



Sculpting global leaders

Masters in Management of Finance and Investment Management

Research Report

Testing the Fama-French five-factor model in selected Emerging and Developed markets

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ABSTRACT

The focus of this research is on testing the adequacy of the Fama and French five-factor model in explaining the patterns in average stock returns for selected developing markets, and developed markets. Further tests are conducted in evaluating the performance of the five-factor model in explaining returns for diversified portfolios. With the proposition that there is some form of relationship between the asset's expected returns and market risk, the Capital Asset Pricing Model (CAPM) serves as a cornerstone for the asset pricing models. The evolution of the market over the years resulted in other factors being discovered that related to the asset's expected returns. This led to the development of the three-factor model and later the five-factor model.

The performance of the five-factor model depends on the region upon which it is being tested, especially for emerging markets, although the global five-factor model fails dismally as compared to the emerging market five-factor model. Across all the countries studied, the market premium (*Mkt*) is redundant, except for India and South Korea, together with some of the other factors depending on the country. For Indonesia, *Mkt* is the only redundant factor for explaining the patterns in average returns for the sample period.

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1 INTRODUCTION

1.1 Background

The proposition has been made that there is some form of fundamental rationality within the markets upon which modern academic finance is built (Dempsey, 2013). Among other things, asset pricing is concerned with ways to determine cost of capital for the purpose of evaluating investment opportunities (Berk & van Binsbergen, 2016). Sharpe (1964) and Lintner (1965) demonstrate that there exist a relationship between the asset's expected returns and its systematic risk. Systematic risk is a market wide effect on an asset's return, and is therefore sometimes regarded as market risk. The systematic risk of an asset relative to the market is measured by the asset's beta coefficient (Jordan, Miller, & Dolvin, 2015).

However, Merton (1980) mentions that there might be other types of risk in addition to market risk that the expected returns on securities may depend on. Fama and French (1992; 1993; 1996a), Banz (1981) and Chen et al. (1986) seem to confirm Merton's contention through various empirical studies. Brown and Barry (1984) associate the anomalies in excess returns to the misspecification in the estimation market model.

With globalisation and world-wide integration of financial systems on the rise, interest in African stock markets has been rekindled due to their low correlation with the global stock markets (Alagidede, 2001; Alagidede & Panagiotidis, 2009; Prayag, Du Toit, Kenmuir, Morrison, & Tembo, 2010). Developing and emerging stock markets are more prone to illiquidity risk and are relatively small as compared to developed markets (Andrianaivo & Yartey, 2010; Hearn & Piesse, 2010; Amihud, Hameed, Kang, & Zhang, 2015).

The role of the stock market is primarily based on the efficient allocation of ownership of the economy's capital stock (Fama, 1970; Naceur, Ghazouani, & Omran, 2007). Moreover, stock markets ensure that the economy's capital stock is utilised in a profitable manner (Singh, 1999). Contributing to whether the country is investable or not is dependent on the development of its local stock market (Ladekarl & Zervos, 2004). Stock market development plays a major role in the financial development of most emerging economies because of its contributions to the

countries' economic development by attracting foreign capital to fund investment and growth (Buckberg, 1995; Adjasi & Biekpe, 2009). Emerging markets have become an alternative investment opportunity for investors seeking diversification (Chang, Lima, & Tabak, 2004).

1.2 Problem statement

There is currently no valuation model that has been able to accurately capture the actual behaviour of asset prices in emerging markets (Bruner, Conroy, Estrada, Kritzman, & Li, 2002). The derivation of an accurate pricing model is what some academics and practitioners have been striving to achieve in financial economics for over a half century (Basiewicz & Auret, 2010). Though for developed markets the return generating process is more established, for emerging markets there is difficulty in identifying risk components for risk premiums to evaluate due to lack of historical data (Girard & Omran, 2007).

Fama and French (2015) recently extended the Fama and French (1993) three-factor asset pricing model into a five-factor model and their subsequent empirical test (Fama & French, 2016) shows that the five factor model explains a greater proportion of the cross-section of equity returns than the three-factor model in developed equity markets. There is no knowledge, however on whether the Fama-French five-factor model applies well to developing market equity prices as it has been tested so far only with returns on equities in developed countries, particularly the North America, Europe, Japan and Asian Pacific countries. Emerging markets are susceptible to various limitations such as accounting transparency, low liquidity, small size, segmentation and relative inefficiency, which are all likely to affect firm valuation. So, the issue at hand is the applicability of the Fama-French five-factor "theory" to equity prices in the selected developing markets as well as some developed markets omitted in previous studies.

1.3 Significance of the study

Given the observed low correlation between emerging equity markets and equity markets elsewhere and the inference that emerging equity markets are different from more advanced equity markets in Europe and America (where the Fama-French model emanates), emerging market equities are potential candidates for portfolio diversification. International investors seeking diversification opportunities and other

investors need to understand the behaviour of equity prices in emerging markets to help them make informed decisions.

Since we do not have a clear understanding of the factors that explain equity prices in developing markets, several studies have touched on this issue but they have not resolved it. Given that the Fama-French model offers an unambiguous set of five factors whose relevance to emerging markets have not been tested, this study intends to extend asset pricing literature by investigating these five factors in emerging equity markets and developed markets.

1.4 Research Objectives

Fama and French (2015) tested the five factor asset pricing model in US stock markets, however this model has not been tested in emerging countries' stock market. The objective of the research is to test the applicability of the Fama-French Five-Factor Asset Pricing Model to emerging countries' stock markets.

1.5 Hypothesis

Fama-French Five-Factor Asset Pricing Model explains variations in average returns of equities in emerging and developed stock markets.

2 LITERATURE REVIEW

2.1 Background

Equity markets are vital because they provide information that improves the efficiency of the financial systems and enables investors undertake valuation of assets (Naceur, Ghazouani, & Omran, 2007). Valuation of assets is focused on identifying risk factors which better explain the required rates of return (Girard & Omran, 2007). Several asset pricing models have been developed in an attempt to incorporate what their developers believe to be the most important factors affecting equity returns; such models are vital in assisting investors make reliable investment decisions when developing investment strategies and portfolios (Shaker & Elgiziry, 2014). Following the development of modern portfolio theory (Markowitz, 1952), what came to be known as the Capital Asset Pricing Model (CAPM) was developed (Sharpe, 1964; Lintner, 1965) as a first attempt to explain the behaviour of equity returns.

The Capital Asset Pricing Model (CAPM) has served as bedrock for market rationality and for valuing assets since its inception in the early 1960's (Dempsey, 2013). Vast majority of research on Sharpe (1964) and Lintner (1965) original CAPM is confined to developed markets (Hearn & Piesse, 2009). Ever since, utilisation of the model has yielded a large number of potential return anomalies which have served as motivation for researchers to develop improved models that capture each anomaly as a risk factor (Berk & van Binsbergen, 2016). Anomalies usually surface when using portfolio-based approaches (Cederburg & O'Doherty, 2015). Some of the anomalies that might have been due to lack of market efficiency could have been a result of the pricing model missing some of the relevant factors (Banz, 1981).

In an efficient capital market, asset prices fully reflect all the available information (Basu, 1977; Ball, 1978), and no individual has monopolistic access to information that might grant them having higher expected returns than others (Fama, 1970; Fama & Macbeth, 1973). Fama (1998), states that asset prices are not fully reflective of all the available information. Although the CAPM and the Three-Factor model hope to approximate these prices, they have rather returned incomplete descriptions of average returns. Fama and French (1993), show that their three-factor model fails to provide accurate average returns on portfolios formed based on size and Book-to-

Market Equity ratio (B/M). Even though these dimensions are designed into the three-factor model's risk factors so that they can be captured, the mispricing of these small stocks many readers have suggested that it's the general prediction of behavioural finance (Fama, 1998).

