of the regression and R^2 is the measure of fitness. MGMT and PERF are the management and performance factors of the mispricing model. SMB, HML, RMW, CMA, and MOM are the size, value, profitability, investment and momentum factors of the Fama and French five plus Momentum model. The first row shows the alphas and the rows beneath it the corresponding t-statistic and R^2.

Panel A: Explaining Mispricing			Panel B: Explaining the FF5 plus Momentum					
Brazil	MGMT	PERF	Brazil	SMB	HML	RMW	CMA	MOM
α	0,03	0,25	α	0,41	0,11	-0,22	0,16	0,61
	0,16	1,12		1,70	0,74	-1,51	1,18	2,37
R^2	0,68	0,69	R^2	0,21	0,23	0,58	0,65	0,32
Russia	MGMT	PERF	Russia	SMB	HML	RMW	CMA	MOM
α	-0,10	-0,16	α	0,35	0,52	0,05	0,03	0,48
	-0,52	-0,79		1,53	3,46	0,35	0,26	1,96
R^2	0,65	0,75	R^2	0,28	0,22	0,49	0,56	0,40
India	MGMT	PERF	India	SMB	HML	RMW	CMA	MOM
α	0,12	-0,11	α	0,31	0,09	0,12	0,05	-0,14
	0,95	-0,85		1,84	0,71	1,17	0,58	-0,65
R^2	0,64	0,91	R^2	0,30	0,37	0,71	0,53	0,52
China	MGMT	PERF	China	SMB	HML	RMW	CMA	MOM
α	0,04	0,03	α	0,81	0,20	0,06	-0,03	-0,28
	0,50	0,25		3,55	1,41	0,39	-0,47	-1,68
R^2	0,81	0,89	R^2	0,41	0,47	0,56	0,80	0,56
SA	MGMT	PERF	SA	SMB	HML	RMW	CMA	MOM
α	-0,21	0,21	α	0,16	0,29	-0,02	0,08	0,11
	-1,39	1,59		0,94	1,97	-0,14	0,64	0,57
R^2	0,59	0,79	R^2	0,25	0,40	0,48	0,42	0,47

In all the BRICS countries, the Fama and French five plus momentum model can explain the two mispricing factors of MGMT and PERF. All the alphas of all the BRICS countries are insignificant for the mispricing factors. In the BRICS countries, the premiums for the PERF factor are also significant in Brazil, Russia, and South Africa and the MGMT factor in India. This deviates largely from the results found in the US, as in the US the alphas for both MGMT and PERF are highly significant. Based on the construction of the mispricing factors according to Stambaugh and Yuan (2017) it could be argued that the mispricing factors are better able to capture the common risk elements in the US than they are in the BRICS countries. The BRICS countries seem to be able to explain both the systematic risk and mispricing with the common Fama and French factors, without the need for clustered factors. This is a large difference found between the US and the BRICS countries.

The mispricing factors also leave unexplained various factors of the Fama and French plus momentum model in the BRICS countries. In Brazil, both the SMB and momentum factors are left unexplained. The SMB is marginally left unexplained at the 10% level, but the momentum is further unexplained at the 2% level. China also leaves the same factors unexplained, this time with the SMB at the 0.1% level and the momentum at the 10% level. The momentum factor is only captured in India and South Africa with large and statistically significant factor loadings on the PERF factor. The momentum factor does have a significant premium in South Africa, but not in India. In terms of the fit of the return data that is used in the BRICS countries as per the R^2, it is much lower than in the US. This could be an indication for some of the results that the models used are not as efficient in the BRICS countries as they are in the US in explaining the different risk elements and mispricing.

The results show that when it comes to the mispricing factors, there are large differences between the BRICS countries and the US during the sample period. It seems that the mispricing factors contain more of the pricing information in the US than they do in the BRICS countries. This becomes evident as the MGMT and PERF factors are left unexplained. In the US, the markets are more developed and run more efficiently, which could play a role in the ability to explain mispricing.

6 CONCLUSIONS

In this master's thesis, the focus was on risk premiums and factor model dominance in the BRICS countries and how the results compare with the US. It was found that the BRICS countries do not behave as a group, but rather each country acts independently. There are also differences in both risk premiums and dominance, when compared with the US.

It was found that the risk premiums in the BRICS countries are dependent on time and that they vary between the sample period and times of economic uncertainty. The highest risk premium is observed with the excess MKT factor in the BRICS countries. During times of economic uncertainty, the change in investor demand for compensation can be witnessed as the results show that the signs of the risk premiums change. This puts forward the different elements that are present in factor constructions. This was for example witnessed with the SMB factor changing to negative in the BRICS countries, showing how large companies perform better on average during times of economic uncertainty.

It becomes evident through this study that when it comes to the BRICS countries, there is not just one factor model that can dominate. Therefore, the factor models in terms of their dominance are not correlated in the BRICS countries or with the US. The pricing information regarding risk and mispricing varies across the BRICS countries and therefore one single factor model cannot be chosen as the most dominant. Similarities, however, are evident with certain countries. Brazil and South Africa show similar results to those witnessed in the US. It was shown through linear regressions that in Brazil, South Africa, and Russia, the Fama and French five plus momentum model dominates the q-model as was the case in the US. In terms of the regressions, it can be argued through this study that when it comes to the mispricing factors of MGMT and PERF, the BRICS countries deviate largely from the US during the sample period.

