SCHOOL OF ECONOMIC AND FINANCE,

FACULTY OF COMMERCE, LAW AND MANAGEMENT

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LEVERAGE AS A RISK FACTOR IN EXPLAINING THE CROSS SECTION OF STOCK RETURNS:

Evidence from the Johannesburg Securities Exchange (JSE)

A research report submitted to the School of Economics and Finance, ***University of the Witwatersrand*****,** ***Johannesburg,*** *in partial fulfilment of the requirements for degree of:*

Master of Commerce in Finance

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DECLARATION

I declare that this research work is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Commerce at the School of Economics and Finance, University of the Witwatersrand. It has not been submitted before for any degree or examination in any other University. Further, all the resources used or quoted have been indicated and acknowledged by means of complete references.

24 October 2022

Mkululi Balani | Date

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ABSTRACT

This study investigated whether there is a leverage risk premium that helps explain the cross-sectional variation in stock return for Johannesburg Securities Exchange (JSE) listed companies. The explanatory power of the Capital Asset Pricing Model (CAPM), the Fama and French three-factor (FF3F) model and the leverage augmented FF3F model were compared. The results suggest that the beta, size, value and leverage premia are all relevant factors in explaining stock returns in South Africa. Further, the results suggest that the leverage augmented FF3F model performs better than the classic FF3F model and CAPM in explaining the cross-sectional variation in average stock returns. Thus, the evidence in this study indicates that leverage is a priced risk factor.

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CHAPTER 1

INTRODUCTION

1.1 Background

Sharpe (1964), Lintner (1965) and Mossin (1966) charted new ground with one of the earliest models of asset pricing, the Capital Asset Pricing Model (CAPM). The CAPM is predicated on the premise that a single risk factor, the market beta is sufficient to explain the variation in average stock returns. However, numerous empirical studies have shown that the cross-sectional variation in expected returns cannot be explained by the market beta alone. For instance, Basu (1977) and Banz (1981) documented evidence that the price to earnings (P/E) ratio and firm size, respectively, yield higher risk adjusted returns than those explicated by the CAPM. Considerable research in asset pricing has usefully focused attention into developing models that include novel risk factors to better explain the cross-sectional variation in expected returns. Given its widespread application, in both developed and emerging markets, the Fama-French three-factor (FF3F) model has emerged as one of the most prominent multifactor models. Fama and French (1992) proposed a three-factor model that included size premium, value premium alongside the market risk premium to describe the cross-sectional variation in portfolio returns. The size premium denotes the idea that small capitalisation stocks earn, on average, higher risk adjusted returns than large capitalisation stocks. The value premium, on the other hand, imply that firms with high book-to-market ratios earn, on average, higher risk adjusted returns than firms with low book-to-market ratios.

Perhaps one of the most ubiquitous and multifaceted concepts in finance literature is leverage, however, Fama and French (1992,1993) contend its effect is subsumed by the book-to-market factor in their three-factor model. This therefore suggests that leverage should not be treated as an additional systematic risk factor. However, in subsequent studies, such as Artikis & Nifora (2011) and Muradoglu & Sivaprasad (2013) show statistical significance for the leverage-based mimicking portfolio in explaining variations in stock returns. Accordingly, through an asset pricing framework, this study aims to empirically investigate the potential role of a leverage factor on the South African stock exchange. Specifically, this study investigates whether a leverage augmented version of the FF3F model provides a better explanation of the cross-sectional variation in the expected returns than the 'vanilla' version of the model and the CAPM within a developing country context. Further, the consideration for using leverage along with three factors of FF3F model is to establish whether leverage is an independently priced risk factor.

The findings of this study may have practical implications for portfolio managers and equity investors by shedding light on the different risk factors driving portfolio returns as well as lead to accurate pricing of assets.

1.2 South African context

South Africa is the putative financial gateway to Africa and boasts well developed debt and equity capital markets. The Johannesburg Securities Exchange (JSE) listed debt market dominates the African continent in terms of market capitalisation and liquidity. The country's equity market compares favorably to many of the world's advanced economies.

1.2.1 The debt markets

It was not until the early 1980s that South Africa began to make key reforms to its bond market; thus, providing a complementary source of external funding to banking institutions and equity markets. This culminated in the country's first corporate debt issue by South African Breweries in 1992. Since then, the South African bond market's total market capitalisation has grown to ZAR 2.3 trillion and 1 816 listed debt instruments as of 31 December 2020[1] . The majority portion of primary listing – about 80.84 percent of total issuance was held by the domestic private sector. Another 9.03 percent of total issuance was held by domestic public sector with the remainder comprised of the foreign sector (World Federation of Exchanges Annual Statistics Guide, 2020).

1.2.2 The equity markets

The JSE began its trading operations on November 8th, 1887 and grew over the years to be the African continent's largest bourse in terms of market capitalisation. Yartey (2007) observes that the JSE accounts for approximately 90 percent of Africa's total market capitalisation. The JSE more than holds its own amongst the world's most sophisticated stock exchanges. With its market capitalisation of US$ 1 052 billion at the end of 2020, the JSE is the 19th largest stock exchange in the world, the only African stock exchange to make it into the top twenty (See Table 1.1).

At the end of year 2020, there were 331 listed companies on the JSE, of which 67 were foreign companies (World Federation of Exchanges Annual Statistics Guide, 2020). Market capitalisation of listed domestic companies to Gross Domestic Product (GDP) ratio grew from 221.63 percent in December 2010 to 313.48 percent in December 2020 (World Bank's World Development Indicators, 2020). A market capitalisation to GDP ratio greater (lesser) than 100% is generally considered to be indicative of an overvalued (undervalued) market (Isu and Okpara, 2013).

[1] World Federation of Exchanges (WEF), Annual Statistics Guide, 2020

Table 1.1: Market Capitalisation (USD millions)

Exchange	End 2020	End 2019	Change in Market Capitalisation
NYSE	26 232 740	24 480 180	7.2%
Nasdaq – US	19 060 372	13 002 048	46.6%
Shanghai Stock Exchange	6 975 970	5 105 841	36.6%
Japan Exchange Group	6 718 220	6 191 073	8.5%
Hong Kong Exchanges and Clearing	6 130 420	4 899 235	25.1%
Euronext	5 443 947	4 701 705	15.8%
Shenzhen Stock Exchange	5 238 495	3 409 663	53.6%
LSE Group	4 045 597	4 182 873	-3.3%
TMX Group	2 608 377	2 409 099	8.3%
National Stock Exchange of India	2 552 464	2 162 703	18.0%
Saudi Stock Exchange (Tadawul)	2 429 102	2 406 820	0.9%
Deutsche Börse AG	2 284 109	2 098 174	8.9%
Korea Exchange	2 176 189	1 484 840	46.6%
Nasdaq Nordic Exchanges	2 110 440	1 612 577	30.9%
SIX Swiss Exchange	2 001 603	1 834 453	9.1%
Australian Securities Exchange	1 720 556	1 487 598	15.7%
Taiwan Stock Exchange	1 598 570	1 217 274	31.3%
Tehran Stock Exchange	1 218 392	320 671	280.0%
Johannesburg Securities Exchange	1 051 529	1 056 341	-0.5%
B3 SA Brasil Bolsa Balcao	988 374	1 187 362	-16.8%

Source: World Federation of Exchanges (WEF), Annual Statistics Guide 2020

1.3 Research objectives

The objective of this study is to evaluate the applicability and effectiveness of asset pricing models to explain a cross section of stock returns in the Johannesburg Securities Exchange. The first of these models covered in the present work is the traditional Capital Asset Pricing Model (Sharpe, 1964; Lintner, 1965; Mossin, 1966), according to which asset returns depend solely on the market factor (beta). Despite its empirical weaknesses, the Capital Asset Pricing Model (Sharpe, 1964; Lintner, 1965; Mossin, 1966) remains one of the most widely tested asset-pricing models, particularly in the developed countries. The second model is the Fama and French (1993,1996)'s three factor model which includes the market factor (beta), the size factor (SMB) as well as the book-to-market factor (HML). SMB (Small minus Big) is the return on portfolio of small stock minus the return on a portfolio of big stocks. HML (High minus Low), on the other hand, is the return on the portfolio of stocks with high book-to-market ratios minus the return on a portfolio of stocks with low book-to-market ratios. Lastly, is the Fama and French (1993,1996)'s three factor model augmented with the financial leverage factor. Studies such as Bhandari (1988) and Fama and French (1992) find that leverage is positively related to expected stock returns. However, Fama and French (1992) suggests that the leverage premium is subsumed by the value premium. In this study, an attempt is made to see if leverage should be treated as an additional systematic risk factor.

1.4 Research questions

This study aims to address the following question:

Can the Capital Asset Pricing Model (CAPM), Fama and French three-factor (FF3F) model and leverage augmented FF3F model explain the cross-sectional variation in stock return for JSE listed companies?

1.5 Research motivation

This study extends the FF3F model by including financial leverage as one of the crucial risk factors that affects stock and portfolio returns using firms listed on the JSE. The motivation for evaluating the performance of the FF3F model from a developing country perspective in Africa is to contribute to the asset pricing literature where research that uses multi-factor pricing models is scant. According to Modigliani and Miller (1958) Proposition II, as the amount of debt increases in the firm's capital structure; rational risk-averse investors should expect a leverage premium to compensate them for the higher risk. In addition, this study conducts further tests to examine if the extended FF3F model that includes leverage premium enhances portfolio returns much better than the CAPM and the FF3F model in a developing country set up.

From a practical point of view, the results of the study could assist company executives and investors to decide upon the appropriate leverage amounts that would deliver better stock returns. The results could also assist lending institutions to enact discipline mechanisms to prevent corporates from defaulting on their debt obligations.

1.6 Contribution

First, this study focuses on a developing country in Africa, and a context, which is unique in many respects to other developing and emerging economies. For example, South Africa's uniqueness in terms of sophisticated financial systems, regulatory and institutional development presents this study with an opportunity to provide some insights into the general applicability of asset pricing models used mainly in developed countries to a developing country context.

Second, a consideration of the effect of capital structure decisions on asset pricing is crucial due to the potential impact on the growth and return generating ability of firms. An augmentation of prior models, especially the FF3F model with a leverage factor is not extensively researched, particularly in South Africa where firms generally have lower levels of leverage compared to developed countries (Vengesai and Muzindutsi, 2020). Thus, the causal relationship between leverage and stock returns might provide some insights into, amongst others, policy direction and management strategies.

Third, this study comparatively examines the applicability of CAPM, FF3F model and the augmented FF3F model from a developing country perspective.

1.7 Organization of the study

The remainder of this study is organized as follows: Chapter 2 provides a review of literature. Chapter 3 explains the methodology and data analysis procedures. After procedures, chapter 4 discusses the findings of this current study, while chapter 5 presents a summary of key findings and recommendations for further research.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter provides an overview of the Asset Pricing theories and a review of the empirical evidence on the impact of CAPM, FF3F and the augmented FF3F models on stock returns.

2.2 Portfolio theory

The pioneering work of Markowitz (1952) forms the bedrock upon which much of Modern Portfolio Theory (MPT) is built. Markowitz (1952, 1959) made an important conceptual advance with the mean-variance framework resulting in the author being jointly awarded the 1990 Alfred Nobel Memorial Prize in Economic Sciences with William Sharpe and Merton Miller. In Markowitz's mean-variance framework, the core underlying idea is that investors are rational, risk averse and single-period utility maximizing, basing their investment decisions solely on the expected return and variance of their portfolio (Fama and French, 2004). These investors thus prefer a portfolio that generates a higher expected return at a given risk and the less risk for a given expected return (Markowitz, 1952). Further, MPT enjoins investors to diversify a portfolio of stocks with the view of achieving the maximum potential returns as commensurate with the amount of risk an investor is prepared to bear.

2.3 Capital Asset Pricing Model (CAPM)

The traditional Capital Asset Pricing Model (CAPM) developed by Sharpe (1964), Lintner (1965) and Mossin (1966) offers robust and intuitively pleasing estimations about risk measurement and the connection between expected return and risk (Fama and French, 2004). The CAPM is based on the asset's sensitivity to non-diversifiable risk (that is the beta (β)) and it uses the theoretically risk-free asset to determine the expected return on a stock. For brevity, the model explains the relationship between market risk and the expected return on a stock. The model rests on the following assumptions (Bodie et al., 2014, p. 304):

Individual behavior

- Investors are rational, mean-variance optimizers
- Their planning horizon is a single period
- Investors have homogeneous expectations

Market structure

- All assets are publicly held and trade on public exchanges, short positions are allowed, and investors can borrow or lend at a common risk-free rate
- All information is publicly available
- No taxes
- No transaction costs

One of the early empirical tests of the CAPM, Black, Jensen, and Scholes (1972) applied time series regression on a monthly data set of all securities listed on the New York Stock Exchange (NYSE) over a thirty-five-year period from 1931 to 1965. In an effort to improve the statistical precision of the beta estimates, Black, Jensen, and Scholes (1972) grouped securities into portfolios instead of working with individual securities. Their results pointed to a linear relationship between the average excess portfolio return and the systematic risk as measured by beta. However, the high beta portfolios had negative intercepts while low beta portfolios had positive intercepts, which is inconsistent with the central prediction of the Sharpe-Lintner CAPM. Modified versions of the CAPM emerged aimed at transcending the restrictive set of assumptions. For instance, the classical Sharpe-Lintner CAPM assumed that all investors could freely borrow or lend at the risk-free rate. Black (1972) offered a tenable suggestion that assumed that the riskless asset might not be available. In the absence of a riskless asset, Black (1972) demonstrated that investors could instead use a portfolio of risky assets that is uncorrelated with the market portfolio as a proxy for the riskless asset. Black (1972)'s modification of the CAPM became known as the zero-beta CAPM.

In a landmark paper, Fama and MacBeth (1973) tested the CAPM using monthly returns data for companies listed on the NYSE over a 42-year period from 1926 to 1968. Fama and MacBeth (1973) employed a now widely used approach of combining the time series and cross-sectional regression techniques to test the CAPM. First, the authors allocated stocks into 20 equal sized portfolios based on estimated beta rankings over the period 1926 – 1929. For the succeeding 5-year period from 1930 to 1934, the betas of the portfolios created were re-estimated using time series regression technique. The authors then conducted cross sectional regression for each month for the period of 1935 – 1968. Fama and MacBeth (1973) results pointed to a positive linear relationship between beta and stock returns.

2.3.1 Criticism of CAPM

Roll (1977) provides a foundational critique and argues that tests performed by using any portfolio other than the true market portfolio are not tests of the CAPM, but rather are tests of whether the proxy portfolio is efficient or not. The principal challenge, Roll (1977) opines, is that the true market portfolio incorporates all the risky assets, including human capital, while the proxy portfolio contains a subset of all assets. Nascent literature further notes several points of critique against the CAPM. From an empirical prism, one of the major points of critique against the CAPM is that several factors other than market beta can explain a significant portion of asset returns. For example, Basu (1977) uses the CAPM to test the relationship between excess returns and price-earnings (P/E) ratio for firms listed on the NYSE over the period from 1956 to 1971. The study concluded that portfolios with high (low) P/E ratios earned, on average, lower (higher) rates of return. In addition, Banz (1981) tested the CAPM using data from the NYSE over the period 1936 to 1975. The authors found that firm size can explain the cross-section of asset returns and concluded that stock returns of smaller firms tend to be higher than that of larger firms. Banz (1981) postulates that the relative lack of information associated with small stocks might induce a higher risk premium.

Still, literature has documented various other risk factors to explain variation in asset return not measured by beta. De Bondt and Thaler (1985) found that stocks that have had low returns over the past three to five years have higher average returns as compared to previous winners, that is, stocks that have had high returns over the same period. Rosenberg, Reid, and Lanstein (1985) documented evidence of a positive relationship between book-to-market equity (BE/ME) and the cross sectional returns in the United States. Jegadeesh and Titman (1993) tested the momentum effect on stocks listed on the NYSE and American Stock Exchange (AMEX) from 1965 to 1989 and concluded that past winners over the last three to twelve months returns continue to outperform past losers over the same period. In subsequent works, Jegadeesh and Titman (2001) and Fama and French (2008) suggest that momentum is a pervasive anomaly.

Notwithstanding mounting criticism over the years, the CAPM remains the most popular asset-pricing model among the researchers as well as practitioners (Graham and Harvey, 2001; Brotherson et al., 2013; Ernst, 2022). Fama (1991) argued that CAPM's enduring appeal is mainly due to its simplicity and the absence of better alternative models.

2.4 Arbitrage Pricing Theory (APT)

The Arbitrage Pricing Theory (APT) was developed by Ross (1976a, 1976b) as a testable substitute to the CAPM. The APT is much more generalized and parsimonious in its assumptions as compared to the CAPM. The following assumptions characterize the APT (John Wei, 1988):

- All investors exhibit homogeneous expectations that the stochastic properties of capital assets return are consistent with a linear structure of k factors
- Either there are no arbitrage opportunities in the capital markets, or the capital markets are in competitive equilibrium
- The number of securities in the economy is either infinite or so large that the theory of large numbers is applied
- The number of factors, k, is known in advance or can be correctly estimated by the investigator

The expected return on i-th asset is given by:

$$E(r_i) = r_f + \beta_{i1}\lambda_1 + \beta_{i2}\lambda_2 + .. + \beta_n\lambda_n \qquad (2.1)$$

Where;

$E(r_i)$ = The expected return on asset i

r_f = The risk-free interest rate in government bonds

β_{ik} = Asset beta sensitivity to different risk factors

β_{ik} = The risk premium of the factor

k $= (1, 2, \dots n)$ number of the factor

The APT does not depend on the notion that market portfolio must be mean-variant efficient as required in the CAPM formulation. Both the CAPM and the APT postulate a linear relationship between risky assets' expected returns and their covariance, the former with the market portfolio whereas the latter is with other random variables. The central tenet in the APT is its recognition that the risky asset's expected return is a function of multiple risk factors, in contrast to the CAPM's single factor.

It has been reported, repeatedly, that there is no theoretical consensus regarding the identification procedure nor the appropriate number of priced risk factors. Presumably, a plethora of potential risk factors impacting on asset returns would need to be tested, in the absence of a theory-grounded rationale for selecting a particular risk factor. In an attempt to help ameliorate this concern, Roll and Ross (1980) conducted a time series analysis on the daily stock returns for companies listed on the NYSE and AMEX over the period 1962 to 1972. They noted that there are at least three and possibly four priced risk factors in the asset returns generating process. An alternative to the factor analytical approach (Roll and Ross, 1980), is the macroeconomic factor approach (Chen, Roll, and Ross, 1986). Chen, Roll, and Ross (1986) adopted a macroeconomic factor approach in a study covering a period from January 1953 to November 1984 for stocks listed on the NYSE. The study investigated the impact of seven macroeconomic variables, namely, term structure, industrial production, changes in risk premium, twists in the yield curve, consumption, oil prices and the market index. The authors concluded that industrial production, changes in risk premium and twists in the yield curve are significant in the explanation of expected asset return.

2.5 Fama-French Three Factor Model

After noting the anomalies associated with the Sharpe (1964), Lintner (1965) and Mossin (1966)'s CAPM, many deviations from the standard CAPM emerged. The deficiencies in CAPM led to the development of notable extensions that explored new dimensions for asset returns (Mirza et al., 2016). For example, the empirical work of Fama and French (1993, 1996) documented the role of size, book to market effects in the expected stock returns (Roy and Shijin, 2019), and developed a three-factor model as an alternative for explaining stock returns. The Fama and French (1993) three-factor asset pricing model incorporates size and value premiums respectively in addition to the market risk premium that was posited by the CAPM.

2.5.1 Augmented Fama-French Three Factor Model

Although Fama and French (1992) criticized the inability of CAPM's beta to capture the variation in stock returns and proposed a three-factor model that includes size and book to market ratio as additional variables, the controversy around their three-factor model as documented in prior studies relates to the type of risk that is captured by Small Minus Big (SMB) and the High Minus Low (HML) factors. In addressing the controversy around their model, Fama and French (1995) proposed that the three-factor model has a better explanatory power because the size and value factors capture the financial risk emanating from the increase in financial leverage. Fama and French (1995) opined that leverage should not be priced as a separate factor since financial distress is captured by the book to market factor.