The five factor asset pricing model developed by Fama and French (2015) aims to capture the size, value, profitability, and investment patterns in average stock returns. The model is said to perform better than the Fama French three-factor asset pricing model. Though identified problem in the five-factor asset pricing model is its inability to precisely capture the low average returns on small stocks. Capturing the riskiness of portfolios consisting of small firms has been rather ineffective due to the presence of auto-correlation caused by the small firm securities being rarely traded (Roll, 1981). Evidence suggests that there is a relationship between book-to-market equity ratio, and average stock returns. There is also evidence that profitability and investment add to the description of the average returns provided by B/M (Fama & French, 2015).

The CAPM market factor has been augmented throughout the years with the inclusion of factors created on firm characteristics that are known ex ante to be associated with CAPM alphas (Cederburg & O'Doherty, 2015), and to account for country-specific risk (Pereiro, 2006). Valid asset pricing models should be able to explain variations in asset prices whether the markets are efficient or not (Webb, 1990).

2.2 Capital Asset Pricing Model

A vital component of research in the field of financial economics is aimed at determining constituents of prices of risky assets (Shanken & Weinstein, 2006). The development of the CAPM came at a time when theoretical foundations of decision making under uncertainty with regards to risk and return in the capital markets were at their infancy. Before CAPM was established, no answer was available on how expected returns and risk were related (Perold, 2004).

Empirical work has been performed over the years aimed at supporting (Merton, 1973) the logic that an asset's excess return over the risk free rate should be proportional to that asset's exposure to overall market risk, as measured by beta. Fama and French (2004) interpret beta as a measure of the sensitivity of the

asset's return to variation in the market return. Perold (2004) further states that beta measures the undiversifiable risk associated with the asset. Early tests of the CAPM showed that higher stock returns were generally associated with higher betas (Dempsey, 2013). Years of testing have revealed that the relationship between returns and betas vary periodically. The CAPM provided the first logical framework in the field of finance on how the risk of an investment should be affected by its expected return. This is the pricing of assets in a market that is in equilibrium, that is, the market whereby all assets lie on the Security Market Line (Perold, 2004).

CAPM provides a platform on how to measure risk and its relation to expected return (Fama & French, 1992). Unfortunately the empirical record of the model has proven to be poor to an extent that it can be invalidated in the way it is used in applications (Fama & French, 2004). Dempsey (2013) argues that CAPM fails as a paradigm for asset pricing just as it was illustrated by Banz (1981), and Jegadeesh and Titman (1993). The argument is mainly based on the ineffectiveness of beta, which is in support of Fama and French who conceded the insensitivity of an asset's beta in explaining the average returns of that asset. However, Banz (1981) does proclaim that without CAPM, there would be nothing more than the market that responds positively to good news and negatively to bad news.

Empirical contradictions of the CAPM suggest that a complicated asset pricing model is required for better explanation of average returns (Fama & French, 2004; Girard & Omran, 2007). These empirical contradictions are due to the fact that CAPM omits relevant risk factors (Cederburg & O'Doherty, 2015). Estrada (2002) highlights the fact that CAPM assumes that the underlying distribution of returns is normal. Zhou (1993) found strong evidence against the normality assumption and is supported by Prayag et al. (2010) and Adu et al. (2015). They show that market returns follow a non-normal distribution, that is there is evidence of skewness and kurtosis in the market returns' distribution. Though it remains that some adjusted form of the CAPM is core to empirical behaviour of the markets and, as such, it shall remain the foundation model of asset pricing (Dempsey, 2013).

Various forms of the CAPM have been created to better capture the asset returns, this included the Arbitrage Pricing Theory (APT) model of Ross (1976) which was proposed as an alternative to the CAPM. For underlying distribution of returns that

are asymmetric. Estrada (2002; 2007) proposes the use of Downside CAPM (D-CAPM), unlike the CAPM, the D-CAPM focuses on the semivariance of the returns, highlighting the dislike of downside volatility by investors. Investors' portfolios are mainly equipped with domestic assets (Stulz, 1981), Solnik and Zuo (2012) augmented the CAPM by assuming that investors prefer their home assets based on familiarity. Their purpose was to determine how this home bias affected asset pricing, and the results yielded a negative relationship.

Liu (2006) develops a two-factor augmented CAPM that comprises of the market premium and the liquidity premium in explaining some of the variations in returns. Merton (1973) presents an Intertemporal Capital Asset Pricing Model (ICAPM) which is based on consumer-investor behaviour. The premise that investor preferences and investment opportunities varies over time.

2.3 Three Factor Asset Pricing Model

Merton (1973) discovered that portfolios with zero covariance with the market had their average returns significantly exceeding the risk free rate, suggesting absence of a factor besides the market that influences stock returns. Different expansion models of the CAPM were created in order to accommodate the complexities apparent of the real world (Perold, 2004). These complexities are not captured by the CAPM and so they are referred to as anomalies (Fama & French, 1996a). Brennan and Xia (2001) define asset pricing anomaly as a statistically significant difference between the realised averaged returns of securities or portfolios of securities and the returns predicted by the particular asset pricing model. They further state that the anomalousness of one model might be consistent with the prediction of other asset pricing models. Hence adding more factors to the CAPM to capture the anomalies led Fama and French to the development of the three-factor model. The three-factor model captured some of the average-return anomalies that were not explained by the CAPM (Fama & French, 1996a; 1996b).

Fama and French used the value- and equal-weighted portfolios of the New York Stock Exchange to provide a convenient way to examine the behaviour of stock returns as a function of firm size (Fama & French, 1989). The Fama French three-factor model comprises of the market return, an element depending on the stock's sensitivity to differential performance in book-to-market value and size of the stock

(Fama & French, 1989). The shortfall of the three factor model, according to Fama and French (1997) is that the model exaggerates the premium for distress. Expected returns on portfolios with high book-to-market slopes were overestimated and portfolios with low book-to-market slopes were underestimated.

Fama and French (1996a) show that their three factor model fails to capture the momentum effect in returns, hence Carhart (1997) augments the three-factor model of Fama and French (1993) to include the momentum factor. This augmented model performed better than the CAPM and the three-factor model in capturing variations in portfolio returns in the New York Stock Exchange. However the model performed poorly in explaining the returns of the spread in alpha-sorted portfolios.

The three factor model of Girard and Omran (2007), comprised of political risk, economic risk, and financial risk. Amongst others these factors are also highlighted by Ladekarl and Zervos (2004) as determinants of whether an investor deems the country investable. Griffin (2002) augments the three factor model of Fama and French by replacing the three-factors with global factors, which provided a less accurate estimates of average returns.

2.4 Five Factor Asset Pricing Model

Fama and French (1989) identified evidence that suggested that variation in capital-investment opportunities played a role in the variation of expected returns. Titman et al. (2004) identified a negative relation between capital investment and future stock returns. Furthermore, Fama and French (1993; 1995) stated that size and profitability were also related and Novy-Marx (2013) concurred and further highlighted that profitability had a significant relationship with average returns. Titman et al. (2004), and Novy-Marx (2013) served as a motivation for Fama & French (2015) to examine a model that adds profitability and investment factors to the market, size, and Book-to-Market equity factors of the Fama-French three-factor model.

What could also have been regarded as a five-factor asset pricing model is that identified by Fama & French (1993), whom identified five common risk factors in the returns on stocks and bonds. In this model, there are three risk factors associated with the stock-market: the market factor, firm size and book-to-market equity. There are two bond-market factors, related to maturity and default risks. The theory behind developing this model was based on the analogy that if markets are intergrated, a

single model should be able to explain stock and bond returns. Cochrane (1996) states that stock and bond returns are correlated with macroeconomic activities. This was in support of Chen et al. (1986) five factor model which discarded the market premium and consisted of majority factors relating to bond returns.

Expected returns on long-term corporate bonds can vary through time due to the variation in default premiums and variation in maturity premiums. The default premium is the difference between the expected returns on low- and high-grade bonds with similar maturities, and the maturity premium is the difference between the expected returns on long- and short-term bonds (Fama & French, 1989).