In the US, the mispricing factors can dominate the Fama and French five plus momentum model, but the result is opposite in all the BRICS countries. In the BRICS countries, the Fama and French five plus momentum model can explain the two mispricing factors of MGMT and PERF. This shows that the pricing information contained within the Fama and French factors and the momentum anomaly already contain pricing information about the mispricing factors in the BRICS countries.

The results of this master's thesis can be used by both retail and institutional portfolio investors looking to diversify in the BRICS countries. The results can aid in determining and identifying the different risk premiums and mispricing's in the BRICS countries. This will allow for portfolio investors to identify, which factors can best explain the cross-section of equity returns in these markets.

There are limitations in this study that could play a role in the deviation of results from previous literature. This pertains to the findings of Hou et. al (2019) regarding the dominance of the Fama and French five plus momentum model

and the q-factor model. The first limitation of the study is regarding the sample size. The sample size is smaller than in previous studies due to the involvement of the BRICS countries. The second limitation is the limited amount of previous literature pertaining to comparing the US and the BRICS countries in terms of factor model dominance. Most of the literature focuses on certain geographical areas such as Eastern Europe, North America, and/or Global. This limits the amount of comparison with prior literature that can be done for the results.

As the trend in research surrounding factors and the progress of involving more factors in the models continue, there are possible avenues for further research. As data becomes available, the study could be conducted by using similar sample sizes that have been used for developed economies such as the US. More factor models and anomaly variables could also be considered as data becomes readily available.

REFERENCES

Ahmed, S., & Zlate, A. (2014). Capital flows to emerging market economies: A brave new world? *Journal of International Money and Finance, 48,* 221–248. https://dio.org/10.1016/j.jimonfin.2014.05.015

Barillas, F., & Shanken, J. (2018). Comparing Asset Pricing Models. *The Journal of Finance, 73*(2), 715-754. https://doi.org/10.1111/jofi.12607

Cakici, N., Fabozzi, F. J., & Tan, S. (2013). Size, value and momentum in emerging market stock returns. *Emerging Markets Review, 16,* 46-65. https://doi.org/10.1016/j.ememar.2013.03.001

Cakici, N., Tang, Y., & Yan, A. (2016). Do the size, value, and momentum factors drive stock returns in emerging markets? *Journal of International Money and Finance, 69,* 179-204. https://doi.org/10.1016/j.jimonfin.2016.06.001

Carhart, M. M. (1997). On Persistence in Mutual Fund Performance. *The Journal of Finance, 52*(1), 57-82. https://doi.org/10.1111/j.1540-6261.1997.tb03808.x

Çepni, O., Gül, S., Hacıhasanoğlu, Y. S., & Yılmaz, M. H. (2020). Global uncertainties and portfolio flow dynamics of the BRICS countries. *Research in International Business and Finance*, *54*, 101277. https://doi.org/10.1016/j.ribaf.2020.101277

Fama, E. F., & French, K. R. (1992). The Cross-Section of Expected Stock Returns. *The Journal of Finance, 47*(2), 427-465. https://doi.org/10.2307/2329112

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics, 33*(1), 3-56. https://doi.org/10.1016/0304-405x(93)90023-5

Fama, E. F., & Fren, K. R. (1997). Value Versus Growth: The International Evidence. *SSRN Electronic Journal,* 1-29. https://doi.org/10.2138/ssrn.2358

Fama, E. F., & French, K. R. (2012). Size, value, and momentum in international stocks returns. *Journal of Financial Economics, 105*(3), 457-472. https://doi.org/10.1016/j.jfineco.2012.05.011

Fama, E. F., & French, K. R. (2015). A five-factor asset pricing model. *Journal of Financial Economics, 116*(1), 1-22. https://doi.org/10.1016/j.jfineco.2015.10.010

Fama, E. F., & MacBeth, J. D. (1973). Risk, Return, and Equilibrium: Empirical Tests. *Journal of Political Economy, 81*(3), 607-636. https://www.jstor.org/stable/1831028

Foye, J. (2018). A comprehensive test of the Fama-French five-factor model in emerging markets. *Emerging Markets Review, 37,* 199-222. https://doi.org/10.1016/j.ememar.2018.09.002

Gibbons, M. R., Ross, S. A., & Shanken, J. (1989). A Test of the Efficiency of a Given Portfolio. *Econometrica, 57(5),* 1121-1152. https://doi.org/10.2307/1913625

Hanauer, M. X., & Lauterbach, J. G. (2019). The cross-section of emerging market stock returns. *Emerging Markets Review, 38*, 265-286. https://doi.org/10.1016/j.ememar.2018.11.009

Harvey, C. R. (1995). Predictable Risk and Returns in Emerging Markets. *Review of Financial Studies, 8*(3), 773-816. https://doi.org/10.1093/rfs/8.3.733

Hou, K., Xue, C., Zhang, L. (2014). Digesting Anomalies: An Investment Approach. *Review of Financial Studies, 28*(3), 650-705. https://doi.org/10.1093/rfs/hhu068