Empirically, Vassalou and Xing (2004) used the US equities in the context of the three-factor model to examine the pricing of default risk and their findings suggested that financial distress and default risk is systematic in nature and is priced in equity returns. Vassalou and Xing (2004) reported that size and value factors contain some leverage related information, although that was not the only reason for these factors to be significant explanatory variables. Further, Vassalou and Xing (2004) concluded that the three-factor model that is augmented by the default factor from financial leverage has a better explanatory power of equity returns. Their finding is consistent with the suggestions in prior studies that proposed that financial leverage should be priced in stock returns and that financial risk premium should be included as an independent risk factor (Bhandari, 1988).

An increase in financial leverage sends mixed signals to the financial markets. On one hand, an increase in financial leverage indicates potential investment opportunities for the firm which would be financed through debt acquisition, while on the other hand, an increase in debt could be putting an upward pressure on the financial structure and increase financial risk (Mirza et al., 2013). This prompted some researchers to examine the role of financial leverage in asset pricing. For example, Mirza et al. (2013) investigated if size and value premia would capture financial distress in the presence of financial leverage which is a primary indicator of financial panic using cross country data of listed companies from nine European Union countries for the period 1989 to 2008. Their objective was to examine if leverage is priced in global stock returns. Their study extended the FF3F to a three-way sorting by including leverage mimicking portfolio to form a leverage factor HLML (that is, high leverage minus low leverage). Their results showed that the explanatory power of the portfolios sorted by size, value and leverage increased substantially with an inclusion of the leverage factor.

Bhandari (1988) examined the impact of capital structure on stock returns, after controlling for beta, firm size and the January anomaly. The results suggested a positive relationship between debt-to-equity ratio and stock returns. Further, Bhandari (1988) observed that the risk that originates from financial leverage is not covered by CAPM's beta and suggested that a unique premium which is different from the market risk premium was necessary. Similarly, Ferguson and Shockley (2003) found that the explanatory power of the single factor model increased when it was augmented by leverage and distress factors. In addition, Ferguson and Shockley (2003) found that the augmented model outperformed the FF3F model in explaining cross sectional variation in returns.

Many other studies continued to explore possible factors that could explain asset prices. For example, Fama and French (2015) constructed a five-factor model by adding two new factors that are related to profitability and investment.

2.6 Empirical Evidence

While there is a plethora of studies that were conducted in developed countries with the objective of comparing the performance of CAPM relative to various other augmented asset pricing models, there is a limited but growing evidence of studies conducted in the context of emerging and developing economies.

2.6.1 Developed Market Empirical Evidence

Evidence in prior studies show that most of the studies on asset pricing use data from the developed countries, and more especially the United States (Hakim et al, 2015; Leite et al, 2018). This is also true for the studies that augmented the CAPM with various other risk factors as potential explanatory factors for excess returns. For example, Fama and French (1992) augmented the CAPM by evaluating the joint roles of market, size, earnings per share-to-share price (E/P), leverage, and book-to-market equity in the cross-section of average returns on NYSE, AMEX, and Nasdaq stocks. In their study, Fama and French (1992) found that in contrast to the relationship between beta and average returns, the univariate relations between average return and size, leverage, E/P, and book-to-market equity were strong. In addition, Fama and French (1992) show that in multivariate tests, the negative relationship between size and average return was robust to the inclusion of other variables while the positive relationship between book-to-market value and average return also persisted when juxtaposed with other variables.

While Fama and French (1992) acknowledged that the size effect attracted more attention, they found that the book-to-market value had a consistently stronger role in average returns. Overall, Fama and French (1992) found that beta did not seem to help explain the cross-section of average stock returns, and that the combination of size and book-to-market equity seemed to absorb the roles of leverage and E/P in average stock returns for their sample period. Based on these findings Fama and French (1992), therefore, inferred that their results suggested that stock risks are multidimensional. Further, Fama and French (1992) identified two dimensions of risk which they suggested were proxied by size and book to market value. Fama, French, Booth and Sinquefield (1993) examined the differences in the risk and return for NYSE and Nasdaq stocks and found that the three risk factors, that is, the market, size and book-to-market performed very well in explaining the average stock returns. Fama and French (1993) found that their three-factor model which they constructed by augmenting CAPM with size and book to market ratio outperformed the CAPM in explaining the cross-section of average stock returns.

Beltratti and Di Tria (2002) used the Italian stock market data over the period 1990 to 2000 to compare the CAPM, FF3F model and the four-factor model and concluded that the FF3F model was more effective in explaining the cross section of returns. Djajadikerta and Nartea (2005) examined the influence of firm size and book-to-market (BM) ratio in the returns on portfolios comprised of stocks traded on the New Zealand market over the period 1994 – 2002. Djajadikerta and Nartea (2005) results confirm the presence of a somewhat significant size effect and a rather weak book-to-market effect. For the Australian market, Brailsford et al. (2012) overcomes the data availability constraints in prior studies by utilizing a bespoke dataset covering a 25-year period of 1982 to 2006 and with 98% of all listed firms on the Australian Stock Exchange included. Brailsford et al. (2012) found strong evidence in support of the value premium but found no conclusive evidence in support of the size premium.

Using monthly data of the Financial Times Stock Exchange (FTSE) 100 index constituents during the period 2009 to 2013, Trinh et al. (2016) compares the CAPM with the FF3F model post the outbreak of the financial crisis in 2008. First, the findings show that market risk factor is most significant in explaining the expected average returns of the six observed portfolios. Second, the explanatory power of the value factor (HML) is more pronounced amongst high book-to-market stock portfolios. Third, effectiveness of the size factor (SMB) in explaining the expected average returns appeared to be somewhat limited to small-scale portfolios. Overall, the results reveal that FF3F model can explain the excess returns better when compared to the traditional CAPM.

Wang (2018) examined the ability of the Fama and French three-factor model (1993) in explaining cross-sectional variation in stock returns. This was tested on a sample of listed companies of the Taiwan Stock Exchange (TSE) between 1982 and 2012. The effectiveness of the Fama and French three-factor model (1993) seems to be quite good with the coefficient of determination R^2 for the six observed portfolios ranging from 93% to 97%.

For the German market, Dirkx and Peter (2020) compared the FF3F model and a Fama and French Six Factor (FF6F) model by including profitability, investment, and momentum factors using monthly data from 2002 to 2019. The explanatory power of the FF6F model was marginal compared to the more parsimonious FF3F model.

Akbar et al. (2021) compared the explanatory power on excess return between the FF3F model and the Fama and French Five-Factor (FF5F) model. This was tested on a sample of 1300 listed companies across six developed countries of the Asia Pacific region (namely, Australia, Hong Kong, Japan, Israel, New Zealand, and Singapore) between 2006 and 2020. The evidence validates the existence of the market risk premium in the Asia Pacific region. Further, the study affirms the explanatory power of profitability and investment factors in the FF5F model. The results also revealed that size factor (SMB) and value factor (HML) do not help explain the variations in expected returns in the Asia Pacific region.

2.6.2 Emerging Market Empirical Evidence

There is a growing number of studies conducted in the context of developing countries that augment the CAPM with other risk factors. A wide variety test the validity of the FF3F model to determine if the size and value premia explain asset prices from the developing and emerging markets context. For instance, Chui and Wei (1998) empirically tested the FF3F model on China, Taiwan, Malaysia, Korea, and Singapore equity markets and found a strong relationship between the expected stock returns and market, size and book to market factors.

In India, Connor and Sehgal (2001), Sehgal and Tripathi (2006) and Taneja (2010) also conducted studies that compared the performance of CAPM and the FF3F model and found that the FF3F model explained excess returns better than the CAPM. The findings in the above-mentioned studies also showed that the market factor was very important in explaining excess returns. However, the authors observed that combined effect of market, size and book-to-market factors had a higher adjusted R squared values than the market factor alone. This suggests that the FF3F model is superior to the CAPM in explaining the cross-sectional variation of expected stock returns. However, evidence in Cakici et al. (2013) which used data from emerging markets show that value premium, was predominant in asset return predictability.

Sehgal and Balakrishnan (2013) examined the robustness of the FF3F model on the Indian stock exchange and found that FF3F model does a better job than the CAPM by explaining the returns on most of the portfolios constructed based on company characteristics. Similarly, Khudoykulov (2020) tested the role of size, profitability, value, investment, and market factors in explaining the average equity returns at the Indian bourses by evaluating the performance of CAPM, the FF3F model and FF5F model for the period between January 2009 and November 2018 and found that the size and value factors added to CAPM yield a vital improvement in explaining the variation in average returns of their sample stocks.

In Pakistan, Iqbal and Brooks (2007) examined the FF3F model and CAPM and found that the risk factors in the FF3F model were more significant than the CAPM for the stocks trading on the Karachi Stock Exchange. In Turkey, Ceylan, Dogan and Berument (2015) tested the FF3F model and found that the market, size and book to market were statistically significant variables in explaining excess returns.

2.6.3 South African Evidence

Mounting evidence on the South African stock market suggests that several factors help to explain the cross-section of equity returns. Van Rensburg (2001) examined three groupings of investment styles based on JSE listed industrial stocks over the period 1983 to 1999 using a time series analysis. The author found that size, value as proxied by earnings yield and momentum were significant factors in explaining stock returns in South Africa. In a follow up study, Van Rensburg and Robertson (2003) extended the dataset to cover all stocks listed on the JSE for the period 1990 to 2000 to examine the effect of size, value and CAPM beta using cross sectional analysis. The results show a significant effect of size and value premiums and evidence of a low CAPM beta phenomenon.

Basiewicz and Auret (2009) used the cross-section of average returns on the JSE over the period 1992 – 2005 and confirmed that size and value premiums were significant factors in explaining share returns in South Africa. Furthermore, Basiewicz and Auret (2009) found that the size effect and value effect are independent of each other. In subsequent work, Basiewicz and Auret (2010) examined the feasibility of the FF3F model on the JSE using time series tests on grouped and ungrouped data for the period from June 1992 to July 2005. Basiewicz and Auret (2010) found that both models captured a significant amount of time-series difference in most assets and yielded small pricing errors. Furthermore, Basiewicz and Auret (2010) found that the tests on ungrouped data using the FF3F model, explained the value effect and showed the right direction in explaining the size effect.

Strugnell et al. (2011) examined the effects of beta, size and value factors on the JSE for the period 1994 – 2007. The authors found that the size premium was significant and persistent and was indicative of some level of market inefficiency and a misspecification of the equilibrium pricing model such as CAPM. On the other hand, Auret and Cline (2011) categorized the data for the overall JSE index into two sets: the earlier set, (1988 to 1995) and the later set, (1996 to 2006) to test value, size and January month effects. For both periods, Auret and Cline (2011) found no significant support for value or size effects. According to Auret and Cline (2011), the contradictory results may be as a result of different time periods, databases or style proxies.

Muller and Ward (2013) used a sample of monthly returns for top 160 companies listed on the JSE sorted by market capitalisation for a period from 1985 to 2011 to examine effect of size, value (as proxied by earnings yield and cash flow to price) and momentum on stock returns. The authors found no evidence to support the size effect but strong evidence to support the value effect and momentum effect. Van Heerden and Van Rensburg (2015) also found strong and consistent value and momentum effects nevertheless an inconsistent size effect. In their follow up studies, Van Heerden and Van Rensburg (2016) studied the impact of liquidity on size, value and momentum and found that size was the most sensitive factor to liquidity followed by momentum. In addition, they found that the value factor was the most robust and that it was mostly insensitive to liquidity.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the methodological approach followed in this study. It also discusses the sample and data sources as well as the method that is applicable for analysis. In addition, this chapter discusses the variables used in the analysis and how they are constructed. Thereafter, this chapter also discusses the portfolio construction procedure and how the tests are conducted for each model constructed.

3.2 Data and sample

3.2.1 Population

The population comprises of all non-financial firms listed on the JSE for the 1999 to 2019 period.

3.2.2 Sampling

This study comprises of all listed non-financial firms for the period 1999 to 2019. A screening criterion was used to the initial sample to minimize the impact of outliers. Consistent with Fama and French (1992), financial firms are excluded from the sample since they have financial, operating, and risk characteristics that are not comparable to those of non-financial companies.

Following the Fama and French (1993) methodology, firms with negative book-to-market equity are excluded from the final sample. Additionally, all companies with missing data necessary for the analysis were excluded from the final sample. Also, stocks that have not been traded for more than 85% of the full observation period were excluded from the final sample. The sample includes historical data for firms that have been delisted over time. This was done to circumvent the possible survivorship bias.

Thus, after the above exercise, the final sample was determined, and it is presented in Table 3.1 below.

Table 3.1: Year on year sample size from 1999 to 2019

Year	Number of Firms
1999	65
2000	68
2001	69
2002	69
2003	70
2004	74
2005	75
2006	79
2007	84
2008	88
2009	89
2010	91
2011	93
2012	95
2013	99
2014	101
2015	102
2016	102
2017	105
2018	103
2019	98
Average	**87**
Total	**1819**

3.2.3 Data description

The data that is used for this study consists of daily stock prices, market capitalisation and risk-free rate of return of one-month Treasury Bill of South Africa. The collected data is primarily sourced from Annual Financial Statements, Bloomberg and IRESS INET BFA (formerly known as McGregor BFA database).

3.3 Methodology

3.3.1 Calculation of stock returns

Th daily stock returns were used for all the firms selected and included in the final sample as explained in prior sections and presented in Table 3.1 above. These daily stock returns were calculated as shown below:

$$R_{it} = LN \left[\frac{P_{it}}{P_{it-1}}\right] \qquad (3.1)$$

Where:

R_{it} = represent return on firm i at time t

$P_{i(t)}$ = represent price of stock *i* at time *t*, while $P_{i(t-1)}$ represents price of stock *i* at time *t-1*

3.3.2 Portfolio construction

The construction of portfolios starts at the beginning of January at year t. The sorting process follows a three-way sorting based on size, book-to-market and leverage factors. First, the sorting is done by size, whereby all the stocks are combined and ranked by market capitalisation (herein used as a proxy for size). Thereafter, the ranking is used to identify the median stock, which then represents a cut off that divides the stocks into Big and Small in year t+1. All the stocks above the median are defined as Big while those below the median are defined as Small. This results in two groups of size portfolios.

Second, each of the two groups of size portfolios is sort into two portfolios constructed based on book-to-market ratio. Thus, for each size portfolio, the stocks are sort into two portfolios. The first portfolio includes stocks with a high book-to-market ratio (that is, top 50% of stocks with a high book-to-market ratio, herein represented by **H**).The second portfolio is made up of stocks with a low book-to-market ratio (that is, the bottom 50% of stocks with a lower book-to-market ratio, herein represented by **L**).

The above results in four size and book to market portfolios. Third, the stocks from the four portfolios are then sorted based on leverage ratio. The median leverage is then used to sort the companies into High and Low leverage groups. The companies with leverage above the median leverage would fall under the high leverage (HL) group while those with leverage below the median leverage with fall under the low leverage (LL) group. This process would result in eight value weighted portfolios at the intersection of size, book-to-market and leverage. The portfolios are then rebalanced in June every two years based on their respective market value of equity, book-to-market ratio and financial leverage. A six-month gap between the ends of the fiscal year and the portfolio formation date is applied to facilitate information dissemination. Table 3.2 illustrates the portfolio construction procedure:

Table 3.2: Portfolio Construction Procedure

Market Value	Book to Market	Leverage	Portfolios
Big MV	High B/M	Low Leverage	BHLL
		High Leverage	BHHL
	Low B/M	Low Leverage	BLLL
		High Leverage	BLHL
Small MV	High B/M	Low Leverage	SHLL
		High Leverage	SHHL
	Low B/M	Low Leverage	SLLL
		High Leverage	SLHL

Adopted from Mirza, Saeed and Rizvi (2013)

KEY

BHLL: Big Market Value, High Book to Market, Low Leverage

BHHL: Big Market Value, High Book to Market, High Leverage

BLLL: Big Market Value, Low Book to Market, Low Leverage

BLHL: Big Market Value, Low Book to Market, High Leverage

SHLL: Small Market Value, High Book to Market, Low Leverage

SHHL: Small Market Value, High Book to Market, High Leverage

SLLL: Small Market Value, Low Book to Market, Low Leverage

SLHL: Small Market Value, Low Book to Market, High Leverage

The eight portfolios are named according to their characteristics, that is, with respect to size, book-to-market and leverage. For example, a portfolio named BHHL consists of stocks that are Big in

Size with High Book-to-Market and High Financial Leverage. A portfolio named SLLL represents a portfolio of stocks which are Small in Size, Low Book-to-Market and Low Financial Leverage.

3.3.3 Variables and model estimation

Since the aim of this study is to evaluate the pricing of financial leverage in stock returns, a leverage augmented four factor model is estimated to explain the variation in returns of the South African listed companies. This study follows the single factor CAPM and the traditional Fama and French three factor Model presented, which are then modified to include a leverage factor (see equation 3 below).

The Single CAPM Model

$$r_i - r_f = \alpha_i + \beta_1(r_m - r_f) + \varepsilon_i \qquad (3.2)$$

Where;

r_i = The return on asset *i*

r_f = The risk-free interest rate in government bonds

α_i = Intercept of the regression line

β_1 = Beta value of the independent variable $r_m - r_f$

r_m = Return of the market portfolio

ε_i = residuals of the regression model

The Traditional Fama and French Three Factor Model:

$$r_i - r_f = \alpha_i + \beta_1(r_m - r_f) + \beta_2(SMB_t) + \beta_3(HML_3) + \varepsilon_T \qquad (3.3)$$

Where

$r_i - r_f$ = represents excess returns for stock i above the risk-free rate

$r_m - r_f$ = represents market risk premium

SMB = (i.e. Small minus Big) - captures the size premium

HML = incorporates risk premium associated with growth firms, that is, the value premium.

ε_{iT} = is the error term which is characterized by

$E(\varepsilon_{iT}) = 0$; $Var(\varepsilon_{iT}) =$ constant; $Cov(\varepsilon_{iT}, \varepsilon_{iT-1}) = 0$ and $Cov(\varepsilon_{iT}, \varepsilon_{jT}) = 0$

However, as explained before, this study incorporates the leverage factor by modelling the relationship between excess returns and the risk factors. This is done by estimating a four-factor asset pricing model that includes leverage as one of the independent/explanatory variables for portfolio returns. In view of the foregoing, the current study presents the estimation of a single factor CAPM and the FF3F model for the eight portfolios. The results are then compared with those of the leverage augmented four-factor model.

Therefore, motivated by multifactor models, this study seeks to examine, amongst its other objectives, how market, value, size, and leverage risk factors are priced in a cross section of portfolio returns. Thus, building on Fama and French (1993)'s three factor model, this study utilizes the multifactor representation of expected returns in the cross section of each of the eight portfolio's returns which takes the following form:

$$r_{p(t)} - r_f = \alpha_i + \beta_{1p}\left(r_{m(t)} - r_f\right) + \beta_2 p(SMB_t) + \beta_{3p}(HML_t) + \beta_{4p}(HLMLL) + \varepsilon_t \tag{3.4}$$

Where:

$r_i - r_f$ = represents excess returns for stock i above the risk-free rate

$r_m - r_f$ = represents market risk premium

SMB = (i.e. Small minus Big) - captures the size premium

HML = incorporates risk premium associated with growth firms, that is, the value premium.

HLMLL = (High Leverage Minus Low Leverage) represents a proxy for leverage premium.

ε_{iT} = is the error term which is characterized by

$E(\varepsilon_{iT}) = 0$; $Var(\varepsilon_{iT}) =$ constant; $Cov(\varepsilon_{iT}, \varepsilon_{iT-1}) = 0$ and $Cov(\varepsilon_{iT}, \varepsilon_{jT}) = 0$

If financial leverage is priced, the HMLL factor should have a significant factor loading. The coefficients; β_1; β_2; β_3 *and* β_4 represent the factor loadings for market, size, value and leverage premiums respectively.

3.3.4 Variable construction

3.3.4.1 Dependent variable

Based on the traditional asset pricing model, the dependent variable is excess returns. The excess portfolio return is the difference between value weighted portfolio return and the risk-free rate of the yield on a daily Treasury bill of South Africa. Following prior studies, excess returns are used to capture the impact of taking risk. Therefore, any return over and above the risk-free rate should be a function of the associated risk factors. Thus, excess returns are captured using the formula below: $r_{p(t)} - r_f$

3.3.4.2 Independent variables

- **Market Risk Premium:** The initial independent variable is the market risk premium of CAPM. The market risk premium is the difference between daily returns on the JSE Index and the risk-free rate. It represents the additional return that investors would require for them to be enticed into investing in a fully diversified market portfolio instead of an individual security or a synthetic portfolio.