2.5 Empirical Review

Fama and French (1998) illustrate the volatility of emerging market returns by highlighting the significantly large annual return standard deviations obtained in their selected emerging market countries. With the fact there is no normal distribution of stock returns, Vendrame et. al (2016) augment the CAPM by including the four moments, mean, variance, skewness and kurtosis. They believe this augmentation of the CAPM produces better set of systematic risks as compared to the tradition CAPM for explaining returns on individual assets, the results though said different.

The three-factor model proposed by Fama and French added two new factors – size and value factors – to the original CAPM model. For stocks listed on the Johannesburg Stock Exchange (JSE) Basiewicz and Auret (2009) undertook to identify a proxy for the value factor. The variables they identified are Earnings-to-Price ratio (E/P), Cashflow-to-Price ratio (C/P) and Book-to-Market ratio (B/M) since they all had a similar economic meaning. The results yielded high correlation amongst these three variables with the B/M being a better predictor of returns than E/P and C/P. For their analysis on returns on the JSE, Auret and Sinclair (2006) also realised the high significance of B/M, this time in relation to the size factor and the Price-to Earnings ratio, which rendered them significant while itself remained significant.

Basiewicz & Auret (2010) tested the Arbitrage Pricing Theory (APT) model and CAPM, and made them serve as a benchmark against which the Fama-French Three-Factor model is tested on firms listed on the JSE. Their quantities of interest were the resultant intercept, that is, the pricing errors. Collectively, the closer the

pricing errors are to zero, this would suggest that the asset pricing model is adequate in capturing the returns of the test assets (Fama & French, 1996a; Cochrane, 1996).

Basiewicz and Auret (2009) provided evidence of the presence of size and value effects on the JSE, and further revealed that these effects are independent of each other with the value effect having the strongest power in predicting the returns. The size and value effects are only regarded as anomalies because they are incompatible with the CAPM (Avramov & Chordia, 2006; Struggnell, Gilbert, & Kruger, 2011). With the inclusion of the size and the value effects in the asset pricing equation, Basiewicz and Auret (2010) performed time-series regression on the returns of test assets listed on the JSE. The CAPM and APT model both failed in explaining the size and value effects. The three-factor model produced improved results in explaining the returns of many types of these test assets. However, the pricing errors for the three-factor model are indicative of the model not being able to eradicate the size and the value effects as is indicated by the intercepts. Moreover, Fama and French (1996a) revealed that the three-factor model poorly predicts the portfolios of small and growth firms in the United States (US) whereas in the JSE, according to Basiewicz and Auret (2010), it is the portfolio of small and value firms that are mispriced.

According to Sharpe (1964), the expected returns of single assets will lie above the capital market line, which he considers to be the reflection of the inefficiency of undiversified holdings. Moreover, Black et al (1972) showed that high beta stocks have a negative intercept, indicative of stock returns being less than those the model predicted, and low beta stocks had positive intercept, indicative of stock returns being more than those predicted by the model. However, in tests on ungrouped data conducted by Basiewicz and Auret (2010), the three-factor model captured the value effect and further went on to explain the size effect. This is despite the fact that the B/M ratio loses its power to predict the pricing errors of these models after the inclusion of size as an explanatory power.

Stock markets in Africa are mostly small and illiquid (Adjasi & Biekpe, 2009; Alagidede & Panagiotidis, 2009). Hearn & Piesse (2009), for their augmentation of the CAPM in studying Africa's emerging markets, included the firm size factor, and

the illiquidity factor. The illiquidity factor is based on intraday trading volumes and order flows that have an impact on stock prices. The portfolios sorted in accordance with the size of the illiquidity, alpha is not significantly different from zero in all cases except for large-size, medium liquidity portfolio. Estimated coefficients on both the market excess return and the illiquidity factor are large and significant in almost all cases. Coefficient on the size factor is small in majority of the cases and significantly different from zero in the large or small-size company portfolios whereas they are, in medium-size portfolios, insignificant. Anomalies encountered with the model are those regularly encountered in modelling small firms.

For their time series regressions Shaker & Elgiziry (2014), estimated the CAPM, Fama-Fench three-factor model, and various augmentation of the three factor model that included momentum and liquidity factors in the Egyptian Stock Market. In general, their results indicated the superiority of the Fama-French three-factor model in capturing cross-section of average returns as compared to the other models. The CAPM and various augmentation of the three-factor model failed to fully explain the cross-section of average returns.

Obrimah et al. (2015) performs empirical tests of the relevance of the CAPM, and augmentations of the CAPM to a description of the cross-section of expected returns on the Nigerian Stock Exchange. There is augmentation of the CAPM with the co-skewness factor to capture the investor's response to the presence of positive skewness in market returns. The other augmentation of the CAPM included the measures of the idiosyncratic risk. The selected stocks had significant trading history within the different sectors of the Nigerian economy, and companies included in the portfolios were price leaders in their respective industries. Furthermore, they implemented purposive sampling to minimise the probability of rejecting the validity of CAPM by eliminating small stocks based on the general consensus in the literature (Cederburg & O'Doherty, 2015) that CAPM performs poorly for small stocks.

Most asset pricing models assume that all investors are informed instantaneously (Berk & van Binsbergen, 2016), hence Obrimah et al. (2015) in their approach to testing for relevancy to asset pricing, considered non-synchronous trading within stock markets. The results revealed that on average, an asset pricing model that

incorporates the co-skewness factor together with idiosyncratic risk provides best explanation of portfolio risk-return trade-offs on the Nigerian Stock Exchange.

3 METHODOLOGY

3.1 Introduction

The research aims at testing how well the recent five-factor model of Fama and French explains the variation in stock returns in selected developing and developed market countries as listed in Table A.1. For this research data will be of quantitative nature therefore a deductive research approach will be implemented. The performance of the model was on the basis of the model's adequacy on explaining variations in returns for selected emerging and developed stock markets. The Generalized Method of Moments (GMM) was used to carry out the regressions since according to Lim (1989), it does not impose distributional assumptions on assets returns.

3.2 Population

The population in this research encompass developing and developed countries' stock markets. The time frame considered for the analysis is from January 2010 until November 2016, amounting to 361 weekly observations. Relevant data was collected for each of the listed firms during this time period.

3.3 Sample

The sample was stratified and the division was based on a single variable, the market. Moreover the sample data looked at the stock markets that have been in existence for the entire study period. In terms of sampling, firms whereby relevant data was missing were subject to exclusion. To minimize survivorship bias, firms that were active then got delisted during this period formed part of the sample. Table A.1 shows the total number of firms that are used in this study arranged in terms of the type of market in accordance with MSCI indices (2017). Table A.2 to Table A.4 shows the number of firms in each of the portfolio sorts across all the regions.

3.4 Data

The study uses secondary data acquired from Bloomberg and FRED. Relevant information (market cap, B/M, Operating profitability, Book equity, and Total assets)

were acquired which served as an input to the regression equation as stipulated in equation (2). The study uses weekly stock returns for the period 01 January 2010 to 25 November 2016, resulting in 361 observations. More information required included the share prices of the firms that are and were listed during the sample period. Three months treasury bills served as a proxy for the risk free return. In order to maintain consistency in our analysis especially for those countries that had insufficient risk free rate data, the returns for all the countries studied were converted into US dollar-denominated returns using equation (1), therefore allowing the use of three months US treasury bills for risk free return. According to Kodongo and Ojah (2014), the US dollar-denominated returns are computed using:

$$\tilde{r}_{USD,t} = \ln(1 + \tilde{r}_{j,t}) - \ln(1 + S_{D,t}) \quad (1)$$

where $\tilde{r}_{j,t}$ is the return in local currency, and $S_{D,t}$ is the change in the nominal value of the US dollar.