Jegadeesh, N., & Titman, S. (1993). Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *The Journal of Finance, 48*(1), 65-91. https://doi.org/10.1111/j.1540-6261.1993.tb04702.x

Jensen, T. I., Kelly, B. T., & Pedersen, L. H. (2021). Is There a Replication Crisis in Finance? *SSRN Electronic Journal,* 1-113. https://doi.org/10.2139/ssrn.3774514

Leite, A. L., Klotzle, M. C., Pinto, A. C. F., & da Silva, A. F. (2018). Size, value, profitability, and investment: Evidence from emerging markets. *Emerging Markets Review, 36,* 45-59. https://doi.org/10.1016/j.ememar.2018.04.006

Lintner, J. (1965). Security Prices, Risk, and Maximal Gains From Diversification. *The Journal of Finance, 20*(4), 587-615. https://doi.org10.2307/2977249

Markowitz, H. (1952). Portfolio Selection. *The Journal of Finance, 7*(1), 77-91. https://doi.org/10.1111/j.1540-6261.1952.tb01525.x

Sharpe, W. F. (1964). Capital Asset Prices: A Theory of Market Equilibrium Under Conditions Of Risk. *The Journal of Finance, 19*(3), 452-442. https://doi.org/10.1111.j.15406261.1964.tb02865.x

Suwanprasert, W. (2022). The international spillover effects of US trade policy uncertainty. *Economics Letters, 212,* 110286. https://doi.org/10.1016/j.econlet.2022.110286

Zaremba, A., & Maydybura, A. (2019). The cross-section of returns in frontier equity markets: Integrated or segmented pricing? *Emerging Markets Review, 38,* 219-238. https://doi.org/10.1016/j.ememar.2019.02.003

APPENDIX 1 SUMMARY STATISTICS

Country: Brazil					
Factors	**Mean (%)**	**Std. Dev (%)**	**Min (%)**	**Max (%)**	**Sharpe Ratio**
MKT	**2,346**	**16,808**	35,557	203,652	3,855
SMB	0,113	3,743	-15,419	20,117	0,092
ME	0,375	4,245	-9,815	19,555	1,861
HML	0,249	2,406	-5,860	9,438	1,776
RMW	0,081	3,053	-12,408	12,717	-0,193
CMA	0,111	3,119	-11,434	18,668	0,087
I/A	0,270	5,029	-16,471	28,534	0,971
ROE	0,210	4,073	-11,729	14,672	0,773
WML	0,816	4,282	-20,511	13,139	**4,818**
MGMT	0,161	5,023	-22,841	22,102	0,342
PERF	0,652	5,274	-21,654	20,353	3,014
Country: Russia					
Factors	**Mean (%)**	**Std. Dev (%)**	**Min (%)**	**Max (%)**	**Sharpe Ratio**
MKT	**1,119**	**9,700**	-38,871	28,871	3,029
SMB	0,082	3,735	-14,526	17,357	-0,144
ME	0,478	4,713	-15,789	24,360	2,310
HML	0,617	2,335	-6,297	8,938	**6,380**
RMW	0,397	2,785	-10,036	10,068	3,062
CMA	0,064	2,557	-8,626	11,711	-0,421
I/A	0,0470	4,257	-17,54	19,000	-1,005
ROE	0,256	4,735	-18,326	16,654	0,946
WML	0,764	4,380	-16,654	18,165	4,366
MGMT	0,192	4,166	-16,855	15,107	0,632
PERF	0,764	5,103	-22,840	17,974	3,748
Country: India					
Factors	**Mean (%)**	**Std. Dev (%)**	**Min (%)**	**Max (%)**	**Sharpe Ratio**
MKT	**1,217**	**8,574**	-32,316	44,573	**3,756**
SMB	0,169	2,698	-9,147	10,525	0,729
ME	0,161	3,805	-14,717	13,892	0,454
HML	0,182	2,198	-10,395	6,483	1,065
RMW	0,151	2,588	-9,263	8,813	0,558
CMA	0,196	1,823	-9,994	6,762	1,505
I/A	-0,590	3,445	-25,77	9,55	-1,342
ROE	0,484	3,886	-15,388	9,149	2,843
WML	0,334	4,398	-29,939	20,840	1,525
MGMT	0,437	2,766	-10,845	9,838	3,505
PERF	0,388	5,507	-33,247	11,621	1,501