- **Firm Size Premium (Small Minus Big (SMB)):** The SMB factor considers the risk that is associated with the size of the firm. It is calculated as the difference between arithmetic mean of six portfolios that are made up of firms with low (small) and that of firms with high (large) market capitalisation. Thus, the size factor is created based on market capitalisation. As explained earlier, small stocks are those whose market capitalisation is less that the median market capitalisation while large stocks are those whose market capitalisation falls greater than the median market capitalisation. This is consistent with Fama and French (1992)'s argument that small firms are more vulnerable to business risk, which in turn impel investors to require a premium commensurate to the risk borne for investing in these firms. The equation below illustrates how the size premium is calculated.

$$SMB = \frac{(SHHL+SHLL+SLHL+SLLL)}{4} - \frac{(BHHL+BHLL+BLHL+BLLL)}{4} \qquad (3.5)$$

- **Value Premium / Book to Market Premium – High Minus Low (HML):** The value premium is used to make a distinction between value and growth firms based on the book to market ratio. Value stocks are, by definition, those stocks which have a high book to market value which have entered maturity phase or are expected to do so very soon. In addition, values stocks are stocks that are considered to have stable cash flows and are likely to offer modest returns to their shareholders. Growth stocks by contrast, are those stocks which have a low book-to-market value. Growth stocks have significantly more cash flows than value stocks. Therefore, based on the rationale that the underlying fundamentals for value stocks are going to remain low, investors would demand a higher premium to invest in value stocks than in growth stocks.

Thus, according to Fama and French (1992), value premium represents the premium that is received as compensation for investing in financially distressed companies that is shown through a high book-to-market ratio. In this study, it is calculated as the difference between average returns on four value weighted portfolios with high book-to-market ratio and four portfolios with a low book-to-market ratio. Construction of portfolios is based on the explanation provided in the procedure for portfolio construction. Mathematically is computed as below:

$$HML = \frac{(BHHL + BHLL + SHHL + SHLL)}{4} - \frac{(BLHL + BLLL + SLHL + SLLL)}{4} \quad (3.6)$$

- **Financial Leverage Premium – High Leverage Minus Low Leverage (HLLL):** The leverage factor is computed as a difference between the returns on high leverage firms and those that have low leverage. Thus, leverage premium is calculated to account for the higher returns that are associated with firms with a leveraged capital structure.

The above leads to Modigliani and Miller (1958)'s proposition that an increase in leverage would result in an increase in the required rate of return of equity. The increase in the required rate of return as equity holders would demand a risk premium when investing in firms with a high leverage. Consequently, an increase in the cost of equity offsets the tax benefits that are derived from introducing leverage in the capital structure of the firm (Modigliani and Miller, 1958). The leverage premium is calculated as the difference between average returns of four high leverage portfolios and four low leverage portfolios. The procedure for sorting firms based on leverage is also explained under the portfolio construction process. Mathematically, this is computed as shown below:

$$HLLL = \frac{(SHHL + BHHL + SLHL + BLHL)}{4} - \frac{(SHLL + BHLL + SLLL + BLLL)}{4} \qquad (3.7)$$

The sorting process explained above ensures that each factor captured is unique. That means, the factors are independent of each other.

Table 3.3 provides a summary of the number of firms in each of the portfolios for each year over the entire period. According to Table 3.3, on average, there are 11 firms through the period of the study in BHHL portfolio while there are 17, 8, 9, 10, 7, 15 and 11 firms are in the BHLL, BLHL, BLLL, SHHL, SHLL, SLHL and SLLL, respectively. Based on the portfolio construction procedure, fewer stocks qualified to be grouped under SHLL portfolio. This resulted in the SHLL portfolio having a lower number of stocks than those typically used in U.S. studies, albeit, only for the period 1999 to 2002. This , however, does not have a material impact to the results for the period under study.

Table 3.3: Distribution of factors sorted portfolios (using financial leverage)

Year	BHHL	BHLL	BLHL	BLLL	SHHL	SHLL	SLHL	SLLL	TOTAL
1999	13	13	3	4	5	2	12	13	**65**
2000	10	12	8	5	9	4	8	12	**68**
2001	13	14	3	5	6	2	13	13	**69**
2002	14	12	5	4	7	2	9	16	**69**
2003	10	13	6	7	9	4	11	10	**70**
2004	8	15	7	8	11	4	12	9	**74**
2005	7	16	8	7	11	4	12	10	**75**
2006	7	18	8	7	8	7	17	7	**79**
2007	10	15	8	10	13	5	12	11	**84**
2008	10	15	7	13	15	5	13	10	**88**
2009	10	17	8	10	11	7	16	10	**89**
2010	11	17	9	9	10	8	16	11	**91**
2011	13	18	8	8	9	7	17	13	**93**
2012	11	18	9	10	12	7	16	12	**95**
2013	10	20	9	11	11	9	20	9	**99**
2014	11	19	10	11	9	12	21	8	**101**
2015	8	21	11	12	13	10	20	7	**102**
2016	12	19	10	11	13	8	17	12	**102**
2017	12	21	10	10	12	8	18	14	**105**
2018	15	18	10	9	9	10	18	14	**103**
2019	13	16	13	8	9	12	15	12	**98**
Average	**11**	**17**	**8**	**9**	**10**	**7**	**15**	**11**	**87**
Total	**228**	**347**	**170**	**179**	**212**	**137**	**313**	**233**	**1819**

CHAPTER 4

EMPIRICAL RESULTS

4.1 Introduction

This chapter provides an analysis of findings of this study. It also provides a discussion of the findings of this study in comparison and contrast to empirical evidence in prior studies.

4.2 Descriptive statistics

The descriptive statistics are presented in Tables 4.1,4.2 and 4.3 as shown below.

Table 4.1: Descriptive statistics: firm size based on market capitalisation (R million)

Year	Median	Average	Std Dev
1999	2 552.15	9 707.03	20 977.24
2000	2 621.18	10 977.08	26 223.53
2001	2 968.90	19 076.93	58 522.96
2002	3 858.70	17 032.11	43 943.77
2003	4 525.80	19 715.82	52 374.83
2004	6 355.54	23 214.72	55 309.38
2005	8 467.49	33 645.40	85 274.51
2006	11 938.23	43 583.08	110 690.13
2007	11 914.13	60 187.71	170 216.75
2008	9 083.15	50 336.69	144 829.20
2009	10 257.57	60 564.00	182 022.25
2010	13 332.13	67 199.90	193 929.60
2011	12 569.60	66 294.36	182 733.55
2012	15 109.52	74 954.11	205 509.62
2013	16 030.14	84 756.11	235 487.32
2014	17 161.23	82 995.26	212 654.81
2015	13 501.03	78 997.73	219 437.79
2016	19 520.99	85 364.65	222 000.40
2017	17 472.53	101 237.04	290 852.65
2018	13 172.33	87 682.29	244 974.37
2019	12 005.28	92 303.27	257 678.68

Table 4.1 presents the descriptive statistics on firm size based on market capitalisation of the firms under study for each year and for the period 1999 to 2019. The results shown in table 4.1 confirm a fluctuation in the year-on-year average firm size over the period under consideration. However,

the observed fluctuations in firm size could be attributed to changes in the number of firms that are included in the sample for each year (see Table 3.1). Table 3.1 shows that the number of firms considered for this study rose from a minimum of 65 in 1999 to a maximum of 105 firms in 2017. Furthermore, the fluctuations in firm size could be attributed to the volatility in stock prices, with much of this volatility experienced in 2017.

Table 4.2: Descriptive statistics: book to market ratio

Year	Median	Average	Std Dev
1999	2.52	3.63	2.92
2000	2.52	4.54	8.31
2001	2.40	3.07	2.16
2002	2.53	2.98	1.66
2003	2.62	3.11	1.73
2004	3.06	3.40	1.41
2005	3.63	4.07	2.14
2006	4.28	5.85	7.87
2007	4.30	5.18	3.94
2008	3.31	4.53	5.62
2009	3.09	4.08	3.20
2010	3.26	4.21	2.88
2011	3.44	4.16	2.65
2012	3.30	4.56	3.60
2013	3.30	4.48	3.30
2014	3.40	4.59	3.28
2015	3.02	4.30	3.29
2016	2.82	3.94	2.79
2017	2.82	3.66	2.61
2018	2.66	3.46	2.64
2019	2.56	3.17	2.04

The average book to market ratio, as shown in Table 4.2 above, fluctuated, on average, between a minimum of 2.98 in 2002 to a maximum of 5.85 in 2006. However, the descriptive statistics in Table 4.2 show that the average book-to-market ratio fluctuated more frequently. However, the results in Table 4.2 show a few spikes in the average book-to-market values recorded in certain years, for example, in 2000, 2006 and 2008. These spikes can also be explained by the volatility in the book to market values for the above-mentioned years. For example, in the early 2000s, the average book-to-market value experienced volatility of 8.31% (that is, in year 2000) and then in mid 2000s, it spiked again to 7.87% in 2006 and to 5.62% in 2008, but thereafter it stabilized to lower levels of volatility since 2008 (refer to Table 4.2 above).

Evidence in prior asset pricing studies show that equities are affected differently during turbulent periods. For instance, there is evidence in extant studies that show that growth stocks and value stocks are impacted differently in situations arising from adverse economic events especially if leverage is considered. For instance, Choi (2013) examined how asset risk and financial leverage interact to explain the differences between equity risk dynamics of value and growth stocks during economic downturns. The results show that value stocks are particularly risky during economic downturn when the risk premium is high. In the same study, Choi (2013) shows that the asset risk and leverage of value firms increase, leading to a sharp increase in equity betas. Meanwhile, the betas of growth firms remain stable over time due to lower leverage and asset betas which are less sensitive to economic conditions. Further evidence provided by Carlson et al. (2004) and Zhang (2005) show that value firms' asset risk will rise during economic downturns owing to either high operating leverage or costly reversibility of investments.

The evidence of spikes in market-to-book values in years following an economic downturn as shown in Table 4.2 is consistent with those of Choi (2013), in that, equity betas of value firms rise during turbulent times relative to those of growth firms.

Table 4.3: Descriptive statistics: debt to total assets

Year	Median	Average	Std Dev
1999	0.80	0.76	0.20
2000	0.81	0.77	0.19
2001	0.78	0.76	0.18
2002	0.79	0.77	0.16
2003	0.79	0.77	0.17
2004	0.78	0.77	0.15
2005	0.81	0.77	0.16
2006	0.78	0.75	0.19
2007	0.80	0.75	0.19
2008	0.75	0.73	0.19
2009	0.72	0.71	0.20
2010	0.77	0.74	0.19
2011	0.77	0.75	0.18
2012	0.79	0.75	0.19
2013	0.76	0.74	0.18
2014	0.72	0.72	0.19
2015	0.72	0.71	0.19
2016	0.72	0.72	0.19
2017	0.72	0.72	0.20
2018	0.71	0.72	0.17
2019	0.69	0.71	0.18

The average total debt ratio oscillated between 0.71 and 0.77, which is an indication of a high use of debt by the companies in the sample for the period under consideration. This may have been a result of the JSE being dominated by companies that are highly capital intensive, which in turn, have higher funding requirements as firms in these industries try to secure machinery and relevant equipment for production to take place. This could be the reason why companies on average maintained high but relatively stable leverage ratios.

4.3 Analysis of results

The aim of this study is to evaluate and compare the performance of three asset pricing models namely, the CAPM, FF3F model and the augmented FF3F model which includes leverage risk premium. In pursuit of the above objective, this study, first, considers the regressions coefficients of each model for the explanatory power of market, size, value and leverage factors. Second, the study compares the models based on the adjusted R squared as well as reporting on the average standard error of the intercepts (SE). To achieve the above, section 4.3.1 presents the results based on the single factor regression model. The single factor model examines the applicability of the CAPM to explain stock returns in South Africa.

Section 4.3.2 presents results based on the FF3F model, which is used to examine its applicability in explaining stock returns. Third, section 4.3.3 presents the results based on the augmented FF3F model for leverage premium. The FF3F model examines whether leverage premium is relevant in asset pricing. Thereafter, section 4.3.4 presents an analysis that compares the findings based on the leverage augmented four factor model to the single factor and the FF3F models.

4.3.1 Analysis based on the Single Factor Model

Table 4.4 reports the regression coefficients of results based on the single factor model (CAPM). The results presented in Table 4.4 show that the regression coefficients for CAPM are positive and statistically significant at 1% significance level for all the portfolios. In addition, the results show that the regression coefficients for the four portfolios constructed using big firms have higher betas relative to the four portfolios constructed using the small firms. However, the market factor loadings for all portfolios irrespective of size are positive and significant at 1% (99% confidence interval) since the absolute t-statistics are greater than 2.33 (that is, $| t | > 2.33$) and p-values are 0.0000 for all portfolios. This finding is consistent with the proposition by Sharpe (1964) that market risk is priced in stock returns.

These findings are also consistent with Hassan and Javed (2011) who found that the market risk premium is valid in explaining stock returns. Overall, the findings of this current study suggest that the CAPM is valid in explaining the variation in portfolio returns in South Africa (see Table 4.4).

Table 4.4: Single factor regression on portfolios sorted for size, book to market and leverage (total debt to total assets)

	BHHL	BHLL	BLHL	BLLL	SHHL	SHLL	SLHL	SLLL	Median	Average	Std Dev
α	0.00002	-0.00008	-0.00016	-0.00021	0.00012	-0.00002	0.00013	-0.00025	-0.00005	-0.00006	0.00013
β(MRP)	0.97698	1.08890	0.63556	0.72390	0.39778	0.40030	0.39775	0.39848	0.51793	0.62746	0.26316
t-Stat α	0.16351	-0.75521	-0.99022	-1.58437	0.99121	-0.11602	0.99950	-2.13221	-0.43562	-0.42798	1.07027
t-Stat β(MRP)	82.23446	120.19699	49.91405	67.11415	41.65024	24.76341	38.41607	41.06164	45.78215	58.16888	28.82365
P-value α	0.87012	0.45015	0.32211	0.11317	0.32163	0.90764	0.31760	0.03304	0.32187	0.41693	0.29893
P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Standard Error	0.01058	0.00807	0.01134	0.00961	0.00851	0.01440	0.00922	0.00864	0.00942	0.01005	0.00194
Adjusted R Squared	0.56325	0.73371	0.32203	0.46205	0.24850	0.10456	0.21954	0.24322	0.28527	0.36211	0.19488
# of Observations	5244	5244	5244	5244	5244	5244	5244	5244	5244	5244	0

Table 4.4 shows the single factor model (CAPM) with excess return as the dependent variable, while market risk (MRP) is the independent variable. The intercept for the model is denoted by the term α while β(MRP) refers to factor loadings on CAPM based risk premium, the t-stat (MRP) represents statistical significance for the corresponding factor loadings, the level of significance refers to 99% for $|t| > 2.33$ and 95% for $|t| > 1.96$.

4.3.2 Analysis based on the Fama and French three-factor (FF3F) model

Table 4.5 presents the regression results based on the FF3F model. In this model, the CAPM shares its explanatory power with other risk premiums, that is, the size and value premia. However, the results still show that the CAPM is valid in explaining portfolio returns. The coefficients for the market risk premium are positive and statistically significant at 1% for all the portfolios. However, with the addition of the size and value premia, the CAPM coefficients for the big firms, though still positive have slightly decreased while those of small firms have increased tremendously. Interestingly, the inclusion of the size and value premia improved the explanatory power of the model. Thus, the FF3F model has more explanatory power (as shown by the tremendous increase in the adjusted R^2-values for all portfolios) than the single factor model (that is, CAPM). Furthermore, the results show that both size and value premia explain the variation in portfolio returns.

Based on the SMB (that is, size premium), the results show that the coefficients of the portfolios made up of big firms have negative coefficients while portfolios which are made of small firms have positive coefficients. The finding of positive coefficients for small capitalisation portfolios is consistent with the findings of Choi (2013), while the findings of negative coefficients for big portfolios are consistent with Mirza et al. (2013). Apart from the differences in the signs of the coefficients between big and small capitalisation portfolios, the results also show that the loadings on the SMB factor are statistically significant at 1% for all portfolios irrespective of size. The finding of statistically significant loadings on the SMB factor across all portfolios is consistent with the findings of Fama and French (1996) who also found dramatically significant coefficients for all portfolios at 1% significance level.

From the South African perspective, empirical evidence show that the findings are mixed (Page and Auret, 2014). For example, evidence of the size effect that is shown in this study is consistent with most of the studies conducted in South Africa post year 2000 (Van Rensburg, 2001; Page and Auret, 2019), but inconsistent with evidence presented in studies from the late eighties and the early nineties (Bradfield et al, 1988; Page and Palmer, 1991). In addition, the results of this study also support evidence of value premium for the sample portfolios. The factor loadings for HML (value premium) are positive for portfolios with high book- to-market ratios and negative for portfolios with lower book-to-market ratios. The signs are consistent with the rationale of value premium as investors would require high returns to invest in value stocks compared to growth stocks. Also, the coefficients for all portfolios irrespective of classification are significant at 1% since their absolute t-statistics are greater than 2.33.

Table 4.5: Three factor regression on portfolios sorted for size, book to market and leverage (total debt to total assets).

	BHHL	BHLL	BLHL	BLLL	SHHL	SHLL	SLHL	SLLL	Median	Average	Std Dev
α	0.00000	-0.00010	-0.00004	-0.00011	0.00005	-0.00020	0.00015	-0.00025	-0.00007	-0.00006	0.00012
β(MRP)	0.65670	0.88810	0.57819	0.75563	0.58618	0.74765	0.78541	0.75939	0.75164	0.71966	0.09883
β(SMB)	-0.49188	-0.29555	-0.36723	-0.17023	0.47385	0.98870	0.61599	0.59658	0.15181	0.16878	0.52472
β(HML)	0.53722	0.36994	-0.62537	-0.61928	0.16103	0.59432	-0.59686	-0.49598	-0.16747	-0.08437	0.51533
t-Stat α	0.01143	-1.02014	-0.27759	-0.99911	0.47419	-1.33536	1.49637	-2.66174	-0.63835	-0.53900	1.17919
t-Stat β(MRP)	48.15394	82.15345	40.89392	63.37502	53.53801	47.47584	76.09813	76.80792	58.45651	61.06203	14.74272
t-Stat β(SMB)	-29.24230	-22.16528	-21.05722	-11.57501	35.08793	50.90061	48.38754	48.92100	11.75646	12.40716	34.00175
t-Stat β(HML)	31.32965	27.21675	-35.17693	-41.30802	11.69706	30.01474	-45.99255	-39.89700	-11.73993	-7.76454	33.40762
P-value α	0.99088	0.30771	0.78134	0.31779	0.63538	0.18182	0.13462	0.00780	0.31275	0.41967	0.32288
P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
P-value β(SMB)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
P-value β(HML)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Standard Error	0.00930	0.00737	0.00964	0.00813	0.00746	0.01074	0.00704	0.00674	0.00780	0.00830	0.00134
Adjusted R Squared	0.66298	0.77795	0.51046	0.61504	0.42161	0.50232	0.54583	0.53999	0.54291	0.57202	0.10339
# of Observations	5244	5244	5244	5244	5244	5244	5244	5244	5244	5244	0

Table 4.5 above shows the three-factor model (FF3F) with excess return as the dependent variable, while market risk (MRP), SMB (size) and HML (value) as independent variables. The term α represent the intercept for the model while β(MRP), β(SMB), β(HML) refer to factor loadings on CAPM based risk premium, size and value respectively, the t-stat (MRP), t-stat (SMB), and t-stat (HML) represent statistical significance for the corresponding factor loadings, the level of significance refer to 99% for | t | > 2.33 and 95% for | t | > 1.96.

4.3.3 Analysis based on the Four Factor model (Leverage Augmented FF3F model)

Table 4.6 shows the empirical results of a four-factor model for the 8 portfolios that were created at the intersection of size, book to market and financial leverage ratio. Thus, Table 4.6 represents the regression results for the portfolios that were sorted using total debt to total assets as a proxy for financial leverage premium.