In addition to the market premium from the CAPM, the five factor model captures the relation between average returns and:

- Size, represented by the market capitalization, price times number of shares outstanding.
- Value of the firm, which in this case is Book-to-Market equity ratio.
- Operating profitability, from accounting data, the profit for the year divided by the book equity
- Investment, the percentage change in total assets

3.5 Analysis

The empirical specification of the of the Fama and French (2015) five factor model is:

$$R_{it} - R_{Ft} = a_i + b_i(R_{Mt} - R_{Ft}) + s_iSMB_t + h_iHML_t + r_iRMW_t + c_iCMA_t + e_{it} \quad (2)$$

From equation (2), time series regressions of excess returns on an asset were carried out on the market factor and four factor mimicking-portfolios. From this equation, R_{it} is the return on a security or portfolio i for period t , R_{Ft} is the risk free return, R_{Mt} is the return on the value-weight market portfolio. With all the portfolios regarded as being diversified, SMB_t is the size factor and is the return on portfolio of small stocks minus the returns on a portfolio of big stocks. HML_t is the difference

between the returns on portfolios of high and low B/M stocks, RMW_t is the difference between the returns on portfolios with strong and weak profitability. CMA_t is the difference between the returns on portfolios of stocks, e_{it} is a zero-mean residual. If the factor exposures b_i, s_i, h_i, r_i and c_i capture all the variations in expected returns, the intercept a_i in equation (2) will be zero for all securities and portfolios i .

According to Cochrane (1996), expected return pricing errors are useful in assessing an asset pricing model. For assessing the performance of the five factor model against the three factor model on the New York Stock Exchange (NYSE), American Express Foreign Exchange (AMEX), and National Association of Securities Dealers Automated Quotations System (NASDAQ), Fama and French (2015) measured the pricing errors a_i on portfolios formed based on SMB , HML , RMW and CMA . Lastly they performed Gibbons, Ross, & Shanken (1989) tests, which shall be referred to as the GRS statistic test, to measure how well the models capture realised returns based on actual returns as compared to those predicted by the model. A similar approach will be followed in assessing the performance of the five factor model in the selected developing and developed stock markets. The GRS statistic follows an F -distribution and is given by:

$$\left(\frac{T}{N}\right) \left(\frac{T-N-L}{T-L-1}\right) \left[\frac{\hat{\alpha}' \hat{\Sigma}^{-1} \hat{\alpha}}{1 + \bar{\mu}' \hat{\Omega}^{-1} \bar{\mu}} \right] \sim F(N, T - N - L) \quad (3)$$

where T is the number of observations, N is the number of portfolios, and L is the number of factors used in the valuation model. $\hat{\alpha}$ is a vector of intercepts from the regression equation (2), and $\bar{\mu}$ is a vector of means of factor portfolios. $\hat{\Omega}$ is a covariance matrix of factors and is estimated with:

$$\hat{\Omega} = \frac{(F - \bar{F})'(F - \bar{F})}{T-1} \quad (4)$$

where F is the matrix of factors composed of portfolio excess returns. $\hat{\Sigma}$ is a covariance of matrix of residuals given by:

$$\hat{\Sigma} = \frac{\hat{\varepsilon}' \hat{\varepsilon}}{T-L-1} \quad (5)$$

where $\hat{\varepsilon}$ is a vector of residuals from equation (1). The intercept should be statistically indistinguishable from zero and from equation (3), the lower the value determined the higher the probability the five factor model will not be rejected.

4 Results

4.1 Summary statistics for factor returns

The summary statistics of factor returns are displayed in Table 4.1. Average market returns (*Mkt*) for developing countries ranges from -0.08% to 0.12% per week, with standard deviation ranging from 1.35% to 3.28%. Average *SMB* returns for the developing countries are below zero. Similarly to average *SMB* returns, the average *HML* returns are below zero with South Korea being the exception with average returns of 0.07% per week ($t = 0.94$). The average *RMW* returns for the developing countries are above zero ranging from 0.20% to 0.62% per week. The standard deviations for *RMW* ranges from 0.95% to 2.04%. South Korea is the only country amongst the selected developing countries that has positive average *CMA* returns (0.21%, $t = 4.65$). In absolute value terms, the developing countries that had the largest average *SMB*, *RMW*, and *CMA* returns also had the largest standard deviations. For the other two factors, *Mkt* and *HML*, China produced largest standard deviations despite relatively lower average returns.

For selected developed countries, average *Mkt* returns is close to zero (-0.05%, $t = -0.44$ for Australia; -0.08%, $t = -0.87$ for Singapore). Average *SMB* returns are the lowest for both these developed countries (-1.83% for Australia; -1.69% for Singapore) and have the highest standard deviations. Similar to developing countries, average *RMW* returns are positive for Australia (0.94%, $t = 11.53$) and Singapore (0.49%, $t = 4.63$). Only *RMW* returns are positive for all the countries, developing and developed combined. In absolute value terms, average *SMB* returns produced the highest returns for both developed countries, which also corresponded to largest standard deviations for each country with respect to the other factors.

Table 4.1: Means and standard deviations of factor returns

Country specific factors are constructed for each of the countries. *Mkt* is market returns less the risk free rate. For the formation of *HML*, stocks at the end of December of year *t* are sorted from low to high based on their book-to-market (B/M) equity. Low B/M stocks are those in the bottom 25% and high B/M stocks are those in the top 75%. The other B/M breakpoint for the countries studied is at 50%. *HML* is the average returns of high B/M stocks minus the average returns of low B/M stocks. Similar procedure is followed in creating *RMW* and *CMA*, except for using *RMW* (ratio of operating profit to book equity, sorted from robust to weak), and *CMA* (rate of growth of total assets from year *t*-1 to year *t*, sorted from conservative to aggressive). For *SMB* factor, a similar procedure is followed but using market capitalization to rank stocks from small cap to big cap. *Mean* and *Std Dev* are the mean and standard deviation of the return, and *t-Mean* is ratio of the mean to its standard error.

	<i>Mkt</i>	<i>SMB</i>	<i>HML</i>	<i>RMW</i>	<i>CMA</i>	<i>Mkt</i>	<i>SMB</i>	<i>HML</i>	<i>RMW</i>	<i>CMA</i>
South Africa						China				
<i>Mean</i>	0.08	-1.17	-0.74	0.62	-0.97	-0.08	-0.05	-0.25	0.20	-0.23
<i>Std Dev</i>	1.95	2.79	1.94	2.04	2.18	3.28	2.49	2.35	1.45	1.30
<i>t-Mean</i>	0.80	-7.99	-7.24	5.79	-8.49	-0.45	-0.41	-2.03	2.58	-3.40
India						Malaysia				
<i>Mean</i>	0.03	-0.45	-0.58	0.38	-0.25	-0.02	-0.85	-0.38	0.40	-0.40
<i>Std Dev</i>	2.26	2.29	0.96	0.97	0.51	1.35	2.37	1.08	0.95	0.91
<i>t-Mean</i>	0.24	-3.74	-11.54	7.35	-9.11	-0.24	-6.82	-6.66	7.93	-8.39
South Korea						Indonesia				
<i>Mean</i>	-0.04	-0.21	0.07	0.35	0.21	0.12	-0.40	-0.57	0.45	-0.35
<i>Std Dev</i>	2.08	1.32	1.45	0.96	0.85	2.33	2.17	1.50	1.32	1.33
<i>t-Mean</i>	-0.39	-2.98	0.94	6.87	4.65	0.95	-3.51	-7.18	6.40	-4.98
Australia						Singapore				
<i>Mean</i>	-0.05	-1.83	-0.52	0.94	0.34	-0.08	-1.69	-0.40	0.49	-0.48
<i>Std Dev</i>	1.97	3.83	1.89	1.55	1.42	1.86	6.51	1.98	2.02	2.15
<i>t-Mean</i>	-0.44	-9.08	-5.24	11.53	4.53	-0.87	-4.94	-3.82	4.63	-4.24

Table 4.2 shows correlation matrix for each of the factors at different countries. For South Africa the size factor is negatively correlated with the market. Fama and French (2015) highlighted that because small stocks have a tendency of having higher market betas as compared to big stocks, it is thus justified that the size factor is positively correlated with the market, the opposite is true for South Africa. The value, profitability and investment factors have an insignificant correlation with the market. Similarly insignificant correlations are identified between profitability and

size, investment and both value and profitability. The size factor is positively correlated to the value and the investment factor.