Country: China					
Factors	**Mean (%)**	**Std. Dev (%)**	**Min (%)**	**Max (%)**	**Sharpe Ratio**
MKT	**1,289**	**8,715**	-27,881	28,710	**3,936**
SMB	0,637	4,108	-14,973	14,599	3,768
ME	1,188	8,696	-22,333	23,544	3,608
HML	0,256	2,670	-10,557	13,186	1,678
RMW	0,183	3,024	-10,246	13,708	0,777
CMA	-0,033	1,913	-8,017	6,388	-2,017
I/A	-0,240	2,919	-13,514	9,969	-3,377
ROE	0,123	4,029	-14,759	18,186	0,156
WML	0,014	3,488	-10,553	9,57	-0,723
MGMT	0,127	2,419	-8,159	10,750	0,311
PERF	0,294	4,673	-14,756	14,227	1,189
Country: South Africa					
Factors	**Mean (%)**	**Std. Dev (%)**	**Min (%)**	**Max (%)**	**Sharpe Ratio**
MKT	**0,966**	**7,492**	-28,846	17,787	3,332
SMB	-0,094	2,740	-10,007	8,420	-2,055
ME	-0,204	3,332	-12,180	9,766	-2,646
HML	0,173	2,624	-7,041	13,575	0,786
RMW	0,393	2,206	-6,396	10,301	3,822
CMA	-0,112	2,237	-8,650	7,676	-2,745
I/A	-0,258	3,138	-10,278	13,004	-3,303
ROE	0,455	4,254	-19,091	18,108	2,400
WML	0,645	3,676	-16,655	10,742	4,274
MGMT	0,053	3,119	-8,909	10,121	-0,444
PERF	0,899	3,919	-19,161	18,592	**5,879**
Country: USA					
Factors	**Mean (%)**	**Std. Dev (%)**	**Min (%)**	**Max (%)**	**Sharpe Ratio**
MKT	**0,886**	**4,411**	-18,398	13,448	**5,137**
SMB	0,016	1,928	-5,665	8,119	-1,277
ME	-0,033	2,460	-7,187	8,928	-1,576
HML	-0,005	1,882	-7,442	7,566	-1,632
RMW	0,048	1,497	-8,070	4,289	-1,033
CMA	-0,026	1,458	-3,934	5,302	-2,520
I/A	-0,060	1,825	-5,564	5,426	-2,555
ROE	0,064	1,939	-9,931	5,262	-0,551
WML	0,092	2,921	-20,244	9,834	-0,089
MGMT	0,106	1,800	-5,398	6,354	0,078
PERF	0,280	2,940	-14,091	11,448	1,756

APPENDIX 2 FACTOR CORRELATIONS

BRA	*MKT*	*SMB*	*HML*	*RMW*	*CMA*	*ROE*	*WML*	*MGMT*	*PERF*	*IA*	*ME*
MKT	1										
SMB	-0,070	1									
HML	0,013	-0,321	1								
RMW	-0,156	-0,617	0,496	1							
CMA	-0,318	0,170	0,294	0,088	1						
ROE	-0,202	-0,244	0,291	0,723	0,117	1					
WML	-0,192	-0,297	-0,038	0,304	0,044	0,223	1				
MGMT	-0,319	-0,061	0,433	0,327	0,776	0,300	0,082	1			
PERF	-0,133	-0,437	0,148	0,714	-0,122	0,548	0,554	0,091	1		
IA	-0,249	0,187	0,283	0,066	0,844	0,198	0,051	0,682	-0,08	1	
ME	0,156	0,705	-0,203	-0,562	-0,010	-0,268	-0,285	-0,152	-0,35	-0,05	1

RUS	*MKT*	*SMB*	*HML*	*RMW*	*CMA*	*ROE*	*WML*	*MGMT*	*PERF*	*IA*	*ME*
MKT	1										
SMB	0,125	1									
HML	0,366	0,242	1								
RMW	0,016	-0,568	0,087	1							
CMA	0,021	-0,071	0,202	-0,115	1						
ROE	-0,072	-0,351	0,080	0,823	-0,143	1					
WML	-0,276	-0,271	-0,318	0,136	0,113	0,117	1				
MGMT	0,109	-0,194	0,329	0,163	0,741	0,118	-0,011	1			
PERF	-0,181	-0,516	-0,071	0,684	0,075	0,620	0,604	0,192	1		
IA	0,016	-0,186	0,141	-0,049	0,794	-0,129	0,096	0,716	0,140	1	
ME	0,085	0,710	0,199	-0,501	-0,243	-0,282	-0,270	-0,296	-0,532	-0,292	1

IND	*MKT*	*SMB*	*HML*	*RMW*	*CMA*	*ROE*	*WML*	*MGMT*	*PERF*	*IA*	*ME*
MKT	1										
SMB	0,272	1									
HML	0,197	0,331	1								
RMW	-0,575	-0,680	-0,284	1							
CMA	-0,242	-0,037	0,285	-0,089	1						
ROE	-0,543	-0,556	-0,432	0,897	-0,169	1					
WML	-0,346	-0,443	-0,332	0,380	0,337	0,430	1				
MGMT	-0,362	-0,220	0,242	0,261	0,687	0,256	0,465	1			
PERF	-0,591	-0,544	-0,402	0,825	0,108	0,829	0,726	0,432	1		
IA	-0,378	-0,061	0,196	0,077	0,836	0,010	0,435	0,690	0,335	1	
ME	0,301	0,946	0,272	-0,650	-0,139	-0,531	-0,417	-0,312	-0,502	-0,133	1