A review of the results in Table 4.6 shows that, with the inclusion of the leverage premium, the coefficients of CAPM's market risk premium improved, are positive and significant at 1% (99% confidence interval) for all the portfolios since the $| t | > 2.33$. This finding is still consistent with the proposition by Sharpe (1964) that market risk is priced in stock returns. These findings also validate the findings of Hassan and Javed (2011) who found that the market risk premium is valid in explaining stock returns.

Overall, the results in Table 4.6 also show market premium, size, value and leverage premia are valid in explaining portfolio returns in South Africa. The coefficients for the SMB factor loadings (that is size premium) are negative and significant for big firms while they are positive and significant for small firms. The results are significant at 1% (that is 99% confidence interval since $| t | > 2.33$) for all the portfolios irrespective of size. The results also support evidence of value premium for all the portfolios. The factor loadings for HML (value premium) are positive for portfolios with high book-to-market ratios and negative for portfolios with low book-to-market ratios. The signs are consistent with the rationale of value premium as investors would require high returns to invest in value stocks compared to growth stocks. In addition, the results show that the coefficients for all the portfolios are significant at 1% since their absolute t-statistics are greater than 2.33.

The results based on leverage premium (HLLL) show significant coefficients for the leverage premium factor with positive factor loadings for portfolios made up of firms with high leverage and negative for portfolios with lower leverage. Interesting to note also, is that all the coefficients are statistically significant at 1% (that is, 99% significance level) since the absolute t-statistics are significantly greater than 2.33 and the p values are 0.0000 for all portfolios. These findings are consistent with Vassalou and Xing (2004) and Campbell et al. (2008) who found that financial leverage is systematic in nature and hence, is priced in stock returns.

Table 4.6: Four factor regression on portfolios sorted for size, book to market and leverage (total debt to total assets).

	BHHL	BHLL	BLHL	BLLL	SHHL	SHLL	SLHL	SLLL	Median	Average	Std Dev
α	-0.00015	-0.00001	-0.00014	0.00000	-0.00006	-0.00008	0.00005	-0.00021	-0.0001	-0.0001	0.0001
β(MRP)	0.75729	0.82352	0.64621	0.68119	0.65824	0.66915	0.84646	0.73434	0.7078	0.7270	0.0718
β(SMB)	-0.32762	-0.40101	-0.25617	-0.29179	0.59153	0.86052	0.71568	0.55569	0.1498	0.1809	0.5085
β(HML)	0.60615	0.32568	-0.57876	-0.67030	0.21042	0.54053	-0.55503	-0.51314	-0.1514	-0.0793	0.5142
β(HLLL)	0.73926	-0.47465	0.49983	-0.54708	0.52961	-0.57687	0.44865	-0.18405	0.1323	0.0543	0.5179
t-Stat α	-1.38981	-0.07058	-1.11919	0.00070	-0.66157	-0.57684	0.60921	-2.29483	-0.6192	-0.6879	0.8523
t-Stat β(MRP)	64.87045	83.26913	47.99402	63.14304	67.44944	44.85554	89.43610	74.27590	66.1599	66.9117	14.5437
t-Stat β(SMB)	-22.46537	-32.45787	-15.22960	-21.65083	48.51970	46.17486	60.53057	44.99152	14.8810	13.5516	37.0206
t-Stat β(HML)	41.80245	26.51206	-34.60571	-50.02191	17.35814	29.17063	-47.21213	-41.78464	-8.6238	-7.3476	36.8194
t-Stat (HLLL)	46.53890	-35.27118	27.28195	-37.26913	39.88296	-28.41856	34.83782	-13.68075	6.8006	4.2378	33.9092
P-value α	0.16464	0.94373	0.26311	0.99944	0.50828	0.56407	0.54241	0.02178	0.52534	0.50093	0.32588
P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
P-value β(SMB)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
P-value β(HML)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
P-value β(HLLL)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Standard Error	0.00782	0.00663	0.00902	0.00723	0.00654	0.00999	0.00634	0.00662	0.0069	0.0075	0.0013
Adjusted R Squared	0.76151	0.82052	0.57128	0.69566	0.55623	0.56871	0.63119	0.55577	0.6012	0.6451	0.0963
# of Observations	5244	5244	5244	5244	5244	5244	5244	5244	5244	5244	0

Table 4.6 above represents the four-factor model (Fama and French augmented for leverage premium) with excess return as the dependent variable, while market risk (MRP), SMB (size), HML (value) and HLLL (leverage premium) as independent variables. The term α represent the intercept for the model while B(MRP), β(SMB), β(HML), β(HLLL) refer to factor loadings on CAPM based risk premium, size, value and leverage premium respectively, the t-stat (MRP), t-stat (SMB), t-stat (HML), and t-stat (HLLL) represent statistical significance for the corresponding factor loadings, the level of significance refer to 99% for $| t | > 2.33$ and 95% for $| t | > 1.96$.

4.3.4 Comparative analysis of the CAPM, FF3F and leverage augmented FF3F models

Overall, comparative analysis of the three models (that is CAPM, FF3F and the leverage augmented FF3F models) shows that although CAPM is valid in explaining portfolio returns in South Africa, the FF3F and the leverage augmented FF3F models perform much better than the CAPM . In addition of size and value premium, the three-factor model performed better than the single (CAPM) factor model as evidenced by the increased adjusted R Squared value. Similarly, a comparison of the like for like portfolios between the CAPM and the FF3F model shows an improvement in the coefficients of the market risk premium based on FF3F model relative to the single factor model (CAPM). This shows that the FF3F model performed better than the CAPM in South Africa for the period and sample under consideration. The finding that FF3F performed better than the CAPM is consistent with that of Fama and French (1992, 1993, 1995; 1996) which show that the FF3F model explained more of the relationship between the market and stock returns than the CAPM.

However, augmenting the FF3F model with leverage premium performs much better than the FF3F. A comparison of Table 4.4, 4.5 and 4.6 shows that augmenting the FF3F model with the leverage factor increases the explanatory power of the model much more for each of the like for like portfolios. This finding validates the argument that the leverage premium is an important variable in explaining the variation in portfolio returns in South Africa. In terms of which model performs better than the other, the findings of this study, through a comparative like for like analysis of the adjusted R squared values for each of the portfolios examined for the three models show that, the augmented FF3F model performs the best, followed by the FF3F model and lastly the CAPM .This finding is consistent for all the like for like portfolios across the three models. However, in terms of validity in explaining portfolio returns, all the models are valid and applicable in the South African context for the sample and period under consideration.

Although the findings of this study are consistent with other prior studies in terms of the validity of the size, value and leverage premia in explaining portfolio returns, it contradicts some of the studies as explained before, in terms of CAPM's ability to explain portfolio returns. The uniqueness of the findings of this study on the relevance of market risk premium in asset pricing in South Africa as opposed to those found in other developing and emerging markets (Connor and Sehgal, 2001) could be attributed to the characteristics of the South African market which depicts features that mimic those of developed countries. Thus, from the South African context, the findings of this study shows that global investors are not only interested on the firm level sensitivities but also on the market sensitivity due to stronger existence of the market risk premium.

CHAPTER 5

CONCLUSION

5.1 Introduction

This chapter seeks to conclude the study and offers recommendations for further research on the topic.

5.2 Conclusion

This study pursued four objectives. The first was to examine the validity of CAPM in explaining portfolio returns in South Africa. In pursuit of this objective, this study found that CAPM is relevant in explaining portfolio returns in South Africa.

The second objective was to examine the validity of the FF3F model's applicability to the South African context. The results presented in this study suggests that the market risk premium, size and value premia are all important factors in predicting portfolio returns in South Africa. While prior studies such as Van Rensburg and Robertson (2003) and Ward and Muller (2012) have called into question the suitability of the CAPM in the South African context, this study found the CAPM to be valid. This study also found that the explanatory power of each of the like for like portfolios between the CAPM and the FF3F model increased owing to the inclusion of size and value premia.

The third objective was to investigate if financial leverage was applicable in explaining portfolio returns in South Africa. The findings of this study show that financial leverage is also vital in explaining portfolio returns in the context of South Africa. These results were found to be consistent with the other findings in developing countries. In addition, the results show that the market risk premium, size, value and leverage premia are all important determinants of portfolio returns in South Africa.

The fourth objective was to determine if the augmented FF3F model performs better than the FF3F model and CAPM. The results show that the augmented FF3F model performs better than the CAPM and FF3F model, and that FF3F model performs better than CAPM. In short, this study has shown that the CAPM , FF3F model as well as the leverage augmented FF3F model are all relevant in explaining portfolio returns in the context of South Africa for the sample and period considered.

5.3 Recommendations for future research

While this study focused on South Africa's equity market, the relevance of these findings could be extended to other emerging economies with similar characteristics, for example the BRIC (namely Brazil, Russia, India and China) countries. The rationale is to match the countries with common capital market features, governance and political systems and regulatory institutions as these factors could exert influence in the stock return variations. Furthermore, future studies could also consider creating portfolios that cover different countries and different financial products since investors seek to diversify their portfolios. In addition, this study did not segment the entire period into before, during and after financial crisis, thus future studies could focus on that to determine if stock returns behave differently. Another direction for future research is to explore the effects of factors such as liquidity and momentum on asset returns.

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APPENDIX

APPENDIX I: PORTFOLIO CONSTRUCTION

YEAR	FACTOR	PORTFOLIO							
		BHHL	BHLL	BLHL	BLLL	SHHL	SHLL	SLHL	SLLL
1999	α	0.0013	0.0012	-0.0002	0.0000	0.0011	-0.0010	0.0006	0.0003
1999	β(MRP)	1.0769	0.8828	1.3609	0.0000	0.4647	0.6705	0.3179	0.5605
1999	β(SMB)	-0.3450	-0.3289	-1.3504	0.0000	0.1442	1.5949	0.1127	0.1239
1999	β(HML)	0.1576	0.1309	-1.1260	0.0000	0.1486	2.1621	-0.1003	-0.1745
1999	β(HLLL)	0.2707	0.0878	1.3456	0.0000	0.3534	-1.8491	0.1722	-0.0968
2000	α	0.0016	-0.0012	-0.0001	0.0008	-0.0015	-0.0008	0.0000	-0.0006
2000	β(MRP)	0.7326	1.0520	0.0689	1.2032	0.3215	0.3916	0.2935	0.4200
2000	β(SMB)	-0.8029	-0.9203	-0.0875	-1.3335	0.0990	0.1397	0.5283	0.0889
2000	β(HML)	0.7334	0.5824	-0.0335	-0.4624	0.4837	0.5186	-0.9381	-0.2479
2000	β(HLLL)	-0.0188	-1.1558	-0.0147	-1.4150	0.1092	-0.5505	0.3116	-0.4915
2001	α	0.0003	0.0005	0.0000	0.0010	0.0004	0.0015	0.0013	-0.0012
2001	β(MRP)	0.6712	1.2916	0.0069	0.4515	0.2262	0.2935	0.2877	0.5943
2001	β(SMB)	-1.0721	-0.9342	0.0017	-0.5093	0.4626	0.6091	0.1402	0.2741
2001	β(HML)	1.1601	1.0556	0.0002	0.1305	0.5880	1.0951	0.0087	-0.2406
2001	β(HLLL)	0.2570	-1.2995	-0.0026	-0.5442	0.2693	-0.8841	-0.0817	-0.8301
2002	α	0.0009	-0.0002	0.0002	-0.0008	0.0016	0.0005	0.0015	0.0001
2002	β(MRP)	0.6891	1.1955	0.0463	1.6755	0.1990	0.2140	0.0513	0.2137
2002	β(SMB)	-0.8081	-1.0445	-0.0292	-1.5813	0.1813	0.1700	0.1471	0.0386
2002	β(HML)	1.3982	0.4003	-0.0183	-0.8118	0.4542	0.6013	-0.1586	-0.1574
2002	β(HLLL)	0.3576	-1.1578	-0.0458	-1.7099	0.0995	-0.3345	0.1271	-0.2595
2003	α	-0.0003	-0.0005	0.0001	-0.0002	-0.0002	0.0008	0.0013	0.0009
2003	β(MRP)	0.7642	1.3447	0.0733	1.2076	0.3239	0.0845	0.1245	0.1324
2003	β(SMB)	-1.0720	-1.5625	-0.0693	-1.3505	-0.1430	0.0300	0.0720	-0.0134
2003	β(HML)	1.8194	1.6801	0.0461	0.6380	0.5861	0.4224	-0.1500	-0.0260
2003	β(HLLL)	0.0242	-1.6846	-0.0643	-1.6364	0.0328	-0.2996	0.2312	-0.1555
2004	α	-0.0006	-0.0006	-0.0001	-0.0014	0.0017	0.0011	-0.0004	0.0004
2004	β(MRP)	0.9350	1.2945	0.3011	1.2695	0.1024	0.1961	0.3463	0.1212
2004	β(SMB)	-1.1351	-1.2844	-0.3345	-1.3058	0.0134	0.0696	-0.1353	-0.0074
2004	β(HML)	1.6948	1.0743	0.2559	0.3835	0.4975	0.7296	-0.4354	-0.2078
2004	β(HLLL)	0.0707	-1.3504	-0.0472	-1.4158	0.2315	-0.5069	0.1824	-0.2895
2005	α	0.0007	-0.0006	-0.0003	-0.0002	0.0005	0.0005	0.0011	0.0002
2005	β(MRP)	1.0039	1.3811	0.4321	0.6809	0.2717	0.2926	0.2060	0.2678
2005	β(SMB)	-0.9496	-1.2536	-0.5293	-0.7214	0.0813	0.1705	0.1750	0.1192
2005	β(HML)	1.5483	1.5443	0.0953	0.2772	0.4062	0.8890	-0.0136	0.0289
2005	β(HLLL)	0.7142	-1.1845	-0.0500	-0.7321	0.1310	-0.6628	0.4177	-0.2076
2006	α	0.0000	-0.0004	0.0003	0.0002	0.0003	0.0003	0.0003	0.0005
2006	β(MRP)	1.4717	1.0743	0.8416	0.1210	0.3445	0.1253	0.2574	0.2339
2006	β(SMB)	-2.0306	-1.2846	-1.0428	-0.1135	-0.1738	-0.0443	-0.1518	-0.1016
2006	β(HML)	3.0313	1.7093	1.1434	0.1485	0.7279	0.2860	0.2684	0.1941
2006	β(HLLL)	3.1003	1.3291	1.3945	0.1154	0.7706	0.1251	0.5315	0.2273
2007	α	-0.0001	0.0005	-0.0003	0.0004	0.0002	0.0007	0.0001	0.0004
2007	β(MRP)	0.9246	1.2380	0.3371	0.4918	0.4296	0.3131	0.4440	0.3203
2007	β(SMB)	-1.4437	-1.7805	-0.4283	-0.7597	-0.2243	0.0146	-0.1485	-0.0540
2007	β(HML)	1.7642	1.9914	0.3521	0.3115	0.7438	0.6569	0.2966	0.1961
2007	β(HLLL)	0.6865	-1.0407	0.0866	-0.5706	0.2981	-0.5897	0.3908	-0.3370
2008	α	0.0008	-0.0007	-0.0002	-0.0002	-0.0003	-0.0008	-0.0008	-0.0012
2008	β(MRP)	1.4069	0.9342	0.3830	0.6236	0.4933	0.3041	0.3632	0.3638
2008	β(SMB)	-1.8039	-1.0002	-0.5501	-0.7325	-0.1628	0.1083	0.0001	-0.0322
2008	β(HML)	2.1953	1.7772	0.3902	0.7325	0.9261	0.7267	0.2062	0.2964
2008	β(HLLL)	1.9547	-0.1607	0.6287	0.4832	0.5746	-0.4625	0.6451	-0.0570
2009	α	-0.0005	-0.0006	0.0004	-0.0001	0.0007	0.0005	0.0010	0.0005
2009	β(MRP)	0.9872	1.0640	0.7892	0.5053	0.3420	0.2733	0.4195	0.2301
2009	β(SMB)	-1.2513	-1.2692	-1.0684	-0.5547	-0.0609	0.0173	-0.1445	0.0446
2009	β(HML)	1.8737	1.3991	0.3844	0.4439	0.7380	0.7949	0.1892	-0.2117
2009	β(HLLL)	1.6578	0.2434	1.0913	0.0708	0.6753	-0.2127	0.5761	-0.1010
2010	α	-0.0003	-0.0003	0.0002	-0.0003	0.0008	0.0004	0.0004	0.0006
2010	β(MRP)	1.2677	0.9710	0.9015	0.4823	0.3541	0.2010	0.2226	0.3809
2010	β(SMB)	-1.6067	-1.2161	-1.1449	-0.6102	-0.2016	-0.0384	-0.0717	-0.2662
2010	β(HML)	2.4779	1.6586	0.9390	0.6559	0.9771	0.8173	-0.0861	0.4220
2010	β(HLLL)	1.9862	0.3760	1.3868	0.2440	0.7213	-0.0801	0.6387	0.1931
2011	α	-0.0005	0.0008	-0.0002	-0.0003	0.0003	-0.0002	-0.0003	-0.0003
2011	β(MRP)	1.2793	0.6588	1.1816	0.4745	0.2241	0.4193	0.3415	0.3459
2011	β(SMB)	-1.7879	-0.7896	-1.5332	-0.6258	-0.0846	-0.1938	-0.2464	-0.2116
2011	β(HML)	1.4969	0.7676	-0.0147	0.2888	0.4452	1.0634	-0.2082	-0.2928
2011	β(HLLL)	2.2344	0.4349	1.9060	0.6297	0.3960	-0.0577	0.6379	0.1674
2012	α	-0.0001	0.0005	-0.0007	-0.0007	0.0004	0.0007	-0.0002	0.0001
2012	β(MRP)	0.8602	0.6005	1.3371	1.1192	0.2174	0.2211	0.4212	0.3599
2012	β(SMB)	-1.0556	-0.6036	-1.4257	-1.1598	-0.0309	0.0709	-0.1710	-0.1137
2012	β(HML)	-0.1440	-0.0175	-1.4570	-1.2735	0.0752	0.2226	-0.6694	-0.4637
2012	β(HLLL)	1.1367	-0.0761	1.3259	0.1153	0.2787	-0.4342	0.6839	-0.1798
2013	α	-0.0010	0.0004	0.0003	-0.0006	0.0003	0.0009	-0.0003	0.0005
2013	β(MRP)	0.9259	0.6937	1.1945	0.8941	0.2508	0.2807	0.4648	0.3410
2013	β(SMB)	-1.0551	-0.7606	-1.2473	-0.9641	-0.0055	0.0994	-0.1031	-0.0179
2013	β(HML)	0.3812	0.0383	-0.7414	-1.1076	0.3371	0.2853	-0.7742	-0.3348
2013	β(HLLL)	1.6435	0.3093	1.1269	0.1133	0.5687	-0.0830	0.8785	-0.1219
2014	α	-0.0005	0.0003	-0.0009	-0.0011	0.0004	-0.0001	-0.0008	-0.0001
2014	β(MRP)	0.8784	0.8502	0.8496	1.2305	0.1873	0.3722	0.4663	0.4235
2014	β(SMB)	-0.8480	-0.6677	-0.9591	-1.4379	0.0809	-0.0195	-0.0837	0.1095
2014	β(HML)	0.0669	0.0678	-0.9701	-1.5060	0.1320	0.1742	-0.4678	-0.6153
2014	β(HLLL)	0.2745	-0.7191	0.3115	-1.0485	0.3066	-0.4466	0.1088	-0.7844
2015	α	0.0002	0.0006	-0.0006	-0.0021	0.0002	-0.0004	-0.0030	-0.0015
2015	β(MRP)	0.7141	0.8016	1.0085	1.3259	0.2223	0.4512	0.6758	0.5482
2015	β(SMB)	-0.6872	-0.8071	-0.8194	-1.2429	0.0202	0.1409	0.2795	0.0028
2015	β(HML)	0.0515	0.0124	-0.7248	-1.4203	0.0740	-0.0959	-1.3580	-0.4549
2015	β(HLLL)	0.0141	-0.6085	-0.2169	-1.4955	0.1255	-0.7198	0.6712	-0.5823
2016	α	0.0007	-0.0004	-0.0005	0.0013	0.0011	-0.0001	0.0005	0.0002
2016	β(MRP)	1.2050	0.5976	1.0428	1.6966	0.2284	0.4614	0.4243	0.5327
2016	β(SMB)	-0.9935	-0.4995	-0.9533	-1.7706	0.0413	-0.0258	-0.1377	-0.0948
2016	β(HML)	0.1057	0.0228	-0.9139	-1.7777	0.0675	0.1151	-0.5481	-0.4491
2016	β(HLLL)	0.2010	-0.3387	-0.0518	-1.8418	0.1617	-0.4967	0.1877	-0.8243
2017	α	0.0008	-0.0003	0.0000	-0.0003	0.0003	-0.0020	-0.0004	-0.0006
2017	β(MRP)	1.4448	0.5725	0.8849	1.4947	0.1417	0.4100	0.2186	0.2847
2017	β(SMB)	-0.7359	-0.3856	-0.6082	-1.1712	0.2927	0.3595	0.2003	0.2466
2017	β(HML)	0.1434	0.1554	-0.6689	-1.4526	0.2429	0.6399	-0.3443	-0.3526
2017	β(HLLL)	0.3080	-0.5231	0.2474	-1.3184	0.3669	-0.6398	0.1566	-0.4398
2018	α	0.0001	0.0003	0.0005	-0.0008	-0.0005	-0.0013	-0.0004	-0.0012
2018	β(MRP)	1.4670	0.7996	0.9985	0.3953	0.3643	0.2918	0.3584	0.3829
2018	β(SMB)	-0.8503	-0.6578	-0.8543	-0.5951	0.2260	0.3268	0.3953	0.0943
2018	β(HML)	1.3254	0.2035	-0.0358	-0.6811	0.5856	0.7271	-0.3996	-0.0418
2018	β(HLLL)	1.4201	0.2412	0.6690	-0.3710	0.7065	-0.2640	0.8888	0.0782
2019	α	-0.0007	-0.0001	0.0000	-0.0003	-0.0002	-0.0018	-0.0006	-0.0018
2019	β(MRP)	0.9990	0.8061	0.8763	0.8209	0.3512	0.5118	0.1183	0.5005
2019	β(SMB)	-0.8915	-0.5675	-0.5809	-0.7711	0.1820	0.2485	0.4963	0.2623
2019	β(HML)	1.1255	0.1243	-0.2665	-0.7373	0.3745	0.4277	-0.6954	-0.2487
2019	β(HLLL)	0.9596	-0.3322	-0.1353	-0.7701	0.2610	-0.3800	0.8343	-0.5981
Average		BHHL	BHLL	BLHL	BLLL	SHHL	SHLL	SLHL	SLLL
	α	0.0001	0.0000	-0.0001	-0.0003	0.0004	0.0000	0.0000	-0.0002
	β(MRP)	1.0336	0.9573	0.7103	0.8649	0.2886	0.3228	0.3249	0.3599
	β(SMB)	-1.1060	-0.9342	-0.7435	-0.9196	0.0351	0.1832	0.0549	0.0234
	β(HML)	1.1622	0.7799	-0.1602	-0.3438	0.4577	0.6314	-0.3037	-0.1611
	β(HLLL)	0.9168	-0.4100	0.5187	-0.6237	0.3542	-0.4681	0.4376	-0.2710