Table 4.2: Correlation between different factors in different countries

Country specific factors are constructed for each of the countries. *Mkt* is market returns less the risk free rate. For the formation of *HML*, stocks at the end of December of year *t* are sorted from low to high based on their book-to-market (B/M) equity. Low B/M stocks are those in the bottom 25% and high B/M stocks are those in the top 75%. The other B/M breakpoint for the countries studied is at 50%. *HML* is the average returns of high B/M stocks minus the average returns of low B/M stocks. Similar procedure is followed in creating *RMW* and *CMA*, except for using *RMW* (ratio of operating profit to book equity, sorted from robust to weak), and *CMA* (rate of growth of total assets, sorted from conservative to aggressive). For *SMB* factor, a similar procedure is followed but using market capitalization to rank stocks from small cap to big cap.

	<i>Mkt</i>	<i>SMB</i>	<i>HML</i>	<i>RMW</i>	<i>CMA</i>		<i>Mkt</i>	<i>SMB</i>	<i>HML</i>	<i>RMW</i>	<i>CMA</i>
South africa						China					
<i>Mkt</i>	1.00					<i>Mkt</i>	1.00				
<i>SMB</i>	-0.43	1.00				<i>SMB</i>	0.13	1.00			
<i>HML</i>	-0.06	0.23	1.00			<i>HML</i>	0.03	-0.62	1.00		
<i>RMW</i>	-0.04	-0.11	-0.26	1.00		<i>RMW</i>	-0.29	-0.86	0.38	1.00	
<i>CMA</i>	0.05	0.33	0.06	-0.24	1.00	<i>CMA</i>	0.09	0.10	0.62	-0.36	1.00
India						Malaysia					
<i>Mkt</i>	1.00					<i>Mkt</i>	1.00				
<i>SMB</i>	-0.75	1.00				<i>SMB</i>	0.01	1.00			
<i>HML</i>	-0.25	0.33	1.00			<i>HML</i>	0.16	0.34	1.00		
<i>RMW</i>	0.65	-0.84	-0.24	1.00		<i>RMW</i>	-0.08	-0.39	-0.36	1.00	
<i>CMA</i>	-0.29	0.33	0.49	-0.35	1.00	<i>CMA</i>	-0.13	0.39	0.26	-0.37	1.00
South Korea						Indonesia					
<i>Mkt</i>	1.00					<i>Mkt</i>	1.00				
<i>SMB</i>	-0.11	1.00				<i>SMB</i>	-0.31	1.00			
<i>HML</i>	0.01	-0.11	1.00			<i>HML</i>	0.06	0.56	1.00		
<i>RMW</i>	-0.23	-0.61	0.25	1.00		<i>RMW</i>	0.36	-0.49	-0.35	1.00	
<i>CMA</i>	-0.20	-0.28	-0.55	0.30	1.00	<i>CMA</i>	-0.14	0.43	0.32	-0.21	1.00
Australia						Singapore					
<i>Mkt</i>	1.00					<i>Mkt</i>	1.00				
<i>SMB</i>	-0.03	1.00				<i>SMB</i>	0.11	1.00			
<i>HML</i>	0.15	0.27	1.00			<i>HML</i>	0.18	0.16	1.00		
<i>RMW</i>	-0.19	-0.40	-0.21	1.00		<i>RMW</i>	-0.13	-0.34	-0.23	1.00	
<i>CMA</i>	-0.07	-0.19	-0.33	0.04	1.00	<i>CMA</i>	0.09	0.31	0.17	-0.38	1.00

China's excess market returns are positively correlated to the size factor while being negatively correlated to the profitability factor, and with no significant correlation to the value and investment factor. The size factor has a negative correlation with both the value and the profitability factor, and a positive correlation with the investment factor. Profitability and investment factors are positively correlated with the value factor. It is rather surprising that the correlation between investment and profitability is negative because expectations are that the higher the profit the more the company would re-invest, but this is not the case.

India's excess market returns are negatively correlated to the size, value, and investment factor, and are positively correlated with the profitability factor. The size factor has a positive correlation with the value and investment factor, and a negative correlation with the profitability factor. Overall this highlights that value firms are characterised by their large market capitalisation and growth firms by their small market capitalisation. The profitability factor is negatively correlated with value and investment factor, whilst between the value and investment factor, there is a negative correlation.

Malaysia's excess market returns are showing low to insignificant correlations with all the other factors. Negative correlations are seen between profitability and size, value, factors, and investment factor. The size factor is positively correlated to the value and investment factor, whilst being negatively correlated to the profitability factor. There is a positive correlation between the investment factor and the value factor.

There are low correlations between the excess market returns in South Korea and the other factors, -0.23 to 0.01. The size factor is negatively correlated to all the other factors. The value factor is negatively correlated to the investment factor whilst profitability is positively correlated with both value and investment factor.

Indonesia's excess market returns are negatively correlated to the size and investment factor, and positively correlated to the profitability factor. The size, value and investment factors are negatively correlated with the profitability factor. The value and investment factors are positively correlated with the size factor, and similarly between the investment and value factors.

For selected developed markets, Australia and Singapore's excess market returns exhibit low correlations with the other factors, -0.19 to 0.15 for Australia and -0.13 to 0.18 for Singapore. In both the markets, there is a positive correlation between size and value factor, and a negative correlation between size and profitability. Australia's investment factor is negatively correlated to the size and value factor, whereas for Singapore the correlations are positive. Lastly, Australia's and Singapore's profitability factor is negatively correlated to the value factor, similar correlation for the profitability and investment factor in Singapore, whereas in Australia, these correlations are insignificant.

Correlations for each of the five factors are shown in Table 4.3. Similar to Fama and French (2016), overall the market factors are the most correlated. The highest correlation is between Australia and South Africa (0.71). The correlation between developed countries, Singapore and Australia is 0.65 and the highest for developing countries is 0.62, between South Korea and India. The market factor for Singapore is positively correlated with all the other countries' market factor, 0.07 to 0.65. The market factors that are negatively correlated are low or can be considered insignificant, -0.14 to -0.01. The market factor correlation of South Africa with China, Malaysia, Indonesia and Singapore is low, 0.28 to 0.59. The market correlations between Indonesia, Malaysia, Australia and Singapore are in the regions of 0.46 to 0.65.

The correlation coefficients for the remaining factors is relatively low as compared to the correlation coefficient of the market factors. For the size factor, -0.14 to 0.17, value factor, -0.09 to 0.24, profitability factor, -0.11 to 0.16, and the investment factor, -0.11 to 0.15.

Table 4.3: Correlation matrices for the same factor in different countries

Country specific factors are constructed for each of the countries. *Mkt* is market returns less the risk free rate. For the formation of *HML*, stocks at the end of December of year *t* are sorted from low to high based on their book-to-market (B/M) equity. Low B/M stocks are those in the bottom 25% and high B/M stocks are those in the top 75%. The other B/M breakpoint for the countries studied is at 50%. *HML* is the average returns of high B/M stocks minus the average returns of low B/M stocks. Similar procedure is followed in creating *RMW* and *CMA*, except for using *RMW* (ratio of operating profit to book equity, sorted from robust to weak), and *CMA* (rate of growth of total assets, sorted from conservative to aggressive). For *SMB* factor, a similar procedure is followed but using market capitalization to rank stocks from small cap to big cap.