CHN	*MKT*	*SMB*	*HML*	*RMW*	*CMA*	*ROE*	*WML*	*MGMT*	*PERF*	*IA*	*ME*
MKT	1										
SMB	0,165	1									
HML	-0,076	-0,039	1								
RMW	-0,307	-0,877	0,120	1							
CMA	0,021	0,625	0,478	-0,642	1						
ROE	-0,267	-0,814	0,082	0,958	-0,678	1					
WML	-0,108	-0,529	-0,320	0,471	-0,378	0,449	1				
MGMT	-0,094	0,343	0,684	-0,294	0,825	-0,323	-0,294	1			
PERF	-0,226	-0,642	-0,451	0,725	-0,765	0,718	0,722	-0,585	1		
IA	0,059	0,714	0,252	-0,764	0,867	-0,794	-0,358	0,677	-0,676	1	
ME	0,204	0,900	-0,329	-0,822	0,367	-0,752	-0,423	0,058	-0,427	0,568	1

SA	*MKT*	*SMB*	*HML*	*RMW*	*CMA*	*ROE*	*WML*	*MGMT*	*PERF*	*IA*	*ME*
MKT	1										
SMB	-0,306	1									
HML	0,108	0,402	1								
RMW	0,306	-0,446	0,155	1							
CMA	-0,072	0,316	0,226	-0,370	1						
ROE	0,110	0,016	0,334	0,668	-0,300	1					
WML	-0,111	-0,186	-0,441	0,140	-0,143	-0,032	1				
MGMT	0,042	0,306	0,563	0,121	0,536	0,288	-0,06	1			
PERF	-0,061	-0,218	-0,275	0,593	-0,332	0,456	0,68	0,015	1		
IA	-0,008	0,200	0,026	-0,334	0,762	-0,354	-0,02	0,448	-0,259	1	
ME	-0,295	0,901	0,430	-0,371	0,223	0,087	-0,14	0,283	-0,139	0,144	1

US	*MKT*	*SMB*	*HML*	*RMW*	*CMA*	*ROE*	*WML*	*MGMT*	*PERF*	*IA*	*ME*
MKT	1										
SMB	0,504	1									
HML	0,001	0,096	1								
RMW	-0,541	-0,781	0,183	1							
CMA	-0,091	0,204	0,675	-0,122	1						
ROE	-0,497	-0,683	0,240	0,930	-0,084	1					
WML	-0,442	-0,528	-0,514	0,351	-0,248	0,273	1				
MGMT	-0,252	-0,031	0,708	0,210	0,854	0,307	-0,194	1			
PERF	-0,503	-0,722	-0,427	0,712	-0,376	0,642	0,765	-0,144	1		
IA	-0,076	0,172	0,740	-0,058	0,942	-0,026	-0,317	0,828	-0,371	1	
ME	0,455	0,954	0,057	-0,756	0,153	-0,637	-0,424	-0,076	-0,635	0,116	1

APPENDIX 3 Q-FACTORS AND THE FAMA AND FRENCH FACTORS IN THE BRICS COUNTRIES

Explaining the Q-Factors in South Africa and Brazil

	South Africa									Brazil							
	α	MKT	SMB	HML	RMW	CMA	MOM	R^2		α	MKT	SMB	HML	RMW	CMA	MOM	R^2
ME	-0,16	-0,02	1,03	0,19	-0,08	-0,13	0,07	0,83	ME	0,18	0,04	0,74	0,23	-0,27	-0,13	0,00	0,57
	-1,54	-1,04	20,89	3,69	-1,23	-2,69	2,24			0,88	2,69	10,16	2,18	-2,80	-1,79	0,09	
I/A	-0,14	0,04	0,03	-0,17	-0,06	1,10	0,04	0,61	I/A	0,00	0,01	0,12	0,15	0,00	1,31	0,06	0,72
	-0,96	1,86	0,47	-2,32	-0,72	15,52	0,86			0,05	0,59	1,74	1,52	0,06	18,45	1,15	
ROE	-0,06	-0,03	0,55	0,13	1,51	-0,29	-0,08	0,60	ROE	0,10	-0,07	0,35	-0,12	1,26	-0,02	0,02	0,59
	-0,32	-0,97	5,65	1,26	12,59	-3,00	-1,28			0,51	-0,60	5,20	-1,22	14,21	-0,22	0,48	

Explaining the Fama and French plus Momentum Factor in South Africa and Brazil.

	South Africa							Brazil						
	α	MKT	ME	I/A	ROE	R^2		α	MKT	ME	I/A	ROE	R^2
SMB	0,09	-0,02	0,73	0,05	-0,02	0,82	SMB	-0,06	-0,03	0,62	0,15	-0,12	0,58
	1,12	-1,30	27,30	1,85	-1,05			-0,32	-3,17	14,62	4,28	-2,58	
HML	0,11	0,07	0,36	0,06	0,18	0,32	HML	0,17	0,02	-0,09	0,13	0,13	0,17
	0,68	3,40	7,24	1,03	4,58			1,07	2,20	-2,28	3,98	3,30	
RMW	0,14	0,03	-0,26	-0,03	0,35	0,65	RMW	0,09	0,00	-0,29	-0,04	0,48	0,67
	1,49	2,60	-8,58	-0,82	14,60			0,74	0,38	-9,40	-1,74	14,68	
CMA	0,06	-0,01	0,08	0,52	-0,03	0,60	CMA	0,03	-0,02	0,02	0,51	-0,05	0,73
	0,56	-0,56	2,36	14,77	-1,00			0,26	-3,37	0,82	21,41	-1,64	
MOM	0,68	-0,08	-0,21	0,00	0,00	0,04	MOM	0,96	-0,03	-0,23	-0,17	0,15	0,12
	2,64	-2,28	-2,54	0,03	0,04			3,29	-1,91	-3,27	-0,29	1,97	