APPENDIX II: MARKET CAPITALISATION

Market Capitalisation (R' million)																					
Code	Year																				
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
ACL	5 998	3 226	3 097	9 472	12 838	29 197	27 302	43 795	60 845	39 427	45 912	35 312	30 570	16 047	16 627	11 772	5 121	13 088	4 404	3 858	1 946
ACT	10	4	4	14	10	11	19	190	129	259	462	424	555	1 251	1 711	2 433	2 994	3 376	3 548	2 694	1 895
ADH	312	114	102	157	331	472	827	1 220	1 909	1 555	2 114	2 385	2 609	2 612	2 768	3 665	7 728	9 347	9 173	8 199	5 849
AEL	1 820	1 894	2 348	2 501	3 267	5 003	6 711	10 298	13 941	7 642	9 332	9 227	7 169	7 272	8 494	5 975	2 103	3 081	4 821	7 188	9 187
AFE	1 941	2 026	1 793	2 639	3 997	4 622	5 799	8 241	9 539	6 061	7 406	9 829	9 845	9 289	16 030	17 161	10 927	12 317	12 183	10 174	12 826
AFT								1 212	1 164	267	454	477	605	1 103	1 791	2 433	4 226	4 043	4 255	4 011	4 784
AFX	4 139	3 440	4 232	4 789	6 599	8 588	8 846	10 354	11 043	7 483	6 789	7 080	5 554	8 054	7 543	5 499	4 457	6 514	9 600	9 428	7 546
AGL	118 893	166 872	268 834	185 630	209 843	197 928	316 834	511 643	548 710	277 765	384 728	414 202	358 485	331 893	293 542	276 563	88 966	251 667	330 341	416 567	486 091
AIP										6 730	9 411	10 422	10 773	9 450	12 448	8 610	8 784	8 480	10 255	10 967	9 668
AMS	40 355	76 296	97 362	67 904	62 770	45 003	99 802	187 598	238 730	123 203	188 802	182 828	140 124	120 367	106 230	91 994	49 983	71 307	95 303	145 041	326 919
ANG	31 614	24 097	46 160	65 257	70 695	53 032	83 674	92 175	83 682	90 086	112 112	125 530	132 440	100 984	49 683	41 243	43 232	62 529	52 945	75 305	114 253
APN	1 598	1 759	2 214	2 867	4 651	6 871	12 855	12 574	14 857	13 415	31 765	39 835	42 205	76 987	122 594	185 278	141 232	129 436	126 665	61 539	53 587
ARI	5 692	2 493	4 007	4 429	4 797	5 416	8 602	21 029	32 009	23 490	36 881	44 722	36 549	40 928	40 910	25 875	9 469	21 530	29 491	31 592	33 699
ARL			584	669	1 220	2 676	3 430	5 079	6 460	4 045	4 298	5 415	5 311	4 362	4 383	7 477	4 962	5 529	11 480	6 859	8 550
ASC															2 493	4 511	5 527	11 116	8 000	1 880	1 487
ASR	865	952	1 176	2 240	1 764	2 058	4 200	4 683	13 294	13 580	19 508	26 389	29 317	56 876	47 552	20 892	8 670	33 076	50 259	40 486	33 469
AVI	2 009	3 033	3 981	5 075	5 852	7 837	4 837	6 165	6 870	7 209	7 161	10 513	13 590	20 512	19 793	27 019	26 856	32 021	38 881	35 855	29 161
BAW	9 494	10 201	12 559	13 030	15 507	23 697	25 178	32 921	21 957	9 479	10 258	15 440	17 346	20 214	23 132	22 126	13 181	25 076	33 937	24 489	24 219
BHP	75 578	60 934	387 938	294 022	374 194	407 097	634 963	791 930	1 284 985	1 069 926	1 484 206	1 600 618	1 415 698	1 667 928	1 833 563	1 417 190	1 013 680	1 265 465	1 458 060	1 660 755	1 800 453
BID															97 784	96 784	101 493	82 224	100 953	88 882	108 211
BLU									6 744	3 755	3 920	5 395	3 838	5 437	5 733	5 936	8 195	12 276	13 048	4 943	2 960
BTI										489 556	483 109	512 812	755 087	826 682	1 056 932	1 178 076	1 627 724	1 451 617	1 902 565	1 076 466	1 324 696
BVT	17 462	13 351	13 206	14 066	15 654	25 519	29 778	43 596	39 856	34 911	44 908	51 312	50 733	70 624	88 007	102 217	110 083	60 792	73 357	69 859	69 047
CAT	2 030	1 930	2 023	2 688	3 685	4 468	7 866	7 894	8 810	5 948	7 435	7 390	7 435	8 190	8 500	5 917	6 627	5 043	4 665	3 151	3 042
CFR	90 471	103 968	113 910	88 681	85 426	107 950	157 618	234 848	265 280	103 069	142 861	224 110	234 101	381 843	600 498	602 910	640 807	521 029	641 668	537 738	639 946
CHP													5 973	6 345	5 997	5 455	8 266	4 069	3 836	834	
CLH	263	226	365	705	1 148	1 487	1 840	2 823	3 487	3 070	3 423	3 472	3 290	4 455	6 024	5 196	6 506	6 433	6 291	5 496	3 529
CLR							2 579	2 585	2 666	2 776	2 866	1 814	2 096	3 138	3 321	3 427	3 204	3 607	2 500	3 491	
CLS	3 612	3 340	1 929	2 467	2 786	3 476	3 232	3 916	4 908	5 510	8 252	12 309	12 512	17 923	16 848	19 937	21 906	28 429	44 552	48 618	65 639
COH										2 715	2 740	3 410	1 935	3 931	8 195	9 442	20 623	20 439	17 473	10 512	7 022
CSB	62	23	89	209	483	784	1 130	1 264	1 387	1 342	1 935	2 452	2 972	3 879	3 904	4 136	7 557	8 596	11 120	7 322	5 323
CTK														3 219	3 428	2 850	3 000	3 300	5 730	4 290	8 067
CVH											6 054	5 972	6 274	5 589	7 349	7 807	8 493	8 185	7 956		
DCP																23 642	23 155	19 129	31 393	24 934	22 311
DST	1 330	1 369	1 995	2 836	2 983	4 909	6 344	8 690	12 441	10 256	12 669	15 348	15 213	21 537	30 156	30 145	36 646	32 245	31 545		
DTC	11 931	4 648	2 686	930	1 895	1 398	2 876	5 146	5 599	2 879	4 731	6 172	7 604	9 441	10 210	11 229	10 787	10 488	12 110	6 316	7 167
EOH	128	62	57	80	99	213	332	483	687	471	754	1 477	2 695	3 818	8 923	14 033	18 130	24 200	10 251	5 441	2 299
EXX	11 286	11 606	8 796	9 666	11 093	13 282	31 222	19 669	36 508	25 527	37 297	48 781	59 509	60 466	52 449	37 064	15 771	32 051	58 290	49 455	47 826
FBR	116	69	61	94	219	618	932	1 204	1 821	1 417	2 185	4 192	4 377	6 944	9 503	11 503	12 976	15 629	10 285	9 780	7 995
GFI	13 340	11 665	26 945	56 552	46 888	34 391	55 152	73 215	64 581	60 033	69 096	86 840	90 237	75 707	25 342	40 556	32 837	35 811	44 445	40 534	63 763
GLN									655 216	646 824	642 546	672 968	643 142	606 410	727 789	707 767	299 555	671 947	926 446	749 856	620 764
GND	173	337	559	691	1 286	3 591	5 888	7 305	11 123	7 321	8 239	8 811	8 382	9 505	16 966	17 070	8 609	10 256	10 409	4 690	3 942
HAR	2 744	3 389	11 347	25 641	28 019	20 212	33 464	44 332	28 193	40 803	32 293	35 649	40 975	32 209	11 284	9 424	6 814	13 866	10 091	13 413	24 411
HDC	283	214	366	532	669	1 043	1 371	1 983	2 827	2 106	2 227	2 826	2 852	3 928	3 586	3 309	3 243	3 902	4 918	4 791	3 691
HPB								973	1 535	1 909	1 503	2 135	1 594	2 328	2 924	2 298	1 941	4 429	6 655	5 059	4 510
IMP	16 362	25 475	37 314	36 272	38 625	31 912	62 504	102 130	149 681	85 263	128 204	147 164	105 717	105 938	77 762	47 909	18 399	31 404	23 836	26 952	89 971
IPL	12 988	12 799	12 185	11 906	14 567	22 818	29 177	34 375	22 142	12 630	18 820	26 997	25 916	41 737	42 539	38 446	24 204	36 544	52 727	13 734	10 938
ITE	542	641	696	1 195	1 345	2 521	3 212	3 885	3 534	2 775	3 412	4 288	5 167	6 510	7 812	10 333	12 193	14 394	19 434	21 781	22 151
IVT	221	245	231	393	480	891	1 094	2 195	2 256	1 673	1 818	3 293	3 762	6 185	9 325	7 427	4 872	7 454	5 539	3 776	2 387
KAP	213	90	90	56	28	1 256	1 596	1 868	1 443	743	1 061	1 125	1 316	8 423	8 094	11 496	16 842	19 913	21 289	21 931	11 222
KIO								34 887	90 374	51 756	97 727	136 652	161 026	183 213	142 829	77 268	13 270	51 212	122 112	91 166	121 066
L4L																			4 360	4 157	3 711
LEW						3 900	4 694	5 885	4 595	4 707	5 197	7 971	7 859	6 766	6 952	7 257	5 385	4 137	2 515	2 905	2 690
LHC												15 477	21 511	35 435	43 627	44 565	36 770	34 999	40 221	38 738	36 273
LON	4 259	4 259	4 259	4 259	4 259	4 259	4 260	4 257	4 262	4 252	4 264	4 262	4 266	4 381	4 024	4 659	141	6 626	3 982	2 373	
MEI						124 965	124 964	124 959	124 977	124 970	124 871	125 055	125 181	123 738	124 214	129 040	115 094	95 842	78 428	44 330	54 386
MND						24 044	23 560	24 782	30 770	15 231	20 831	27 269	27 706	44 759	88 209	91 730	148 141	136 862	156 601	146 587	
MNK															716	385	1 420	2 342	7 514	11 030	4 556
MNP									30 770	15 231	20 831	27 269	27 706	44 759	88 209	91 730	148 141	136 862	156 601	146 587	154 149
MPT													2 459	3 254	4 400	6 031	7 790	4 760	4 184	3 641	2 738
MRP	1 625	1 325	1 118	1 414	1 836	2 974	4 544	6 279	5 541	6 550	9 262	17 598	21 117	37 048	43 330	63 604	53 426	42 862	66 051	66 557	47 336
MSM	2 552	1 990	2 513	3 620	6 075	9 021	10 311	14 113	14 481	17 020	18 002	29 846	36 448	41 447	28 224	31 004	21 714	27 394	30 300	22 482	9 377
MTA	148	191	341	737	855	1 059	1 379	1 729	2 195	885	808	1 876	2 990	4 934	7 878	6 358	5 398	4 378	4 278	3 880	4 696
MTN	27 815	40 992	21 654	20 235	47 176	72 289	103 499	158 681	238 806	202 463	216 997	253 123	270 904	334 507	406 539	409 244	245 248	237 738	257 391	167 700	174 050
MUR	1 605	1 124	2 423	4 215	4 547	4 564	6 505	13 309	33 853	15 931	15 426	13 332	8 513	11 007	11 923	9 455	3 558	5 123	5 386	6 426	4 523
NHM	1 419	3 614	3 911	4 445	2 292	2 049	4 431	12 156	9 540	7 410	17 313	16 360	11 472	14 538	16 069	14 591	13 453	20 646	26 646	22 053	54 547
NPK	9 388	5 679	6 011	9 063	8 328	10 046	10 972	14 234	14 104	8 687	9 987	15 190	15 748	22 190	28 621	30 565	17 085	12 782	11 188	9 554	3 794
NPN	7 151	4 580	3 093	6 940	12 353	23 751	35 290	53 414	63 230	67 212	121 284	157 817	143 852	225 481	456 657	632 861	929 808	884 129	1 516 933	1 271 335	933 539
NT1	6 099	6 104	6 104	6 090	6 132	6 077	6 133	6 272	5 753	7 592	6 580	3 745	2 925	1 915	4 081	6 274	9 748	8 494	8 432	2 856	2 828
NTC	1 188	1 342	4 338	4 710	8 331	8 518	13 684	25 271	21 501	15 613	19 702	22 161	19 467	28 815	38 411	56 129	49 401	46 560	36 988	38 879	29 037
NVS														5 036	5 047	4 706	4 168	3 439	2 049	1 418	884
OCE	547	804	1 430	1 539	1 864	1 660	1 763	1 927	2 354	2 670	3 681	4 586	5 726	8 338	9 801	12 534	15 857	16 263	11 520	10 013	8 442
OMN	318	187	322	733	1 021	2 168	1 717	2 810	3 253	2 249	2 756	5 173	5 851	9 233	13 581	12 361	9 092	12 634	10 196	5 835	5 832
PAN									1 165	473	1 310	1 646	2 673	4 408	4 094	3 550	3 205	5 013	5 363	3 576	4 514
PFG								6 113	7 090	4 782	7 947	11 015	12 077	15 347	21 224	33 151	37 017	35 796	31 992	19 688	23 904
PIK	1 671	6 892	5 465	6 430	8 581	11 278	13 952	16 091	19 041	18 226	21 055	23 251	22 387	21 373	24 981	25 643	31 749	31 124	33 977	33 441	33 495
PPC	2 649	2 751	3 918	5 471	7 712	15 322	16 491	20 859	23 504	16 854	18 671	20 487	16 055	20 704	19 009	16 648	9 323	8 802	11 095	9 399	4 827
PPH																			55 028	72 416	60 996
RBP												10 953	9 082	9 435	9 799	10 167	5 163	6 974	5 483	5 574	11 266
RBX									7 700	3 963	4 381	4 264	2 464	3 109	4 043	4 112	3 189	4 471	3 624	3 090	4 084
RCL	215	423	832	838	1 354	2 057	2 488	3 921	5 800	5 355	5 511	5 753	5 355	5 107	10 951	18 037	13 549	11 871	14 225	13 172	9 127
REM		27 040	33 930	32 312	36 853	49 256	63 684	92 921	103 654	39 750	46 082	58 351	61 281	82 245	107 362	131 214	126 679	125 962	133 275	109 974	108 540
RFG																3 344	5 171	6 630	5 684	4 706	4 462
RLO	1 704	2 632	3 938	4 048	4 505	7 202	10 184	15 991	14 026	9 987	11 467	13 288	12 570	15 110	13 798	11 105	12 548	12 532	13 290	13 074	12 744
S32																	64 418	145 019	176 146	173 777	131 029
SAP		12 934	27 588	26 404	20 830	18 791	16 416	28 091	23 262	20 196	19 068	18 262	12 783	16 731	17 732	22 849	35 335	50 039	49 870	45 496	21 840
SDO																			6 327	2 854	1 710
SGL															9 041	20 269	20 934	23 458	34 309	22 708	77 110
SHP	4 946	4 293	3 424	3 859	5 082	7 011	10 016	13 940	23 397	28 804	35 446	54 158	74 022	116 684	93 575	96 380	82 070	98 496	130 798	112 443	75 786
SNH	4 718	5 431	7 697	6 663	8 630	14 297	21 276	28 484	26 185	17 186	30 815	37 614	39 579	50 366	91 794	150 191	303 256	303 193	19 676	7 413	4 267
SOL	30 972	32 506	70 174	70 165	63 642	81 546	154 114	161 769	213 786	187 084	199 097	222 064	248 300	234 423	334 338	280 509	273 193	259 839	279 607	265 454	165 252
SPG	3 501	1 875	2 969	2 145	3 252	5 182	4 332	4 676	4 696	698	2 160	2 717	3 519	5 298	8 246	10 784	13 624	13 871	15 362	12 609	10 588
SPP						3 629	5 247	7 341	10 246	9 686	12 128	16 739	18 672	22 739	22 772	27 954	31 899	38 247	39 162	39 965	39 661
SUI	2 172	2 864	2 188	2 395	3 422	6 634	9 782	14 059	15 402	9 926	10 545	11 717	9 332	10 781	10 877	14 711	10 161	9 491	6 595	8 818	5 543
SUR		200	249	322	415	591	829	1 025	1 025	722	1 026	1 464	1 533	1 967	2 928	3 394	3 642	3 477	2 983	2 419	2 407
TBS	11 741	10 766	9 945	11 898	13 204	16 353	24 651	29 253	28 921	24 821	32 491	36 826	47 832	62 186	51 130	70 648	60 779	76 411	88 352	51 969	38 780
TFG	3 901	1 574	1 732	2 742	4 726	9 620	12 530	13 805	11 616	11 544	14 548	21 645	25 250	33 850	21 257	28 114	25 960	34 931	46 719	39 358	36 740
TKG					38 686	54 277	75 060	76 608	73 534	61 012	19 503	19 790	15 129	8 749	14 582	36 455	33 899	38 989	25 357	32 350	23 967
TON	5 006	3 847	5 454	4 763	3 399	5 526	8 467	11 938	9 167	6 556	10 210	11 372	10 606	14 626	12 353	23 364	12 576	17 671	15 488	7 538	
TRE	702	596	1 559	1 324	1 567	2 235	3 268	4 832	5 244	3 673	4 921	5 999	6 729	9 698	12 218	12 466	7 880	5 046	8 499	4 959	5 008
TRU	3 140	1 701	2 168	3 148	4 478	8 303	11 726	15 523	12 212	15 496	19 858	32 680	33 971	50 185	35 695	32 662	39 163	35 219	41 761	38 992	22 631
TSG	98	298	425	587	1 309	2 783	3 243	4 544	9 782	5 256	5 691	5 715	19 539	28 079	31 462	30 426	25 390	28 957	27 942	24 594	13 081
VOD										83 154	84 055	113 799	132 428	184 506	197 898	191 098	226 779	226 764	250 776	242 334	222 360
WBO	280	228	370	566	899	1 471	2 442	4 818	9 109	7 096	7 094	9 174	6 943	10 362	9 636	7 970	7 157	9 731	9 822	7 919	8 417
WHL	3 552	2 610	3 530	4 778	6 782	10 936	12 412	16 006	12 994	9 994	13 641	20 520	29 090	53 314	56 241	71 495	104 400	74 383	68 448	57 757	54 712