	South Africa	China	India	Malaysia	South Korea	Indonesia	Australia	Singapore
<i>Mkt</i>								
South Africa	1.00							
China	0.28	1.00						
India	-0.02	-0.01	1.00					
Malaysia	0.42	0.13	0.04	1.00				
South Korea	-0.01	0.02	0.62	-0.01	1.00			
Indonesia	0.45	0.16	0.09	0.56	-0.02	1.00		
Australia	0.71	0.26	-0.06	0.46	-0.14	0.47	1.00	
Singapore	0.59	0.35	0.12	0.57	0.07	0.57	0.65	1.00
<i>SMB</i>								
South Africa	1.00							
China	0.04	1.00						
India	0.01	-0.01	1.00					
Malaysia	0.03	0.12	-0.10	1.00				
South Korea	0.04	0.07	0.00	0.12	1.00			
Indonesia	-0.01	0.03	0.08	-0.01	0.06	1.00		
Australia	0.00	-0.07	-0.08	0.09	0.04	0.02	1.00	
Singapore	0.00	0.06	-0.14	0.16	0.02	-0.02	0.17	1.00
<i>HML</i>								
South Africa	1.00							
China	0.01	1.00						
India	0.06	0.00	1.00					
Malaysia	0.05	-0.01	-0.01	1.00				
South Korea	0.03	-0.01	0.05	0.06	1.00			
Indonesia	0.04	0.06	0.03	0.13	0.08	1.00		
Australia	0.11	0.10	0.00	0.14	0.13	0.24	1.00	
Singapore	0.11	-0.09	-0.07	0.13	0.14	0.08	0.15	1.00

Table 4.3 (continued)

	South Africa	China	India	Malaysia	South Korea	Indonesia	Australia	Singapore
<i>RMW</i>								
South Africa	1.00							
China	0.15	1.00						
India	0.02	0.01	1.00					
Malaysia	0.01	0.10	-0.03	1.00				
South Korea	0.06	0.00	-0.07	0.03	1.00			
Indonesia	0.01	0.05	0.05	-0.04	-0.05	1.00		
Australia	0.16	0.11	-0.05	0.03	0.05	-0.11	1.00	
Singapore	0.12	-0.02	-0.08	0.08	0.09	0.08	0.13	1.00
<i>CMA</i>								
South Africa	1.00							
China	0.05	1.00						
India	0.12	0.02	1.00					
Malaysia	0.13	0.02	0.12	1.00				
South Korea	0.05	-0.07	-0.11	0.09	1.00			
Indonesia	0.05	0.05	0.07	0.13	-0.02	1.00		
Australia	0.02	-0.05	0.03	-0.01	0.06	-0.06	1.00	
Singapore	0.15	0.04	0.04	0.01	-0.03	0.01	-0.06	1.00

Examination is conducted of size, value, profitability, and investment patterns in average weekly returns in excess of the risk free rate. Stocks are divided equally into four size groups ranging from small to big according to their market cap of the fiscal year ending in year $t - 1$. Furthermore these stocks are independently divided into four *B/M* groups ranging from low to high based on their book-to-market equity ratio of the fiscal year ending in year $t - 1$. The intersections of these two sorts creates 16 portfolios which will be referred to as *Size-B/M* portfolios. A similar process is followed in developing *Size-OP* and *Size-Inv* portfolios but using profitability and investment respectively, instead of using *B/M*. These portfolios were used to evaluate the performance of the five-factor model across the different regions.

Table 4.4 shows average excess returns for the *Size-B/M* portfolios. There is no relation between size and average returns for all the *B/M* quartiles for South Africa. The average returns decrease from growth stocks (low *B/M*) to value stocks (high *B/M*) for all the size quartiles except for the first quartile, which consists of portfolio of

small cap stocks. The spread in average returns is largest for portfolios consisting of big stocks (0.84% per week).

China's average returns are consistently falling from growth stocks to value stocks with the spread in average returns of 0.21% per week for small stocks and 0.28% for big stocks. Except for the high B/M quartile, the relation between size and average returns is not that significant. India's size effect is present for low B/M stocks, with average returns increasing from small stocks (-0.67%) to big stocks (0.05%). Comparatively, the second B/M quartile also has average returns increasing with size (-0.56% to -0.25% per week) though not as large as those of Low B/M quartile. Average returns decline with increase in B/M for all portfolio sizes except for the portfolio containing small cap stocks.

Malaysia's average returns increase with size only for portfolios consisting of low B/M stocks (-0.74% to 0.06%). For *Size* quartiles, average returns are decreasing for third quartile and big stocks. In South Korea, there is a weak presence of size and value effect for almost all the *Size-B/M* portfolio ranges. Only low B/M portfolios have average returns increasing with size, whereas for the *Size* quartiles, average returns increase with B/M for second quartile and decrease with B/M for big stocks. The first two columns for Indonesia have average returns increasing with size and the last two rows show average returns decreasing with increase in B/M.

Australia's average returns show a consistent increase in average returns from small stocks to big stocks for all the B/M columns, indicative of the strong presence of the size effect. The value effect is only present in the portfolios containing big stocks with average returns decreasing with increase in B/M. For Singapore, average returns are increasing with size for the second and high B/M columns. Average returns are declining for second row and a row of portfolios consisting of big stocks.

Overall the selected markets seem to exhibit a common thread in the portfolios consisting of big stocks. The common thread being that there is a decline in average returns from a portfolio consisting of growth stocks to a portfolio consisting of value stocks. For *Size-BM* portfolios Fama and French (2015) got the opposite for portfolios consisting of big stocks.

Table 4.4: Average monthly percent excess returns for *Size-B/M* portfolios

Average weekly excess returns for the portfolio formed on Size and B/M; January 2010 – November 2016, 361 weeks. Based on the accounting data of December of each year, stocks are allocated four size groups (Small to Big) using the breakpoints. They are further allocated independently to four B/M groups (Low to High) using the breakpoints. The intersection of these two sorts produce 16 value-weight *Size-B/M* portfolios.

	Low B/M	2	3	High B/M	Low B/M	2	3	High B/M
South Africa					China			
Small	-1.44	-0.79	-1.64	-1.23	-0.05	-0.14	-0.21	-0.26
2	-0.05	-0.17	-0.25	-0.68	-0.05	-0.13	-0.21	-0.30
3	-0.07	-0.20	-0.25	-0.48	-0.03	-0.11	-0.20	-0.30
Big	0.00	-0.17	-0.24	-0.84	0.03	-0.05	-0.16	-0.25
India					Malaysia			
Small	-0.67	-0.56	-0.54	-0.67	-0.74	-0.59	-0.56	-0.82
2	-0.46	-0.52	-0.52	-0.76	-0.28	-0.23	-0.20	-0.40
3	-0.22	-0.32	-0.44	-0.73	-0.05	-0.06	-0.19	-0.32
Big	0.05	-0.25	-0.52	-0.88	0.06	-0.08	-0.20	-0.33
South Korea					Indonesia			
Small	-0.81	-0.54	-0.29	-0.32	-0.62	-0.26	-0.26	-0.49
2	-0.58	-0.33	-0.26	-0.20	-0.23	-0.12	-0.26	-0.47
3	-0.36	-0.21	-0.15	-0.21	0.12	0.01	-0.26	-0.33
Big	-0.05	-0.13	-0.16	-0.25	0.24	0.05	-0.21	-0.38
Australia					Singapore			
Small	-2.46	-1.72	-1.75	-2.02	-1.53	-1.29	-0.64	-0.89
2	-1.51	-1.31	-1.14	-1.36	-0.07	-0.27	-0.43	-0.65
3	-0.83	-0.67	-0.64	-0.90	0.02	-0.18	-0.16	-0.59
Big	-0.04	-0.12	-0.23	-0.58	-0.01	-0.11	-0.16	-0.36

Table 4.5 shows average excess returns for the *Size-OP* portfolios. South Africa's average returns increases with size for all OP portfolios. Also there is an increase in average returns with OP for portfolio of stocks in second size quartile. In China, there is not a significant decrease in average returns for low OP with increase in size (-0.23 to -0.30%). Except for the small cap and second size quartile stocks, the size rows show an increase in average returns with OP. For India, average returns in column three and four increase with size of stocks in a portfolio. The average returns of portfolios with big stocks increase with OP.

Table 4.5: Average monthly percent excess returns for *Size-OP* portfolios

Average weekly excess returns for the portfolio formed on Size and OP; January 2010 – November 2016, 361 weeks. Based on the accounting data of December of each year, stocks are allocated four size groups (Small to Big) using the breakpoints. They are further allocated independently to four OP groups (Low to High) using the breakpoints. The intersection of these two sorts produce 16 value-weight *Size-OP* portfolios.