Explaining the Q-Factors (Russia)

	α	MKT	SMB	HML	RMW	CMA	MOM	R^2
ME	0,48	-0,17	0,64	0,31	-0,43	-0,49	-0,03	0,59
	2,05	-0,67	8,16	2,75	-4,19	-5,28	-0,57	
I/A	-0,09	0,00	-0,20	0,04	-0,09	1,29	-0,02	0,65
	-0,47	0,21	-3,12	0,42	-1,06	16,82	-0,46	
ROE	-0,34	-0,05	0,24	0,00	1,58	-0,04	0,02	0,71
	-1,72	-2,52	3,69	0,02	18,26	-0,53	0,39	

Explaining the Fama and French plus Momentum Factors (Russia)

	α	MKT	ME	I/A	ROE	R^2
SMB	-0,16	0,02	0,52	-0,02	-0,13	0,53
	-0,87	1,19	12,08	-0,34	-3,17	
HML	0,42	0,09	0,15	0,14	0,11	0,24
	2,87	5,67	4,46	3,82	3,39	
RMW	0,34	0,03	-0,19	-0,03	0,43	0,77
	3,51	2,80	-8,29	-1,30	19,98	
CMA	0,10	0,00	-0,02	0,47	-0,03	0,63
	0,88	0,16	-0,63	16,86	-1,10	
MOM	1,00	-0,12	-0,21	0,04	0,04	0,14
	3,40	-3,85	-3,08	0,55	0,57	

Explaining the Q-Factors (India and China)

	India								China							
	α	MKT	SMB	HML	RMW	CMA	MOM	R^2		α	MKT	SMB	HML	RMW	CMA	MOM	R^2
ME	-0,03	0,01	1,32	0,01	-0,06	-0,26	0,05	0,91	ME	0,10	0,00	1,18	-0,44	-0,24	-0,49	-0,06	0,91
	-0,34	0,47	28,78	0,21	-0,99	-4,43	2,20			0,72	0,24	17,89	-5,48	-2,12	-3,63	-1,14	
I/A	-0,40	-0,05	0,18	0,08	0,16	1,42	0,14	0,76	I/A	-0,13	-0,03	0,02	0,06	-0,43	0,87	0,08	0,83
	-3,06	-2,32	2,69	1,18	1,96	16,16	3,84			-1,37	-2,43	0,52	1,12	-5,48	9,10	2,36	
ROE	0,29	-0,01	0,25	-0,29	1,35	-0,18	0,12	0,86	ROE	-0,27	0,01	0,16	0,12	1,27	-0,40	0,05	0,93
	2,66	-0,36	4,26	-4,98	19,16	-2,38	3,82			-3,11	0,64	3,98	2,37	18,33	-4,71	1,58	

Explaining the Fama and French plus Momentum Factors (India and China)

	India							China						
	α	MKT	ME	I/A	ROE	R^2		α	MKT	ME	I/A	ROE	R^2	
SMB	0,11	-0,01	0,65	0,39	-0,06	0,90	SMB	0,39	-0,01	0,50	0,32	-0,13	0,87	
	1,73	-1,10	34,76	1,98	-2,82			3,62	-0,79	17,74	5,32	-2,37		
HML	0,25	0,02	0,06	0,15	-0,19	0,24	HML	0,57	0,03	-0,27	0,78	0,24	0,42	
	1,77	0,87	1,37	3,43	-3,94			3,82	1,44	-6,82	9,19	3,05		
RMW	0,00	-0,04	-0,16	-0,01	0,47	0,86	RMW	0,22	-0,02	-0,13	-0,06	0,54	0,95	
	-0,04	-3,51	-7,54	-0,32	18,68			4,26	-3,53	-9,40	-1,93	19,99		
CMA	0,31	-0,01	-0,08	0,42	-0,14	0,75	CMA	0,19	-0,01	-0,09	0,56	-0,10	0,78	
	4,64	-1,03	-4,16	19,97	-5,99			2,90	-0,87	-5,45	15,20	-2,99		
MOM	0,15	0,04	-0,22	0,55	0,41	0,40	MOM	0,06	0,00	-0,12	-0,02	0,25	0,22	
	0,61	1,00	-2,84	6,99	4,76			0,26	0,17	-2,06	-0,13	2,16		