APPENDIX III: SINGLE FACTOR REGRESSION

Period	Factor	BHHL	BHLL	BLHL	BLLL	SHHL	SHLL	SLHL	SLLL	Median	Average	Std Dev
1999 - 2000	α	0.00089	0.00007	0.00006	-0.00020	0.00095	0.00110	0.00072	-0.00009	0.00040	0.00044	0.00049
	β(MRP)	0.98711	0.95216	0.55027	0.01255	0.53498	0.54619	0.32368	0.49691	0.54059	0.55048	0.29494
	t-Stat α	1.97950	0.15842	0.05131	-2.78835	1.53572	0.67996	1.90336	-0.17697	0.41919	0.41787	1.44909
	t-Stat β(MRP)	25.81429	25.43870	5.21134	2.04157	10.21862	3.96515	10.06315	11.30382	10.14088	11.75708	8.57457
	P-value α	0.87012	0.45015	0.32211	0.11317	0.32163	0.90764	0.31760	0.03304	0.32187	0.41693	0.29893
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Standard Error	0.57341	0.56622	0.05019	0.00636	0.17282	0.02888	0.16844	0.20389	0.17063	0.22128	0.21240
	Adjusted R Squared	0.01001	0.00980	0.02764	0.00161	0.01370	0.03605	0.00842	0.01151	0.01076	0.01484	0.01055
	# of Observations	496	496	496	496	496	496	496	496	496	496	0
2001 - 2002	α	0.00043	0.00041	-0.00050	0.00066	0.00017	0.00085	0.00084	-0.00060	0.00042	0.00028	0.00052
	β(MRP)	0.78341	1.30230	0.26348	0.77216	0.38064	0.39449	0.34252	0.51121	0.45285	0.59377	0.32287
	t-Stat α	0.62075	1.17564	-2.07941	1.39612	0.34669	1.38961	2.22215	-1.19929	0.89820	0.48403	1.35064
	t-Stat β(MRP)	17.99753	59.04144	17.64303	26.11344	12.16909	10.34493	14.54288	16.27674	16.95989	21.76614	14.76654
	P-value α	0.53505	0.24030	0.03809	0.16330	0.72897	0.16527	0.02672	0.23099	0.19813	0.26609	0.22872
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Standard Error	0.39288	0.87475	0.38340	0.57709	0.22766	0.17523	0.29668	0.34594	0.36467	0.40920	0.20923
	Adjusted R Squared	0.01553	0.00787	0.00533	0.01055	0.01116	0.01361	0.00840	0.01121	0.01086	0.01046	0.00304
	# of Observations	500	500	500	500	500	500	500	500	500	500	0
2003 -2004	α	-0.00073	-0.00048	-0.00025	-0.00032	0.00023	0.00057	0.00101	0.00018	-0.00003	0.00003	0.00054
	β(MRP)	0.79404	1.29147	0.20969	1.19258	0.37732	0.25693	0.26021	0.25880	0.31877	0.58013	0.42061
	t-Stat α	-1.73733	-1.62283	-1.68930	-1.27401	0.65863	1.72329	2.97972	0.70229	-0.30769	-0.03244	1.69174
	t-Stat β(MRP)	21.41832	49.14736	16.19654	53.48134	12.22287	8.75111	8.65413	11.60058	14.20970	22.68403	17.01365
	P-value α	0.08295	0.10526	0.09179	0.20325	0.51044	0.08546	0.00303	0.48282	0.09852	0.19562	0.18115
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Standard Error	0.47794	0.82844	0.34325	0.85116	0.22887	0.13131	0.12876	0.21083	0.28606	0.40007	0.27551
	Adjusted R Squared	0.00936	0.00663	0.00327	0.00563	0.00779	0.00741	0.00759	0.00563	0.00702	0.00667	0.00172
	# of Observations	501	501	501	501	501	501	501	501	501	501	0
2005 -2006	α	0.00032	-0.00040	-0.00035	-0.00011	0.00053	0.00017	0.00069	0.00039	0.00024	0.00015	0.00038
	β(MRP)	1.19823	1.15751	0.48778	0.77970	0.30425	0.35177	0.39289	0.23669	0.44034	0.61360	0.35987
	t-Stat α	0.70278	-1.28423	-1.37932	-0.39940	2.16856	0.46655	2.15359	1.35386	0.58467	0.47280	1.31378
	t-Stat β(MRP)	30.08344	42.59073	21.84169	32.08380	14.38421	11.36800	14.07918	9.49724	18.11295	21.99104	11.07432
	P-value α	0.48252	0.19966	0.16841	0.68977	0.03059	0.64102	0.03175	0.17639	0.18803	0.30251	0.24715
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Standard Error	0.64388	0.78383	0.48774	0.67285	0.29169	0.20412	0.28287	0.15139	0.38971	0.43979	0.22414
	Adjusted R Squared	0.01019	0.00695	0.00571	0.00622	0.00541	0.00791	0.00714	0.00637	0.00666	0.00699	0.00142
	# of Observations	501	501	501	501	501	501	501	501	501	501	0
2007 -2008	α	0.00009	0.00057	-0.00020	-0.00007	-0.00030	-0.00039	-0.00042	-0.00076	-0.00025	-0.00018	0.00037
	β(MRP)	0.92940	1.36168	0.47525	0.38486	0.48636	0.42700	0.32513	0.31265	0.45112	0.58779	0.34465
	t-Stat α	0.15207	1.53928	-0.58249	-0.23225	-0.72382	-0.66102	-0.98943	-2.09754	-0.62176	-0.44940	0.96886
	t-Stat β(MRP)	28.55291	65.44777	24.70060	23.96188	21.08292	12.82389	13.78620	15.32122	22.52240	25.70967	15.92487
	P-value α	0.87920	0.12437	0.56050	0.81644	0.46952	0.50891	0.32293	0.03645	0.48921	0.46479	0.27973
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Standard Error	0.61956	0.89545	0.54919	0.53409	0.47005	0.24637	0.27437	0.31856	0.50207	0.48846	0.20070
	Adjusted R Squared	0.01298	0.00830	0.00767	0.00641	0.00920	0.01328	0.00941	0.00814	0.00875	0.00942	0.00231
	# of Observations	501	501	501	501	501	501	501	501	501	501	0

Period	Factor	BHHL	BHLL	BLHL	BLLL	SHHL	SHLL	SLHL	SLLL	Median	Average	Std Dev
2009 -2010	α	-0.00010	-0.00021	0.00044	-0.00036	0.00042	0.00019	0.00028	0.00030	0.00024	0.00012	0.00028
	β(MRP)	1.03205	1.01044	0.78828	0.52692	0.39011	0.29219	0.45201	0.28188	0.48947	0.59673	0.28673
	t-Stat α	-0.26389	-0.79015	1.13931	-1.82166	1.26702	0.49187	0.78074	0.78693	0.63631	0.19877	1.00439
	t-Stat β(MRP)	36.66400	50.93484	27.03054	35.95482	15.72640	9.86255	16.63230	9.95481	21.83142	25.34503	13.88957
	P-value α	0.79197	0.42982	0.25512	0.06911	0.20574	0.62303	0.43533	0.43170	0.43076	0.40522	0.21637
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Standard Error	0.72874	0.83836	0.59338	0.72094	0.33005	0.16145	0.35537	0.16402	0.47437	0.48654	0.25005
	Adjusted R Squared	0.00841	0.00593	0.00872	0.00438	0.00741	0.00885	0.00812	0.00846	0.00827	0.00754	0.00149
	# of Observations	501	501	501	501	501	501	501	501	501	501	0
2011 -2012	α	-0.00023	0.00026	-0.00024	-0.00067	-0.00007	-0.00019	-0.00029	-0.00032	-0.00023	-0.00022	0.00024
	β(MRP)	1.33905	0.65625	1.20609	0.54011	0.28034	0.40792	0.39963	0.37459	0.47402	0.65050	0.37582
	t-Stat α	-0.78700	1.07156	-0.92810	-4.19383	-0.26207	-0.59537	-1.23636	-1.20672	-0.85755	-1.01724	1.38505
	t-Stat β(MRP)	45.74749	26.61551	46.92435	33.52897	10.94539	12.88248	17.10042	14.16766	21.85797	25.98903	13.70571
	P-value α	0.43166	0.28444	0.35380	0.00003	0.79337	0.55186	0.21691	0.22811	0.31912	0.35752	0.22442
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Standard Error	0.80771	0.58685	0.81548	0.69282	0.19261	0.24882	0.36916	0.28625	0.47801	0.49996	0.23962
	Adjusted R Squared	0.00647	0.00545	0.00569	0.00356	0.00567	0.00700	0.00517	0.00585	0.00568	0.00561	0.00095
	# of Observations	499	499	499	499	499	499	499	499	499	499	0
2013 -2014	α	-0.00099	0.00029	-0.00031	-0.00083	-0.00009	0.00037	-0.00053	0.00069	-0.00020	-0.00018	0.00056
	β(MRP)	0.89581	0.81243	1.13448	1.08911	0.33108	0.39680	0.50390	0.44751	0.65817	0.70139	0.30029
	t-Stat α	-2.72084	1.37670	-1.21134	-2.39835	-0.35585	1.16836	-1.54367	2.02410	-0.78360	-0.45761	1.68872
	t-Stat β(MRP)	23.03254	36.21287	41.28117	29.20158	12.25353	11.78231	13.73534	12.25972	18.38394	22.46988	11.11027
	P-value α	0.00674	0.16922	0.22634	0.01684	0.72210	0.24322	0.12330	0.04349	0.14626	0.19391	0.21711
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Standard Error	0.51433	0.72381	0.77305	0.63010	0.22976	0.21608	0.27290	0.22994	0.39361	0.44875	0.22330
	Adjusted R Squared	0.00810	0.00468	0.00573	0.00777	0.00563	0.00702	0.00765	0.00761	0.00731	0.00677	0.00118
	# of Observations	501	501	501	501	501	501	501	501	501	501	0
2015 -2016	α	-0.00007	0.00016	-0.00030	-0.00025	0.00007	-0.00045	-0.00024	-0.00044	-0.00024	-0.00019	0.00021
	β(MRP)	0.80575	0.86178	1.13135	1.46852	0.37710	0.49831	0.82110	0.65385	0.81343	0.82722	0.32525
	t-Stat α	-0.18521	0.56439	-0.84505	-0.39260	0.22625	-1.11019	-0.36967	-1.02391	-0.38113	-0.39200	0.55459
	t-Stat β(MRP)	23.69682	34.75088	36.27368	26.24102	13.13480	13.97971	14.43021	17.35491	20.52587	22.48275	8.71148
	P-value α	0.85314	0.57274	0.39849	0.69478	0.82110	0.26745	0.71179	0.30638	0.63376	0.57823	0.21471
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Standard Error	0.52904	0.70744	0.72488	0.57947	0.25580	0.28039	0.29343	0.37562	0.45233	0.46826	0.17983
	Adjusted R Squared	0.00863	0.00629	0.00791	0.01420	0.00728	0.00904	0.01444	0.00956	0.00883	0.00967	0.00285
	# of Observations	500	500	500	500	500	500	500	500	500	500	0
2017 -2018	α	0.00054	-0.00117	-0.00011	0.00037	-0.00044	-0.00146	-0.00038	-0.00086	-0.00041	-0.00044	0.00066
	β(MRP)	1.42672	0.63121	0.93893	1.18054	0.31462	0.38403	0.38478	0.43133	0.53127	0.71152	0.39365
	t-Stat α	1.55221	-2.45639	-0.31503	0.70005	-1.27498	-3.31595	-0.88790	-2.38361	-1.08144	-1.04770	1.55492
	t-Stat (MRP)	38.43105	12.34425	25.10678	21.12200	8.44669	8.14915	8.49212	11.24426	11.79425	16.66704	10.12299
	P-value α	0.12125	0.01437	0.75287	0.48422	0.20291	0.00098	0.37502	0.01752	0.16208	0.24614	0.25338
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Standard Error	0.74696	0.23240	0.55727	0.47098	0.12334	0.11568	0.12452	0.20055	0.21648	0.32146	0.22415
	Adjusted R Squared	0.00777	0.01070	0.00783	0.01170	0.00780	0.00987	0.00949	0.00803	0.00876	0.00915	0.00143
	# of Observations	501	501	501	501	501	501	501	501	501	501	0
2019	α	-0.00036	-0.00023	0.00011	-0.00012	-0.00032	-0.00190	-0.00067	-0.00184	-0.00034	-0.00067	0.00072
	β(MRP)	1.00278	0.90466	1.01665	1.06530	0.38014	0.49591	0.17178	0.54562	0.72514	0.69786	0.31899
	t-Stat α	-0.39061	-0.47947	0.23209	-0.17304	-0.62645	-3.29883	-0.87746	-3.11768	-0.55296	-1.09143	1.26001
	t-Stat β(MRP)	9.40866	16.57707	19.07392	13.03169	6.37176	7.43976	1.94302	7.96846	8.68856	10.22679	5.28541
	P-value α	0.69642	0.63203	0.81666	0.86277	0.53160	0.00111	0.38109	0.00204	0.58181	0.49046	0.31606
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.05315	0.00000	0.00000	0.00664	0.01758
	Standard Error	0.26086	0.52472	0.59398	0.40503	0.13769	0.17976	0.01107	0.20128	0.23107	0.28930	0.18795
	Adjusted R Squared	0.01450	0.00743	0.00725	0.01112	0.00812	0.00907	0.01203	0.00932	0.00919	0.00986	0.00236
	# of Observations	249	249	249	249	249	249	249	249	249	249	0

APPENDIX IV: THREE FACTOR REGRESSION

Period	Factor	BHHL	BHLL	BLHL	BLLL	SHHL	SHLL	SLHL	SLLL	Median	Average	Std Dev
	α	0.00087	0.00002	0.00079	-0.00020	0.00079	-0.00019	0.00080	0.00009	0.00044	0.00037	0.00045
	β(MRP)	0.76137	0.68071	0.68270	0.01747	0.53066	0.16951	0.55849	0.88360	0.61960	0.53556	0.27789
	β(SMB)	-0.46101	-0.52728	-0.75489	0.00723	0.21958	1.03276	0.41371	0.59800	0.11340	0.06601	0.57762
	β(HML)	0.38253	0.46990	-0.60041	-0.00938	0.09109	1.29912	-0.42203	-0.72554	0.04085	0.06066	0.62238
	t-Stat α	2.19690	0.05130	0.79362	-2.74843	1.32937	-0.19016	2.50133	0.21806	0.50584	0.51900	1.53970
	t-Stat β(MRP)	19.25931	18.80478	6.80579	2.39814	8.91436	1.64897	17.49094	21.80022	13.20265	12.14031	7.59013
	t-Stat β(SMB)	-12.46118	-15.56514	-8.04148	1.06010	3.94158	10.73543	13.84511	15.76561	2.50084	1.16000	11.31153
1999 - 2000	t-Stat β(HML)	9.13938	12.26076	-5.65337	-1.21586	1.44524	11.93646	-12.48392	-16.90749	0.11469	-0.18485	10.32775
	P-value α	0.02849	0.95911	0.42780	0.00621	0.18434	0.84926	0.01270	0.82747	0.30607	0.41192	0.38510
	P-value β(MRP)	0.00000	0.00000	0.00000	0.01685	0.00000	0.09979	0.00000	0.00000	0.00000	0.01458	0.03268
	P-value β(SMB)	0.00000	0.00000	0.00000	0.28962	0.00009	0.00000	0.00000	0.00000	0.00000	0.03621	0.09578
	P-value β(HML)	0.00000	0.00000	0.00000	0.22462	0.14903	0.00000	0.00000	0.00000	0.00000	0.04671	0.08307
	Standard Error	0.67520	0.71097	0.38935	0.00555	0.23817	0.61472	0.41624	0.51789	0.46706	0.44601	0.22295
	Adjusted R Squared	0.00873	0.00800	0.02216	0.00161	0.01315	0.02271	0.00705	0.00895	0.00884	0.01155	0.00695
	# of Observations	496	496	496	496	496	496	496	496	496	496	0
	α	0.00015	0.00040	-0.00045	0.00091	-0.00003	0.00048	0.00091	-0.00037	0.00027	0.00025	0.00049
	β(MRP)	0.30639	1.17520	0.30328	0.76470	0.54997	0.51801	0.58083	0.90076	0.56540	0.63739	0.27864
	β(SMB)	-0.70601	-0.27891	0.02181	-0.41295	0.72752	0.88134	0.44904	0.56603	0.23542	0.15598	0.54551
	β(HML)	0.87944	0.09481	-0.13038	-0.60369	0.42048	0.84544	-0.29139	-0.73436	-0.01779	0.06004	0.57563
	t-Stat α	0.26984	1.18133	-1.91030	2.18068	-0.06163	1.02566	2.86704	-0.98096	0.64775	0.57146	1.47895
	t-Stat β(MRP)	6.61931	42.64219	15.69598	22.41021	16.12790	13.41611	22.15387	29.33497	19.14088	21.05007	10.35221
	t-Stat β(SMB)	-10.12693	-6.71923	0.74942	-8.03488	14.16469	15.15515	11.37124	12.23892	6.06033	3.59980	10.11539
2001 - 2002	t-Stat β(HML)	11.05216	2.00111	-3.92521	-10.29132	7.17280	12.73721	-6.46514	-13.91176	-0.96205	-0.20377	9.32846
	P-value α	0.78740	0.23804	0.05667	0.02968	0.95088	0.30555	0.00432	0.32709	0.27180	0.33745	0.33059
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.00000	0.00000	0.45396	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.05675	0.15013
	P-value β(HML)	0.00000	0.04593	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00575	0.01518
	Standard Error	0.60208	0.88666	0.40169	0.67356	0.46793	0.50991	0.49482	0.63763	0.55599	0.58429	0.14273
	Adjusted R Squared	0.01257	0.00749	0.00525	0.00927	0.00926	0.01049	0.00712	0.00834	0.00880	0.00872	0.00209
	# of Observations	500	500	500	500	500	500	500	500	500	500	0
	α	-0.00016	0.00006	-0.00044	-0.00007	-0.00047	-0.00003	0.00025	-0.00035	-0.00011	-0.00015	0.00024
	β(MRP)	0.39867	0.94216	0.33239	1.06056	0.78565	0.60730	0.74642	0.59440	0.67686	0.68345	0.23495
	β(SMB)	-0.32733	-0.46492	0.17168	-0.43071	0.93724	0.80373	0.71206	0.49570	0.33369	0.23718	0.54376
	β(HML)	1.02365	0.39061	-0.11273	-0.59794	0.69468	0.59465	-0.35383	-0.23191	0.13894	0.17590	0.54064
	t-Stat α	-0.47101	0.22471	-3.18044	-0.33296	-1.86948	-0.12403	0.93050	-1.67577	-0.40199	-0.81231	1.24519
	t-Stat β(MRP)	8.86516	27.48779	17.77257	37.62164	22.78778	17.06146	20.41604	20.97060	20.69332	21.62288	7.84209
	t-Stat β(SMB)	-5.37664	-10.01938	6.78066	-11.28605	20.08048	16.67910	14.38639	12.91819	9.84942	5.52034	11.80106
2003 -2004	t-Stat β(HML)	15.13694	7.57834	-4.00831	-14.10483	13.39890	11.10920	-6.43571	-5.44066	1.78502	2.15423	10.23724
	P-value α	0.63784	0.82230	0.00156	0.73930	0.06214	0.90134	0.35257	0.09441	0.49520	0.45143	0.34437
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(HML)	0.00000	0.00000	0.00007	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00002
	Standard Error	0.68304	0.87956	0.43449	0.90185	0.60312	0.47313	0.46850	0.47437	0.53875	0.61476	0.17713
	Adjusted R Squared	0.00729	0.00556	0.00303	0.00457	0.00559	0.00577	0.00593	0.00460	0.00557	0.00529	0.00117
	# of Observations	501	501	501	501	501	501	501	501	501	501	0