	Low OP	2	3	High OP	Low OP	2	3	High OP
South Africa					China			
Small	-1.82	-0.58	-0.76	-1.38	-0.23	-0.17	-0.07	-0.08
2	-0.55	-0.38	-0.18	-0.16	-0.26	-0.22	-0.11	-0.11
3	-0.43	-0.20	-0.21	-0.15	-0.27	-0.18	-0.14	-0.09
Big	-0.40	-0.16	-0.05	-0.10	-0.30	-0.19	-0.13	-0.06
India					Malaysia			
Small	-0.65	-0.57	-0.58	-0.62	-0.63	-0.53	-0.42	-0.86
2	-0.66	-0.69	-0.48	-0.55	-0.43	-0.28	-0.14	-0.20
3	-0.60	-0.43	-0.26	-0.28	-0.33	-0.18	-0.15	0.01
Big	-0.48	-0.35	-0.11	-0.01	-0.32	-0.18	-0.07	0.07
South Korea					Indonesia			
Small	-0.56	-0.32	-0.25	-0.52	-0.53	-0.31	-0.37	-0.55
2	-0.50	-0.24	-0.24	-0.23	-0.58	-0.30	-0.15	-0.06
3	-0.42	-0.22	-0.20	-0.11	-0.32	-0.04	-0.08	0.05
Big	-0.42	-0.20	-0.15	-0.04	-0.13	-0.04	0.01	0.14
Australia					Singapore			
Small	-2.22	-1.77	-1.77	-2.47	-1.05	-0.89	-0.74	-1.32
2	-1.59	-1.31	-0.94	-1.14	-0.85	-0.30	-0.11	-0.24
3	-1.05	-0.99	-0.56	-0.47	-0.60	-0.16	-0.16	-0.09
Big	-0.66	-0.47	-0.18	-0.02	-0.43	-0.15	-0.11	0.04

Row three and four of Malaysia have average returns increasing with OP. For portfolios consisting of low OP and high OP, average returns increase with size. South Korea's average returns for all OP portfolios excluding low OP portfolios, increase with size, though for the second and third column the spreads are small, 0.12% and 0.10% respectively. Average returns are increasing from low OP to high OP for the last two size rows. Portfolios formed from Indonesia's market have average returns increasing with OP for size row two and big stocks. All the OP columns except for second quartile OP columns have average returns consistently increasing with size.

Australia's OP columns have average returns increasing with size, indicating the presence of the size effect in the portfolios. Size row three and four have average returns increasing with OP. For Singapore, portfolios formed with low OP and those formed with high OP stocks have average returns significantly increasing with size. Only portfolios of big stocks have average returns consistently increasing with OP.

Table 4.6 shows average excess returns for the *Size-Inv* portfolios. Portfolios developed in South Africa's market show that there is an increase in average returns with size for low Investment, third quartile Investment and high investment portfolios. The second and third size quartiles have average returns increasing with level of Investment. China's average returns decrease with increase in size for low Investment and high Investment portfolios, though the spreads are small, 0.10% and 0.05% per week respectively. There is an increase in average returns with Investment for all size rows. The Investment columns in India show an increase in average returns with size except for the portfolios consisting of low Investment stocks. Third size quartile and the big stock portfolios have average returns increasing with level of investment.

Malaysia's average returns increase with size for all Investment columns, indicative of the presence of the investment effect. The average returns increase with Investment for portfolios consisting of big stocks. South Korea's average returns increase with size for low Investment and second Investment quartile column. There is a decrease in average returns with increasing Investment for portfolios of big stocks. For Indonesia, there is an increase in average returns with size for all Investment columns except for high investment portfolios. Average returns consistently increase with Investment for small cap stocks.

Furthermore, there is an increase in average returns with size for all Investment columns for Australia. However no obvious relation between average returns and Investment for all size rows. In Singapore, there is an increase in average returns with size for all Investment columns except for the portfolio of high Inv stocks. Increase in average returns with Investment can only be identified in the second size quartile.

Table 4.6: Average monthly percent excess returns for *Size-Inv* portfolios

Average weekly excess returns for the portfolio formed on Size and Inv; January 2010 – November 2016, 361 weeks. Based on the accounting data of December of each year, stocks are allocated four size groups (Small to Big) using the breakpoints. They are further allocated independently to four Inv groups (Low to High) using the breakpoints. The intersection of these two sorts produce 16 value-weight *Size-Inv* portfolios.

	Low Inv	2	3	High Inv	Low Inv	2	3	High Inv
South Africa					China			
Small	-1.72	-1.15	-0.44	-0.59	-0.22	-0.19	-0.13	0.02
2	-0.51	-0.41	-0.28	-0.16	-0.26	-0.20	-0.19	-0.02
3	-0.46	-0.22	-0.15	-0.12	-0.26	-0.22	-0.15	-0.05
Big	-0.20	-0.38	-0.11	0.08	-0.32	-0.17	-0.12	-0.03
India					Malaysia			
Small	-0.66	-0.59	-0.50	-0.60	-0.88	-0.46	-0.58	-0.52
2	-0.66	-0.57	-0.53	-0.61	-0.42	-0.19	-0.16	-0.31
3	-0.52	-0.40	-0.36	-0.31	-0.31	-0.17	-0.08	-0.09
Big	-0.38	-0.30	-0.11	-0.03	-0.25	-0.09	-0.08	0.02
South Korea					Indonesia			
Small	-0.53	-0.34	-0.25	-0.57	-0.51	-0.47	-0.40	-0.23
2	-0.31	-0.22	-0.26	-0.45	-0.55	-0.28	-0.30	-0.11
3	-0.30	-0.19	-0.18	-0.31	-0.19	-0.21	0.04	-0.12
Big	-0.07	-0.04	-0.16	-0.40	0.05	0.01	0.06	0.08
Australia					Singapore			
Small	-2.35	-1.95	-1.93	-2.09	-1.05	-0.92	-0.82	-1.13
2	-1.74	-1.15	-1.06	-1.38	-0.81	-0.39	-0.31	-0.03
3	-1.03	-0.56	-0.68	-0.81	-0.37	-0.21	-0.16	-0.23
Big	-0.11	-0.08	-0.26	-0.69	-0.20	-0.10	-0.11	-0.09

4.2 Model performance

Tests are carried out to determine how well the five factors explain the average excess returns on the different portfolios. The model's performance is evaluated based on the intercept generated from the regression equation (1). If the model explains the expected excess returns, then the intercepts generated should jointly be indistinguishable from zero. The GRS statistic, which follows an F distribution, tests this hypothesis for different sets of portfolios in different regions. The low values for the GRS test are indicative of the effectiveness of the model in explaining the variations of excess returns of the portfolios.

Further, the other statistics used to evaluate the performance of the model across regions include the average absolute intercept, $A|a_i|$. This statistic measures how the generated intercepts which are regarded as the unexplained part of the portfolios average returns, are dispersed relative to the dispersion of the actual average excess portfolio returns. $Aa_i^2/A\bar{r}_i^2$ is a ratio that focuses on the intercept dispersion relative to the dispersion of average portfolio excess returns. Aa_i^2 is the average squared intercept and $A\bar{r}_i^2$ is the average squared value of the difference between average portfolio returns and the average excess market returns. $As^2(a_i)/Aa_i^2$ estimates the proportion of dispersed intercepts that are due to sampling error, whereby $As^2(a_i)$ is the average of the squared standard errors of the intercept (a_i).

Table 4.7 shows that the variations in South Africa's average returns are explained by the five factor model at 1% significant level for *Size-B/M*, 5% significant level for *Size-OP*, and does not explain average returns for *Size-Inv* portfolios. The results of $Aa_i^2/A\bar{r}_i^2$ for different portfolio sorts range from 0.51 to 0.59. In units of squared returns the model leaves 51% to 59% of the dispersion of average returns unexplained. $As^2(a_i)/Aa_i^2 = 0.14$ for all portfolio sorts suggests that 14% of the unexplained dispersion of average returns is sampling error. South Africa had the smallest number of listed firms (and therefore sample size) in the sample.