APPENDIX 4 EXPLAINING MISPRICING AND THE Q-FACTORS IN THE BRICS COUNTRIES

Explaining the Q-Factors

	Brazil							South Africa					
	α	MKT	SMB	MGMT	PERF	R^2		α	MKT	SMB	MGMT	PERF	R^2
ME	0,19	0,05	0,80	-0,04	-0,01	0,54	ME	-0,14	-0,01	1,11	0,00	0,05	0,82
	0,89	3,65	13,10	-0,94	-0,30			-1,33	-0,40	25,82	0,14	1,84	
I/A	0,18	-0,01	0,28	0,69	-0,05	0,52	I/A	-0,07	-0,02	-0,02	0,46	-0,22	0,27
	0,69	-0,40	3,70	13,30	-0,94			-0,35	-0,73	-0,20	7,09	-4,33	
ROE	-0,04	-0,01	-0,01	0,19	0,40	0,37	ROE	-0,11	0,09	0,15	0,33	0,52	0,31
	-0,19	-0,99	-0,14	3,90	8,08			-0,41	2,49	1,39	3,90	7,87	

Explaining the Stambaugh and Yuan Model

	Brazil							South Africa					
	α	MKT	ME	I/A	ROE	R^2		α	MKT	ME	I/A	ROE	R^2
SMB	-0,06	-0,03	0,62	0,15	-0,12	0,58	SMB	0,09	-0,02	0,73	0,05	-0,02	0,82
	-0,32	-3,17	14,62	4,28	-2,58			1,12	-1,30	27,30	1,85	-1,05	
MGMT	0,08	-0,04	-0,08	0,62	0,16	0,51	MGMT	0,06	0,02	0,16	0,59	0,35	0,45
	0,31	-2,44	-1,32	12,00	2,52			0,36	0,78	2,98	10,35	8,33	
PERF	0,70	-0,01	-0,27	-0,21	0,67	0,38	PERF	0,72	-0,09	-0,26	-0,08	0,44	0,27
	2,34	-0,73	-3,74	-3,43	8,78			2,99	-2,79	-3,45	-0,92	7,15	

Explaining the Q-Factors

	India							China					
	α	MKT	SMB	MGMT	PERF	R^2		α	MKT	SMB	MGMT	PERF	R^2
ME	-0,05	0,03	1,36	-0,17	0,08	0,91	ME	-0,20	0,02	1,43	-0,53	0,14	0,89
	-0,64	2,21	38,32	-5,38	3,55			-1,44	1,44	33,84	-7,46	3,22	
I/A	-0,37	-0,06	0,19	0,80	0,02	0,51	I/A	-0,52	0,00	0,36	0,55	-0,06	0,73
	-2,08	-2,58	2,47	11,63	0,54			-4,52	-0,03	10,34	9,45	-1,54	
ROE	0,47	-0,05	-0,22	-0,19	0,52	0,72	ROE	0,43	-0,04	-0,58	0,15	0,32	0,74
	3,08	-2,47	-3,46	-3,31	13,39			2,76	-1,96	-12,63	1,98	6,58	

Explaining the Stambaugh and Yuan Model

	India							China					
IND	α	MKT	ME	I/A	ROE	R^2	CHN	α	MKT	ME	I/A	ROE	R^2
SMB	0,11	-0,01	0,65	0,04	-0,06	0,90	SMB	0,39	-0,01	0,50	0,32	-0,13	0,87
	1,73	-1,10	34,76	1,98	-2,82			3,62	-0,79	17,74	5,32	-2,37	
MGMT	0,39	0,02	-0,09	0,55	0,15	0,55	MGMT	0,44	0,00	-0,15	0,92	0,17	0,64
	2,83	0,80	-2,16	12,84	3,17			4,09	-0,26	-5,41	15,16	3,11	
PERF	-0,09	-0,02	-0,05	0,49	1,12	0,79	PERF	0,00	-0,05	0,20	-0,49	0,73	0,58
	-0,48	-0,85	-0,81	8,50	17,53			0,02	-1,78	3,41	-3,89	6,33	

Explaining the Q-Factors (Russia)

	α	MKT	SMB	MGMT	PERF	R^2
ME	0,60	0,00	0,73	-0,16	-0,19	0,56
	2,65	-0,19	10,40	-2,93	-3,76	
I/A	-0,12	-0,03	-0,07	0,73	-0,03	0,52
	-0,58	-1,22	-1,02	14,08	-0,67	
ROE	-0,19	0,02	-0,06	-0,01	0,56	0,39
	-0,71	0,78	-0,70	-0,21	9,20	

Explaining the Stambaugh and Yuan Model (Russia)

	α	MKT	ME	I/A	ROE	R^2
SMB	-0,16	0,02	0,52	-0,02	-0,13	0,53
	-0,87	1,19	12,08	-0,34	-3,17	
MGMT	0,13	0,05	-0,03	0,72	0,19	0,57
	0,67	2,46	-0,62	14,66	4,26	
PERF	0,87	-0,06	-0,37	0,13	0,57	0,55
	3,53	-2,40	-6,40	2,16	10,35	