Period	Factor	BHHL	BHLL	BLHL	BLLL	SHHL	SHLL	SLHL	SLLL	Median	Average	Std Dev
	α	0.00055	-0.00012	-0.00020	0.00013	0.00019	-0.00027	0.00036	0.00007	0.00010	0.00009	0.00026
	β(MRP)	0.68166	0.85246	0.48542	0.71216	0.56948	0.62811	0.86605	0.66807	0.67486	0.68293	0.12157
	β(SMB)	-0.39310	-0.48388	-0.26485	-0.41410	0.57652	0.74453	0.57524	0.54778	0.14147	0.11102	0.50613
	β(HML)	1.02932	0.07990	-0.54695	-0.62605	0.25727	0.56973	-0.49155	-0.39923	-0.15966	-0.01595	0.56422
	t-Stat α	1.38596	-0.42057	-0.89792	0.56487	1.03490	-0.95077	1.34103	0.29929	0.43208	0.29460	0.89385
	t-Stat β(MRP)	11.84188	20.41086	14.96139	21.56797	20.99564	15.49049	22.35312	19.49007	19.95047	18.38893	3.55193
	t-Stat β(SMB)	-5.76904	-9.78755	-6.89603	-10.59465	17.95639	15.51178	12.54288	13.50041	3.38692	3.30802	11.74717
2005 -2006	t-Stat β(HML)	11.81582	1.26414	-11.13935	-12.52865	6.26757	9.28449	-8.38352	-7.69615	-3.21601	-1.38946	9.09545
	P-value α	0.16638	0.67425	0.36966	0.57242	0.30122	0.34218	0.18052	0.76485	0.35592	0.42144	0.20951
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(HML)	0.00000	0.20677	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.02585	0.06838
	Standard Error	0.73582	0.81868	0.61599	0.78550	0.58632	0.51463	0.50904	0.42985	0.60115	0.62448	0.13269
	Adjusted R Squared	0.00877	0.00637	0.00495	0.00503	0.00413	0.00618	0.00591	0.00522	0.00557	0.00582	0.00131
	# of Observations	501	501	501	501	501	501	501	501	501	501	0
	α	-0.00043	0.00018	-0.00020	0.00003	-0.00009	-0.00009	0.00007	-0.00032	-0.00009	-0.00011	0.00019
	β(MRP)	0.38413	1.02121	0.52626	0.51366	0.55548	0.48443	0.71660	0.68874	0.54087	0.61131	0.18463
	β(SMB)	-0.27230	-0.47200	-0.20286	-0.06233	0.65986	1.07494	0.67615	0.57956	0.25861	0.24763	0.52861
	β(HML)	1.02276	0.35548	-0.30976	-0.36033	0.45667	0.87325	-0.28363	-0.33813	0.03592	0.17704	0.53774
	t-Stat α	-0.86731	0.57342	-0.62512	0.09517	-0.26558	-0.22804	0.20188	-1.13730	-0.24681	-0.28161	0.53656
	t-Stat β(MRP)	7.94984	33.49229	16.36811	19.42471	17.49262	12.07558	22.13216	25.30049	18.45867	19.27947	7.40221
	t-Stat β(SMB)	-4.40827	-12.10894	-4.93558	-1.84386	16.25463	20.96050	16.33526	16.65373	7.20538	5.86343	12.07541
2007 -2008	t-Stat β(HML)	12.88198	7.09534	-5.86344	-8.29284	8.75212	13.24772	-5.33123	-7.55940	0.88205	1.86628	8.86880
	P-value α	0.38619	0.56662	0.53218	0.92421	0.79067	0.81971	0.84009	0.25596	0.67864	0.63945	0.22492
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.00001	0.00000	0.00000	0.06580	0.00000	0.00000	0.00000	0.00000	0.00000	0.00823	0.02176
	P-value β(HML)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Standard Error	0.72766	0.92705	0.59106	0.58973	0.67378	0.64462	0.55567	0.60604	0.62533	0.66445	0.11161
	Adjusted R Squared	0.01099	0.00693	0.00731	0.00601	0.00722	0.00912	0.00736	0.00619	0.00726	0.00764	0.00154
	# of Observations	501.00000	501.00000	501.00000	501.00000	501.00000	501.00000	501.00000	501.00000	501.00000	501.00000	0.00000
	α	0.00004	-0.00010	0.00051	-0.00040	0.00017	-0.00006	-0.00003	-0.00003	-0.00003	0.00001	0.00024
	β(MRP)	0.80536	0.84864	0.73199	0.59730	0.71969	0.60961	0.89655	0.75746	0.74473	0.74583	0.09903
	β(SMB)	-0.20745	-0.24872	-0.42625	0.08534	0.78952	0.86957	0.77819	0.76564	0.42549	0.30073	0.51740
	β(HML)	0.74585	0.24318	-0.89156	-0.17145	0.31749	0.61950	-0.39559	-0.61539	0.03587	-0.01849	0.55416
	t-Stat α	0.12586	-0.39830	1.56377	-2.10863	0.68299	-0.19124	-0.10423	-0.10905	-0.10664	-0.06735	0.97183
	t-Stat β(MRP)	21.92824	30.82494	20.15416	28.32981	26.33628	18.42889	30.11831	25.49017	25.91322	25.20135	4.31587
	t-Stat β(SMB)	-3.86286	-6.17828	-8.02604	2.76817	19.75846	17.97768	17.87807	17.62065	10.19441	7.24198	11.45267
2009 -2010	t-Stat β(HML)	10.68655	4.64815	-12.91758	-4.27913	6.11392	9.85524	-6.99322	-10.89777	0.18451	-0.47298	8.81310
	P-value α	0.89989	0.69058	0.11851	0.03548	0.49493	0.84842	0.91703	0.91321	0.76950	0.61476	0.33880
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.00013	0.00000	0.00000	0.00585	0.00000	0.00000	0.00000	0.00000	0.00000	0.00075	0.00193
	P-value β(HML)	0.00000	0.00000	0.00000	0.00002	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001
	Standard Error	0.78871	0.85756	0.71142	0.73573	0.62800	0.52170	0.64614	0.57875	0.67878	0.68350	0.10399
	Adjusted R Squared	0.00742	0.00557	0.00734	0.00426	0.00552	0.00669	0.00602	0.00601	0.00601	0.00610	0.00098
	# of Observations	501.00000	501.00000	501.00000	501.00000	501.00000	501.00000	501.00000	501.00000	501.00000	501.00000	0.00000

Period	Factor	BHHL	BHLL	BLHL	BLLL	SHHL	SHLL	SLHL	SLLL	Median	Average	Std Dev
	α	-0.00036	0.00009	0.00004	-0.00063	-0.00016	-0.00042	-0.00013	-0.00014	-0.00015	-0.00021	0.00023
	β(MRP)	0.91917	0.75590	1.06094	0.56114	0.69387	0.92822	0.80797	0.86710	0.83753	0.82429	0.14527
	β(SMB)	-0.70743	0.21285	-0.31685	0.02724	0.74666	0.96374	0.68105	0.82437	0.44695	0.30395	0.56319
	β(HML)	0.41246	0.53013	-0.86728	-0.13511	0.29154	0.70608	-0.49785	-0.55956	0.07822	-0.01495	0.54363
	t-Stat α	-1.43764	0.40507	0.22826	-3.94082	-0.83205	-2.02492	-0.73366	-0.73142	-0.78286	-1.13340	1.29432
	t-Stat β(MRP)	22.46027	20.67637	33.28525	21.50670	21.49842	27.36242	28.03302	27.71914	24.91135	25.31770	4.17762
	t-Stat β(SMB)	-12.61086	4.24739	-7.25182	0.76155	16.87680	20.72537	17.23828	19.22517	10.56210	7.40149	12.10950
2011 -2012	t-Stat β(HML)	6.24821	8.98974	-16.86851	-3.21022	5.59993	12.90367	-10.70859	-11.08962	1.19486	-1.01692	10.25885
	P-value α	0.15117	0.68560	0.81954	0.00009	0.40578	0.04341	0.46351	0.46487	0.43464	0.37925	0.27645
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.00000	0.00003	0.00000	0.44669	0.00000	0.00000	0.00000	0.00000	0.00000	0.05584	0.14773
	P-value β(HML)	0.00000	0.00000	0.00000	0.00141	0.00000	0.00000	0.00000	0.00000	0.00000	0.00018	0.00047
	Standard Error	0.85912	0.65959	0.89365	0.69797	0.51951	0.67688	0.64038	0.62555	0.66824	0.69658	0.11542
	Adjusted R Squared	0.00554	0.00495	0.00432	0.00353	0.00437	0.00459	0.00390	0.00424	0.00434	0.00443	0.00058
	# of Observations	499.00000	499.00000	499.00000	499.00000	499.00000	499.00000	499.00000	499.00000	499.00000	499.00000	0.00000
	α	-0.00081	0.00015	-0.00015	-0.00049	-0.00048	-0.00017	-0.00086	0.00020	-0.00032	-0.00033	0.00037
	β(MRP)	0.75385	0.96580	0.96077	0.71461	0.72855	0.94683	0.79865	0.92100	0.85983	0.84876	0.10311
	β(SMB)	-0.47200	0.14155	-0.17832	-0.39661	0.59136	0.83371	0.73504	0.93451	0.36646	0.27365	0.53516
	β(HML)	0.67043	0.39878	-0.39676	-0.81828	0.34894	0.43602	-0.64517	-0.28563	0.03166	-0.03646	0.52851
	t-Stat α	-2.63663	0.81132	-0.64322	-1.76100	-2.38896	-0.73394	-3.38981	0.77258	-1.24747	-1.24621	1.45920
	t-Stat β(MRP)	15.59291	32.99640	25.72954	16.25929	23.28686	26.05103	20.12606	23.10721	23.19703	22.89366	5.30627
	t-Stat β(SMB)	-7.96457	3.94509	-3.89564	-7.36154	15.41985	18.71300	15.11082	19.12697	9.52796	6.63675	11.05736
2013 -2014	t-Stat β(HML)	11.51268	11.31084	-8.82115	-15.45660	9.25951	9.95947	-13.49762	-5.94934	1.65509	-0.21027	11.06431
	P-value α	0.00864	0.41757	0.52038	0.07885	0.01727	0.46333	0.00076	0.44014	0.24821	0.24337	0.21975
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.00000	0.00009	0.00011	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00003	0.00004
	P-value β(HML)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Standard Error	0.65453	0.78358	0.80711	0.76353	0.52458	0.57969	0.60838	0.57734	0.63146	0.66234	0.10118
	Adjusted R Squared	0.00684	0.00414	0.00528	0.00621	0.00442	0.00514	0.00561	0.00564	0.00545	0.00541	0.00083
	# of Observations	501	501	501	501	501	501	501	501	501	501	0
	α	-0.00017	0.00007	-0.00022	-0.00005	0.00010	-0.00036	0.00015	-0.00025	-0.00011	-0.00009	0.00017
	β(MRP)	0.88931	0.99864	0.93159	0.77327	0.72048	0.98438	0.96802	0.91993	0.92576	0.89820	0.09437
	β(SMB)	-0.10395	-0.00919	-0.09006	-0.50976	0.53468	0.86551	1.08945	0.79741	0.26274	0.32176	0.53716
	β(HML)	0.34826	0.36887	-0.40892	-1.17751	0.22751	0.18606	-0.97975	-0.30313	-0.05853	-0.21733	0.56695
	t-Stat α	-0.47627	0.30659	-0.70525	-0.13341	0.36121	-1.15901	0.44555	-0.75650	-0.30484	-0.26464	0.56129
	t-Stat β(MRP)	20.23765	34.65838	24.40270	17.00192	21.06680	25.16109	22.87818	22.48785	22.68302	23.48682	4.85131
	t-Stat β(SMB)	-1.88067	-0.25369	-1.87547	-8.91060	12.42926	17.58803	20.47012	15.49714	6.08779	6.63302	10.35347
2015 -2016	t-Stat β(HML)	9.51329	15.36704	-12.85804	-31.07798	7.98546	5.70863	-27.79536	-8.89478	-1.59307	-5.25646	16.52585
	P-value α	0.63409	0.75928	0.48099	0.89393	0.71810	0.24701	0.65612	0.44971	0.64510	0.60490	0.19078
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.06060	0.79984	0.06132	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.11522	0.26004
	P-value β(HML)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Standard Error	0.60501	0.80166	0.79302	0.86052	0.46970	0.56469	0.80381	0.63034	0.71168	0.69110	0.13234
	Adjusted R Squared	0.00790	0.00518	0.00686	0.00818	0.00615	0.00703	0.00761	0.00735	0.00719	0.00703	0.00092
	# of Observations	500.00000	500.00000	500.00000	500.00000	500.00000	500.00000	500.00000	500.00000	500.00000	500.00000	0.00000

Period	Factor	BHHL	BHLL	BLHL	BLLL	SHHL	SHLL	SLHL	SLLL	Median	Average	Std Dev
	α	0.00054	-0.00121	-0.00044	-0.00041	-0.00003	-0.00083	-0.00011	-0.00056	-0.00043	-0.00038	0.00050
	β(MRP)	1.28158	0.44321	0.81986	0.79905	0.70463	0.91427	0.85810	0.86669	0.83898	0.83592	0.21773
	β(SMB)	-0.24778	-0.31263	-0.13779	-0.49856	0.58357	0.78008	0.75543	0.68416	0.22289	0.20081	0.51136
	β(HML)	0.44235	0.44934	-0.61123	-1.10864	0.03484	0.24530	-0.66022	-0.44809	-0.20663	-0.20704	0.54261
	t-Stat α	1.68971	-2.65480	-1.51793	-1.18311	-0.09603	-2.37849	-0.35595	-2.03551	-1.35052	-1.06651	1.34368
	t-Stat β(MRP)	28.29826	6.85423	19.80851	16.24457	16.92090	18.58268	18.95008	22.32455	18.76638	18.49797	5.65419
	t-Stat β(SMB)	-5.46315	-4.82776	-3.32428	-10.12104	13.99339	15.83222	16.65871	17.59736	5.33456	5.04318	11.16257
2017 -2018	t-Stat β(HML)	9.01590	6.41440	-13.63171	-20.80447	0.77219	4.60215	-13.45856	-10.65407	-4.94094	-4.71802	10.48464
	P-value α	0.09171	0.00819	0.12967	0.23733	0.92354	0.01776	0.72203	0.04233	0.11069	0.27157	0.32939
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.00000	0.00000	0.00095	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00012	0.00031
	P-value β(HML)	0.00000	0.00000	0.00000	0.00000	0.44037	0.00001	0.00000	0.00000	0.00000	0.05505	0.14564
	Standard Error	0.78692	0.30542	0.69315	0.76815	0.37996	0.45457	0.50524	0.53666	0.52095	0.55376	0.16738
	Adjusted R Squared	0.00713	0.01018	0.00652	0.00775	0.00656	0.00775	0.00713	0.00611	0.00713	0.00739	0.00119
	# of Observations	501	501	501	501	501	501	501	501	501	501	0
	α	-0.00086	-0.00058	-0.00029	-0.00090	0.00011	-0.00130	-0.00012	-0.00132	-0.00072	-0.00066	0.00050
	β(MRP)	0.66878	0.69931	0.80373	0.64581	0.61870	0.83083	0.51086	0.85722	0.68404	0.70441	0.11110
	β(SMB)	-0.56526	-0.34232	-0.35271	-0.69452	0.39619	0.55658	0.57032	0.52211	0.02694	0.01130	0.51321
	β(HML)	1.15406	-0.07781	-0.41646	-0.87934	0.31625	0.38795	-0.63937	-0.28439	-0.18110	-0.05489	0.61244
	t-Stat α	-1.31741	-1.31991	-0.72458	-1.77913	0.23334	-2.65098	-0.20081	-2.62814	-1.31866	-1.29845	0.98170
	t-Stat β(MRP)	7.46096	11.53294	14.85185	9.32216	9.70585	12.41995	6.00236	12.44488	10.61939	10.46762	2.71451
	t-Stat β(SMB)	-6.96048	-6.23132	-7.19386	-11.06568	6.86017	9.18349	7.39629	8.36629	0.31443	0.04436	8.04333
2019	t-Stat β(HML)	12.85356	-1.28117	-7.68292	-12.67217	4.95293	5.78982	-7.49984	-4.12184	-2.70151	-1.20770	7.95368
	P-value α	0.18893	0.18810	0.46940	0.07646	0.81569	0.00855	0.84101	0.00913	0.18851	0.32466	0.32149
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(HML)	0.00000	0.20134	0.00000	0.00000	0.00000	0.00000	0.00000	0.00005	0.00000	0.02517	0.06659
	Standard Error	0.63154	0.58648	0.70502	0.69886	0.30617	0.41779	0.35409	0.43033	0.50841	0.51629	0.14778
	Adjusted R Squared	0.01024	0.00693	0.00618	0.00791	0.00728	0.00764	0.00972	0.00787	0.00776	0.00797	0.00128
	# of Observations	249	249	249	249	249	249	249	249	249	249	0