APPENDIX 5 MISPRICING AND THE FAMA AND FRENCH PLUS MOMENTUM FACTOR IN BRICS

Explaining the Mispricing Factors

	Brazil									Russia							
	α	MKT	SMB	HML	RMW	CMA	MOM	R^2		α	MKT	SMB	HML	RMW	CMA	MOM	R^2
MGMT	0,03	-0,02	-0,07	0,26	0,27	1,14	-0,03	0,68	MGMT	-0,10	0,01	-0,11	0,27	0,29	1,20	-0,09	0,65
	0,16	-1,75	-0,97	2,49	2,79	15,21	-0,57			-0,52	0,49	-1,71	2,88	3,41	15,94	-1,94	
PERF	0,25	0,00	0,20	-0,25	1,32	-0,33	0,45	0,69	PERF	-0,16	-0,04	-0,06	0,12	1,09	0,15	0,59	0,75
	1,12	0,17	2,60	-2,30	13,23	-4,22	8,43			-0,79	-1,75	-0,85	1,29	12,58	1,89	12,56	

Explaining the Fama and French plus Momentum Factors

	Brazil						Russia				
	α	MKT	MGMT	PERF	R^2		α	MKT	MGMT	PERF	R^2
SMB	0,41	-0,03	-0,05	-0,32	0,21	SMB	0,35	0,02	-0,10	-0,36	0,28
	1,70	-2,27	-1,03	-7,10			1,53	0,79	-1,72	-7,78	
HML	0,11	0,03	0,23	0,06	0,23	HML	0,52	0,08	0,17	-0,03	0,22
	0,74	2,78	7,32	2,05			3,46	4,98	4,81	-1,11	
RMW	-0,22	0,00	0,16	0,40	0,58	RMW	0,05	0,43	0,01	0,39	0,49
	-1,51	0,46	5,59	14,95			0,35	2,73	0,22	13,42	
CMA	0,16	-0,02	0,47	-0,12	0,65	CMA	0,03	-0,02	0,47	-0,04	0,56
	1,18	-2,31	17,19	-4,84			0,26	-1,62	15,83	-1,76	
MOM	0,61	-0,03	-0,01	0,44	0,32	MOM	0,48	-0,07	-0,11	0,51	0,40
	2,37	-1,99	-0,10	9,15			1,96	-2,78	-1,92	10,51	

Explaining the Mispricing Factors

	India									China							
	α	MKT	SMB	HML	RMW	CMA	MOM	R^2		α	MKT	SMB	HML	RMW	CMA	MOM	R^2
MGMT	0,12	-0,01	0,04	0,31	0,31	0,83	0,16	0,64	MGMT	0,04	-0,01	0,04	0,25	0,19	1,02	0,02	0,81
	0,95	-0,54	0,61	4,66	3,78	9,64	4,59			0,50	-0,80	1,06	5,05	2,65	11,87	0,60	
PERF	-0,11	-0,01	0,47	-0,29	1,63	0,17	0,60	0,91	PERF	0,03	-0,02	0,33	-0,54	1,07	-0,52	0,49	0,89
	-0,85	-0,44	7,21	-4,43	20,23	1,96	17,08			0,25	-1,54	5,54	-7,44	10,66	-4,26	11,26	

Explaining the Fama and French plus Momentum Factors

.

	India						China				
	α	MKT	MGMT	PERF	R^2		α	MKT	MGMT	PERF	R^2
SMB	0,31	-0,02	0,01	-0,29	0,30	SMB	0,81	0,00	-0,08	-0,59	0,41
	1,84	-1,01	0,14	-7,72			3,55	0,18	-0,65	-9,34	
HML	0,09	0,01	0,41	-0,24	0,37	HML	0,20	-0,01	0,69	-0,05	0,47
	0,71	0,31	8,21	-8,44			1,41	-0,69	9,47	-1,39	
RMW	0,12	-0,05	-0,13	0,37	0,71	RMW	0,06	-0,04	0,20	0,51	0,56
	1,17	-3,27	-3,23	15,98			0,39	-2,24	2,66	12,90	
CMA	0,05	-0,03	0,51	-0,10	0,53	CMA	-0,03	-0,01	0,45	0,18	0,80
	0,58	-2,44	14,13	-4,96			-0,47	-0,74	13,93	-10,64	
MOM	-0,14	0,08	0,33	0,58	0,52	MOM	-0,28	0,05	0,34	0,66	0,56
	-0,65	2,78	4,00	12,20			-1,68	2,28	3,88	14,31	

Explaining the Mispricing Factors (South Africa)

	α	MKT	SMB	HML	RMW	CMA	MOM	R^2
MGMT	-0,21	0,00	0,14	0,52	0,39	0,74	0,17	0,59
	-1,39	0,18	1,99	6,78	4,38	10,21	3,74	
PERF	0,21	-0,06	0,38	-0,37	1,24	-0,07	0,54	0,79
	1,59	-3,13	5,79	-5,30	15,48	-0,99	13,10	

Explaining the Fama and French plus Momentum Factors (South Africa)

	α	MKT	MGMT	PERF	R^2
SMB	0,16	-0,12	0,28	-0,17	0,25
	0,94	-5,46	5,29	-3,98	
HML	0,29	0,02	0,47	-0,19	0,40
	1,97	1,24	10,30	-5,10	
RMW	-0,02	0,10	0,07	0,34	0,48
	-0,14	6,61	1,91	11,95	
CMA	0,08	-0,03	0,39	-0,20	0,42
	0,64	-2,13	10,11	-6,43	
MOM	0,11	-0,03	-0,07	0,63	0,47
	0,57	-1,31	-1,22	13,11	