APPENDIX V: FOUR FACTOR REGRESSION

Period	Factor	BHHL	BHLL	BLHL	BLLL	SHHL	SHLL	SLHL	SLLL	Median	Average	Std Dev
	α	0.00065	0.00033	0.00028	-0.00019	-0.00034	0.00042	0.00048	0.00050	0.00038	0.00027	0.00033
	β(MRP)	0.71339	0.75018	0.56828	0.01865	0.28096	0.30597	0.48787	0.97570	0.52808	0.51263	0.28620
	β(SMB)	-0.35710	-0.67772	-0.50710	0.00466	0.76031	0.73725	0.56663	0.39855	0.20161	0.11569	0.54065
	β(HML)	0.47967	0.32927	-0.36878	-0.01177	0.59657	1.02288	-0.27908	-0.91199	0.15875	0.10710	0.58037
	β(HLLL)	0.24547	-0.35537	0.58533	-0.00605	1.27733	-0.69806	0.36124	-0.47114	0.11971	0.11734	0.60108
	t-Stat α	1.68237	0.98423	0.28174	-2.65842	-0.95905	0.42263	1.64517	1.37781	0.70343	0.34706	1.40024
	t-Stat β(MRP)	18.04839	21.68376	5.64707	2.49158	7.75538	2.99380	16.41646	26.02422	12.08592	12.63258	8.46492
	t-Stat β(SMB)	-8.71454	-18.89582	-4.86074	0.60096	20.24375	6.95841	18.39148	10.25394	3.77968	2.99718	12.68235
	t-Stat β(HML)	10.74194	8.42448	-3.24380	-1.39202	14.57620	8.85934	-8.31238	-21.53186	3.51623	1.01524	11.25969
1999 - 2000	t-Stat β(HLLL)	5.31487	-8.79096	4.97794	-0.69205	30.17464	-5.84548	10.40274	-10.75472	2.14295	3.09837	12.36198
	P-value α	0.09313	0.32549	0.77826	0.00811	0.33801	0.67275	0.10057	0.16889	0.24719	0.31065	0.26311
	P-value β(MRP)	0.00000	0.00000	0.00000	0.01305	0.00000	0.00289	0.00000	0.00000	0.00000	0.00199	0.00428
	P-value β(SMB)	0.00000	0.00000	0.00000	0.54814	0.00000	0.00000	0.00000	0.00000	0.00000	0.06852	0.18128
	P-value β(HML)	0.00000	0.00000	0.00126	0.16455	0.00000	0.00000	0.00000	0.00000	0.00000	0.02073	0.05436
	P-value β(HLLL)	0.00000	0.00000	0.00000	0.48924	0.00000	0.00000	0.00000	0.00000	0.00000	0.06115	0.16180
	Standard Error	0.69225	0.74977	0.41750	0.00449	0.73256	0.63906	0.52069	0.60901	0.62403	0.54567	0.22933
	Adjusted R Squared	0.00850	0.00744	0.02164	0.00161	0.00779	0.02198	0.00639	0.00806	0.00793	0.01043	0.00688
	# of Observations	496	496	496	496	496	496	496	496	496	496	0
	α	0.00037	0.00028	-0.00040	0.00084	0.00010	0.00034	0.00102	-0.00037	0.00031	0.00027	0.00047
	β(MRP)	0.72914	0.94682	0.39098	0.64026	0.79670	0.23454	0.79039	0.88557	0.75976	0.67680	0.23053
	β(SMB)	-0.63726	-0.31605	0.03607	-0.43319	0.76764	0.83524	0.48312	0.56356	0.25960	0.16239	0.53874
	β(HML)	0.54611	0.27488	-0.19953	-0.50558	0.22594	1.06895	-0.45663	-0.72238	0.01320	0.02897	0.56861
	β(HLLL)	1.04498	-0.56453	0.21678	-0.30758	0.60989	-0.70069	0.51800	-0.03755	0.08962	0.09741	0.57108
	t-Stat α	0.82090	0.99882	-1.80200	2.08753	0.27525	0.82199	3.77698	-1.00082	0.82144	0.74733	1.61350
	t-Stat β(MRP)	16.43830	34.12395	17.58314	16.02171	22.08511	5.76802	29.49688	23.90169	19.83413	20.67735	8.23469
	t-Stat β(SMB)	-11.47394	-9.09696	1.29557	-8.65706	16.99452	16.40455	14.39909	12.14769	6.72163	4.00168	11.59604
	t-Stat β(HML)	8.25205	6.64013	-6.01441	-8.47954	4.19786	17.61976	-11.42178	-13.06790	-0.90828	-0.28423	10.30123
2001 - 2002	t-Stat β(HLLL)	17.04876	-14.72354	7.05507	-5.56990	12.23468	-12.47005	13.98944	-0.73333	3.16087	2.10389	11.47966
	P-value α	0.41210	0.31837	0.07215	0.03735	0.78324	0.41148	0.00018	0.31740	0.31789	0.29403	0.24230
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.00000	0.00000	0.19573	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.02447	0.06473
	P-value β(HML)	0.00000	0.00000	0.00000	0.00000	0.00003	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001
	P-value β(HLLL)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.46371	0.00000	0.05796	0.15336
	Standard Error	0.74879	0.92102	0.45526	0.69219	0.59065	0.62631	0.63723	0.63729	0.63726	0.66359	0.12542
	Adjusted R Squared	0.00999	0.00625	0.00501	0.00900	0.00813	0.00916	0.00604	0.00835	0.00824	0.00774	0.00165
	# of Observations	500	500	500	500	500	500	500	500	500	500	0
	α	-0.00004	0.00000	-0.00043	-0.00011	-0.00042	-0.00011	0.00031	-0.00036	-0.00011	-0.00014	0.00023
	β(MRP)	0.64801	0.81383	0.35939	0.97718	0.90782	0.42876	0.88320	0.57865	0.73092	0.69961	0.21609
	β(SMB)	-0.61603	-0.31634	0.14043	-0.33417	0.79580	1.01045	0.55369	0.51394	0.32719	0.21847	0.55387
	β(HML)	0.73323	0.54008	-0.14418	-0.50082	0.55240	0.80260	-0.51314	-0.21355	0.19795	0.15708	0.51983
	β(HLLL)	1.05960	-0.54532	0.11471	-0.35432	0.51912	-0.75873	0.58124	-0.06696	0.02388	0.06867	0.58187
	t-Stat α	-0.18192	-0.00451	-3.13905	-0.55140	-1.83772	-0.54892	1.30658	-1.71165	-0.55016	-0.83357	1.27218
	t-Stat β(MRP)	18.63628	25.18062	18.34718	34.99997	27.53290	14.44774	25.61366	19.22292	22.20177	22.99766	6.16676
	t-Stat β(SMB)	-13.29495	-7.34496	5.37975	-8.98207	18.11209	25.55142	12.05005	12.81245	8.71490	5.53548	13.15996
	t-Stat β(HML)	14.35897	11.37884	-5.01194	-12.21482	11.40824	18.41625	-10.13354	-4.83084	3.27400	2.92140	11.38549
2003 - 2004	t-Stat β(HLLL)	21.07465	-11.66877	4.05010	-8.77659	10.88852	-17.68140	11.65760	-1.53831	1.25589	1.00073	12.42568
	P-value α	0.85572	0.99641	0.00180	0.58161	0.06670	0.58331	0.19196	0.08759	0.38679	0.42064	0.36005
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(HML)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(HLLL)	0.00000	0.00000	0.00006	0.00000	0.00000	0.00000	0.00000	0.12461	0.00000	0.01558	0.04121
	Standard Error	0.83244	0.90531	0.45149	0.91487	0.67904	0.67618	0.58197	0.47581	0.67761	0.68964	0.17028
	Adjusted R Squared	0.00530	0.00493	0.00299	0.00426	0.00503	0.00453	0.00526	0.00459	0.00476	0.00461	0.00070
	# of Observations	501	501	501	501	501	501	501	501	501	501	0

Period	Factor	BHHL	BHLL	BLHL	BLLL	SHHL	SHLL	SLHL	SLLL	Median	Average	Std Dev
	α	0.00022	0.00007	-0.00025	0.00026	0.00014	-0.00013	0.00019	0.00011	0.00012	0.00008	0.00017
	β(MRP)	0.75956	0.80618	0.49635	0.68165	0.58149	0.59651	0.90633	0.65940	0.67052	0.68593	0.12451
	β(SMB)	-0.42312	-0.46604	-0.26906	-0.40234	0.57189	0.75670	0.55972	0.55112	0.14103	0.10986	0.50629
	β(HML)	0.84113	0.19171	-0.57335	-0.55234	0.22824	0.64607	-0.58887	-0.37829	-0.09329	-0.02321	0.54004
	β(HLLL)	1.20683	-0.71703	0.16931	-0.47274	0.18616	-0.48959	0.62407	-0.13426	0.01753	0.04659	0.60075
	t-Stat α	0.81750	0.32037	-1.12011	1.30153	0.78511	-0.52171	0.85085	0.45714	0.62113	0.36134	0.74971
	t-Stat β(MRP)	19.27463	24.00442	15.48963	23.72747	21.98394	16.15031	28.16131	19.33364	20.65879	21.01567	4.00552
	t-Stat β(SMB)	-9.09840	-11.75894	-7.11511	-11.86774	18.32126	17.36093	14.73733	13.69267	3.28878	3.03400	13.13692
	t-Stat β(HML)	14.03022	3.75216	-11.76110	-12.63782	5.67185	11.49795	-12.02702	-7.29062	-1.76923	-1.09555	10.37748
2005 -2006	t-Stat β(HLLL)	23.91182	-16.67010	4.12556	-12.84846	5.49537	-10.34989	15.14035	-3.07369	0.52594	0.71637	13.24605
	P-value α	0.41403	0.74882	0.26321	0.19368	0.43276	0.60211	0.39526	0.64777	0.42340	0.46221	0.17872
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(HML)	0.00000	0.00020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00002	0.00006
	P-value β(HLLL)	0.00000	0.00000	0.00004	0.00000	0.00000	0.00000	0.00000	0.00223	0.00000	0.00028	0.00074
	Standard Error	0.87704	0.88356	0.62798	0.83874	0.60927	0.60003	0.66354	0.43938	0.64576	0.69244	0.14853
	Adjusted R Squared	0.00599	0.00510	0.00487	0.00436	0.00402	0.00561	0.00489	0.00518	0.00500	0.00500	0.00059
	# of Observations	501	501	501	501	501	501	501	501	501	501	0
	α	-0.00030	0.00012	-0.00017	0.00001	-0.00001	-0.00015	0.00014	-0.00032	-0.00008	-0.00009	0.00017
	β(MRP)	0.53358	0.95221	0.56804	0.49250	0.64289	0.41765	0.80183	0.68397	0.60546	0.63658	0.16325
	β(SMB)	-0.19856	-0.50604	-0.18225	-0.07277	0.70299	1.04199	0.71820	0.57721	0.25222	0.26010	0.52699
	β(HML)	0.92159	0.40219	-0.33804	-0.34601	0.39750	0.91845	-0.34132	-0.33491	0.03130	0.15993	0.53276
	β(HLLL)	1.13748	-0.52514	0.31796	-0.16100	0.66525	-0.50829	0.64861	-0.03627	0.14085	0.19233	0.56166
	t-Stat α	-0.80971	0.43881	-0.53725	0.02890	-0.04466	-0.39183	0.50822	-1.15136	-0.21824	-0.24486	0.54743
	t-Stat β(MRP)	14.35652	34.85021	17.97438	18.47766	24.43840	10.88559	29.24347	24.57916	21.45803	21.85067	7.42109
	t-Stat β(SMB)	-4.25648	-14.75640	-4.59475	-2.17525	21.29160	21.63870	20.86971	16.52658	7.17566	6.81796	13.78438
	t-Stat β(HML)	15.36374	9.12039	-6.62765	-8.04329	9.36237	14.83253	-7.71301	-7.45698	1.24637	2.35476	10.03894
2007 -2008	t-Stat β(HLLL)	19.52489	-12.26156	6.41879	-3.85355	16.13316	-8.45190	15.09139	-0.83146	2.79367	3.97122	11.30049
	P-value α	0.41850	0.66099	0.59133	0.97695	0.96440	0.69535	0.61152	0.25014	0.63626	0.64615	0.23082
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.00002	0.00000	0.00001	0.03008	0.00000	0.00000	0.00000	0.00000	0.00000	0.00376	0.00995
	P-value β(HML)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(HLLL)	0.00000	0.00000	0.00000	0.00013	0.00000	0.00000	0.00000	0.40612	0.00000	0.05078	0.13430
	Standard Error	0.84570	0.94391	0.62166	0.60085	0.78562	0.68873	0.69488	0.60579	0.69180	0.72339	0.11655
	Adjusted R Squared	0.00827	0.00608	0.00703	0.00593	0.00585	0.00854	0.00610	0.00619	0.00615	0.00675	0.00101
	# of Observations	501	501	501	501	501	501	501	501	501	501	0
	α	-0.00022	0.00009	0.00033	-0.00029	-0.00001	0.00005	-0.00019	0.00006	0.00002	-0.00002	0.00019
	β(MRP)	0.73607	0.89819	0.68312	0.62823	0.67264	0.63871	0.85378	0.78048	0.70960	0.73640	0.09357
	β(SMB)	-0.09803	-0.32696	-0.34907	0.03650	0.86381	0.82362	0.84573	0.72928	0.38289	0.31561	0.51411
	β(HML)	0.80681	0.19959	-0.84855	-0.19866	0.35889	0.59390	-0.35796	-0.63565	0.00046	-0.01020	0.55488
	β(HLLL)	0.81379	-0.58190	0.57403	-0.36321	0.55255	-0.34174	0.50234	-0.27045	0.11595	0.11068	0.51379
	t-Stat α	-0.81470	0.42398	1.10176	-1.67902	-0.04099	0.18192	-0.78439	0.21989	0.07047	-0.17394	0.81646
	t-Stat β(MRP)	24.51012	38.97952	20.49040	33.13425	28.85196	19.85448	31.72500	26.76497	27.80847	28.03884	6.10275
	t-Stat β(SMB)	-2.22860	-9.68758	-7.14845	1.31450	25.29660	17.47975	21.45551	17.07444	9.19447	7.94452	12.96175
	t-Stat β(HML)	14.25139	4.59475	-13.50187	-5.55807	8.16601	9.79339	-7.05584	-11.56321	-0.48166	-0.10918	9.89569
2009 -2010	t-Stat β(HLLL)	16.20815	-15.10476	10.29868	-11.45817	14.17621	-6.35395	11.16479	-5.54731	2.37568	1.67295	11.73980
	P-value α	0.41563	0.67176	0.27110	0.09378	0.96732	0.85572	0.43319	0.82604	0.55247	0.56682	0.29026
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.02629	0.00000	0.00000	0.18929	0.00000	0.00000	0.00000	0.00000	0.00000	0.02695	0.06196
	P-value β(HML)	0.00000	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(HLLL)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Standard Error	0.86159	0.90224	0.76178	0.79062	0.73473	0.55681	0.71664	0.60256	0.74826	0.74087	0.11020
	Adjusted R Squared	0.00601	0.00461	0.00667	0.00379	0.00467	0.00644	0.00539	0.00584	0.00561	0.00543	0.00093
	# of Observations	501	501	501	501	501	501	501	501	501	501	0

Period	Factor	BHHL	BHLL	BLHL	BLLL	SHHL	SHLL	SLHL	SLLL	Median	Average	Std Dev
	α	-0.00046	0.00019	0.00000	-0.00061	-0.00023	-0.00037	-0.00018	-0.00008	-0.00021	-0.00022	0.00024
	β(MRP)	0.84490	0.83289	1.02906	0.57437	0.64106	0.96237	0.76620	0.91159	0.83890	0.82031	0.14509
	β(SMB)	-0.38095	-0.12562	-0.17670	-0.03091	0.97882	0.81357	0.86464	0.62878	0.29894	0.32145	0.51592
	β(HML)	0.65412	0.27959	-0.76354	-0.17815	0.46339	0.59492	-0.36195	-0.70434	0.05072	-0.00200	0.53811
	β(HLLL)	0.80377	-0.83329	0.34502	-0.14315	0.57157	-0.36970	0.45199	-0.48151	0.10093	0.04309	0.54367
	t-Stat α	-2.11021	1.05546	0.01216	-3.86264	-1.32686	-1.87762	-1.14049	-0.45951	-1.23368	-1.21372	1.39195
	t-Stat β(MRP)	23.50335	27.57806	33.11324	21.91919	21.93839	29.11343	28.58685	31.22865	28.08245	27.12265	3.97040
	t-Stat β(SMB)	-6.94034	-2.72419	-3.72387	-0.77254	21.93840	16.11885	21.12767	14.10743	6.66745	7.39143	11.28880
	t-Stat β(HML)	10.85697	5.52352	-14.65951	-4.05638	9.46194	10.73820	-8.05743	-14.39659	0.73357	-0.57366	10.33276
2011 -2012	t-Stat β(HLLL)	12.82954	-15.83156	6.37023	-3.13460	11.22360	-6.41737	9.67629	-9.46479	1.61781	0.65642	10.07819
	P-value α	0.03534	0.29173	0.99031	0.00013	0.18517	0.06102	0.25463	0.64607	0.21990	0.30805	0.32175
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.00000	0.00667	0.00022	0.44017	0.00000	0.00000	0.00000	0.00000	0.00000	0.05588	0.14526
	P-value β(HML)	0.00000	0.00000	0.00000	0.00006	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00002
	P-value β(HLLL)	0.00000	0.00000	0.00000	0.00182	0.00000	0.00000	0.00000	0.00000	0.00000	0.00023	0.00060
	Standard Error	0.89412	0.77371	0.90152	0.70327	0.61636	0.70114	0.69707	0.68239	0.70220	0.74620	0.09616
	Adjusted R Squared	0.00480	0.00404	0.00415	0.00350	0.00391	0.00442	0.00358	0.00390	0.00397	0.00404	0.00040
	# of Observations	499	499	499	499	499	499	499	499	499	499	0
	α	-0.00047	-0.00004	0.00011	-0.00076	-0.00031	-0.00034	-0.00049	-0.00002	-0.00033	-0.00029	0.00027
	β(MRP)	0.80665	0.93572	1.00134	0.67277	0.75347	0.92064	0.85502	0.88735	0.87118	0.85412	0.09946
	β(SMB)	-0.32777	0.05937	-0.06748	-0.51093	0.65941	0.76217	0.88902	0.84258	0.35939	0.28830	0.52769
	β(HML)	0.62794	0.42299	-0.42941	-0.78461	0.32890	0.45709	-0.69052	-0.25855	0.03518	-0.04077	0.52687
	β(HLLL)	0.68924	-0.39270	0.52962	-0.54629	0.32518	-0.34185	0.73582	-0.43928	-0.00834	0.06997	0.51552
	t-Stat α	-1.70134	-0.25527	0.51201	-2.94873	-1.66254	-1.52521	-2.39299	-0.09002	-1.59388	-1.25801	1.12255
	t-Stat β(MRP)	18.58815	35.10056	29.83526	16.54832	25.34124	26.36319	26.48533	23.60640	25.85222	25.23356	5.51850
	t-Stat β(SMB)	-6.02498	1.77647	-1.60393	-10.02521	17.69149	17.41004	21.96766	17.88079	9.59326	7.38404	11.85717
	t-Stat β(HML)	12.05172	13.21514	-10.65598	-16.07384	9.21313	10.90140	-17.81495	-5.72871	1.74221	-0.61151	12.46356
2013 -2014	t-Stat β(HLLL)	11.31621	-10.49566	11.24317	-9.57400	7.79238	-6.97472	16.23988	-8.32643	0.40883	1.40260	10.50582
	P-value α	0.08951	0.79862	0.60887	0.00334	0.09704	0.12784	0.01708	0.92831	0.11244	0.33383	0.35581
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.00000	0.07627	0.10937	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.02320	0.04103
	P-value β(HML)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(HLLL)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Standard Error	0.72487	0.82256	0.84598	0.80001	0.57558	0.61646	0.74381	0.62843	0.73434	0.71971	0.09575
	Adjusted R Squared	0.00610	0.00375	0.00472	0.00571	0.00418	0.00491	0.00454	0.00528	0.00481	0.00490	0.00073
	# of Observations	501	501	501	501	501	501	501	501	501	501	0
	α	-0.00024	0.00009	-0.00026	0.00003	0.00007	-0.00031	0.00005	-0.00020	-0.00008	-0.00010	0.00016
	β(MRP)	0.91549	0.99122	0.94906	0.74388	0.73030	0.96264	1.00480	0.90191	0.93228	0.89991	0.09941
	β(SMB)	-0.14886	0.00353	-0.12003	-0.45935	0.51783	0.90279	1.02635	0.82832	0.26068	0.31882	0.53116
	β(HML)	0.33055	0.37388	-0.42074	-1.15764	0.22087	0.20075	-1.00462	-0.29094	-0.04509	-0.21849	0.56649
	β(HLLL)	0.62784	-0.17784	0.41902	-0.70465	0.23545	-0.52108	0.88206	-0.43206	0.02880	0.04109	0.54499
	t-Stat α	-0.74571	0.40034	-0.90752	0.09716	0.26840	-1.05003	0.18706	-0.63618	-0.26951	-0.29831	0.55360
	t-Stat β(MRP)	22.82389	34.85876	26.14581	18.25476	21.72618	26.59708	29.73341	23.09094	24.61838	25.40385	4.83161
	t-Stat β(SMB)	-2.94530	0.09846	-2.62427	-8.94579	12.22581	19.79507	24.10245	16.82982	6.16213	7.31703	11.58001
	t-Stat β(HML)	9.89927	15.79444	-13.92347	-34.12502	7.89313	6.66277	-35.71034	-8.94764	-1.14244	-6.55711	18.78782
2015 -2016	t-Stat β(HLLL)	10.13796	-4.05085	7.47658	-11.19975	4.53674	-9.32470	16.90543	-7.16458	0.24294	0.91460	9.60785
	P-value α	0.45620	0.68908	0.36458	0.92264	0.78851	0.29422	0.85169	0.52495	0.60702	0.61148	0.21940
	P-value β(MRP)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(SMB)	0.00338	0.92161	0.00895	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.11674	0.30422
	P-value β(HML)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	P-value β(HLLL)	0.00000	0.00006	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0.00000	0.00001	0.00002
	Standard Error	0.67226	0.80764	0.81365	0.88850	0.48984	0.62898	0.87537	0.66440	0.73995	0.73008	0.12981
	Adjusted R Squared	0.00720	0.00510	0.00651	0.00731	0.00603	0.00649	0.00606	0.00701	0.00650	0.00646	0.00069
	# of Observations	500	500	500	500	500	500	500	500	500	500	0