The variation in China's average returns for *Size-B/M* and *Size-Inv* portfolios are explained by the five factor model at high significance level. The GRS test is not rejected at 1% significance level for *Size-OP* portfolios. $Aa_i^2/A\bar{r}_i^2$ ranges from 1.36 to 1.57 indicating that the model's intercept are more dispersed than the average returns. For all the portfolio sorts, $As^2(a_i)/Aa_i^2$ indicates that 18% of the dispersion of the intercepts is sampling error and the rest is the dispersion of the true intercepts. China is amongst the countries that had a large sample size which can explain its relatively small sampling error.

For India's portfolios, the average returns for *Size-B/M* portfolios are explained by the model at 1% significance level. The *Size-OP* and *Size-Inv* portfolios have GRS test values of 1.52 and 1.57 respectively, both with p-value greater than 0.05 indicating that the intercepts are indistinguishable from zero at 5% significance level. $Aa_i^2/A\bar{r}_i^2$ range of 0.10 to 0.12 indicates that 10% to 12% of the dispersion of

intercepts is not explained by the model. The dispersion of the intercepts relative to portfolio returns is low highlighting the effectiveness of the model though at low significant levels. 26% to 37% of the dispersion of intercepts is due to sampling error and not the dispersion of the true intercepts.

Malaysia's GRS test results show that the five-factor model is not rejected for *Size-OP* portfolios, and not rejected for *Size-B/M* and *Size-Inv* portfolios at 1% significant level. The model leaves 21% to 29% of the dispersion of average portfolio returns unexplained, and 34% to 43% of the unexplained dispersion of average portfolio returns being sampling error.

South Korea and Australia reject the five-factor for all portfolio sorts as indicated by $p\text{-value} = 0.00$. The countries produced relatively low dispersion of average portfolio returns that are unexplained by the five-factor model (14% to 15% for South Korea; 7% to 10% for Australia). South Korea has larger values for $As^2(a_i)/Aa_i^2$ as compared to Australia suggesting that for South Korea, there is a higher probability that chance is the reason the GRS test is rejected for the different portfolio sorts.

For Indonesia, the five-factor model is not rejected for *Size-OP* and *Size-Inv* portfolios as indicated by the GRS test values of 1.40 and 1.33 respectively. This emphasizes the effectiveness of the five-factor model in explaining the variations in average returns of these portfolio sorts for the country. The country has low levels of intercept dispersion relative to the average portfolio returns for these two portfolio sorts, 0.14 for *Size-OP* and 0.17 for *Size-Inv* portfolios. For *Size-OP* and *Size-Inv* portfolio sorts, 58% and 65% of the unexplained dispersion of average returns is sampling error respectively. The model is inefficient in explaining the variations in average returns for *Size-B/M* portfolios. In support of the model's inefficiencies, the relatively higher dispersion of intercept unexplained (29%) and the low percentage of dispersion of intercepts (35%) are due to sampling error.

Singapore does not reject the five-factor model for *Size-B/M* portfolios at 1% significant level and *Size-Inv* portfolios at 5% significance level. The five-factor model fails to explain the variation in average returns for *Size-OP* portfolios. The ratio of unexplained dispersion of average portfolio returns relative to the dispersion of average portfolio returns range from 12% to 16%. Sampling error accounts for 46% and 75% respectively of dispersion of intercepts at 1% and 5% significance levels.

Table 4.7: Summary statistics for the five factor model in different countries

The table shows the test result of the five-factor model in explaining average excess returns across different countries for *Size-BM*, *Size-OP*, and *Size-Inv* portfolios. The *GRS* statistic and the p-value, $p(GRS)$, tests whether the expected of all 16 intercept estimates in the regressions for country are zero. Furthermore, what is determined in evaluating the performance of the model are, the average absolute value of the intercepts $A|a_i|$, $Aa_i^2 / A\bar{r}_i^2$, the average squared value of the intercepts over the average square of $\bar{r}_i$, which is the average return on portfolio i , minus the average value-weight market portfolio return. $As^2(a_i) / Aa_i^2$, the average of the estimates of the variances of the sampling errors of the estimated intercepts over the average squared values of intercepts.

	<i>GRS</i>	$p(GRS)$	$A a_i $	$\frac{Aa_i^2}{A\bar{r}_i^2}$	$\frac{As^2(a_i)}{Aa_i^2}$
<i>Size-B/M Portfolios</i>					
South Africa	1.79	0.03	0.54	0.52	0.14
China	1.05	0.40	0.16	1.37	0.18
India	1.87	0.02	0.19	0.12	0.26
Malaysia	1.87	0.02	0.16	0.21	0.43
South Korea	2.98	0.00	0.09	0.14	0.72
Indonesia	2.23	0.00	0.15	0.29	0.35
Australia	5.25	0.00	0.25	0.07	0.26
Singapore	2.04	0.01	0.13	0.16	0.46
<i>Size-OP Portfolios</i>					
South Africa	1.67	0.05	0.51	0.51	0.14
China	1.80	0.03	0.15	1.57	0.18
India	1.52	0.09	0.16	0.10	0.37
Malaysia	1.50	0.10	0.18	0.29	0.34
South Korea	2.38	0.00	0.06	0.15	0.81
Indonesia	1.40	0.14	0.10	0.17	0.58
Australia	5.07	0.00	0.29	0.11	0.17
Singapore	2.74	0.00	0.14	0.16	0.40
<i>Size-Inv Portfolios</i>					
South Africa	2.55	0.00	0.49	0.59	0.14
China	1.35	0.16	0.15	1.36	0.18
India	1.57	0.07	0.16	0.10	0.37
Malaysia	1.71	0.04	0.17	0.27	0.34
South Korea	2.46	0.00	0.07	0.14	0.89
Indonesia	1.33	0.18	0.12	0.14	0.65
Australia	7.25	0.00	0.32	0.10	0.17
Singapore	1.59	0.07	0.12	0.12	0.70

4.3 Factor spanning tests

From the factor spanning tests Fama and French (2015) identified *HML* as their redundant factor in explaining United States (US) average returns for their chosen period. Fama and French (2016) further carried out the tests for a different time period for North America (NA), Europe, Japan and Asia Pacific (AP). Mixed results were obtained except for NA where they found that all five factors are important in describing average returns in that region.

Table 4.8 shows the regressions for the factor spanning tests whereby the four factors explain returns on the fifth factor. For these regressions, interest lies in the intercept, that is, if the intercept for any of the factor regression is significant, then that factor is not explained by the other four factors in a five factor model. *Mkt* is redundant in all the countries except for India and South Korea, with regression intercept of -0.35% per week ($t = -3.50$) and 0.24% per week ($t = 2.27$) respectively.

The size factor, *SMB*, is important for describing average returns in South Africa, India, Indonesia, South Korea, Australia and Singapore. The intercept in the *SMB* regression for South Africa (-0.50%, $t = -3.58$), Australia (-0.66%, $t = -3.07$) and Singapore (-0.91%, $t = -2.75$) are strongly negative contributing to the average *SMB* returns (Table 4.1). *SMB* regression intercept for India (0.22%, $t = 3.13$), South Korea (0.14%, $t = 2.44$), and Indonesia (0.25%, $t = 2.83$), are positive despite the negative average *SMB* returns (-0.58% per week for India; -0.21% per week for South Korea; -0.40% per week for Indonesia) due to negative *Mkt* and *RMW* slopes.

The value factor, *HML* is important for South Africa, India, Malaysia, Indonesia, and Singapore. The intercepts from the regressions on *HML* are all negative highlighting the average *HML* returns (Table 4.1) being negative across the regions. Surprisingly the intercepts are greater than the average *HML* returns despite the positive slopes for *Mkt* and *SMB* across the regions, which when combined with their respective average factor returns that are below zero might be contributing to the negative returns. For India, the negative intercept contributes significantly to the negative average *HML* returns, whereas for South Africa, Malaysia, Indonesia and Singapore, some of the contributions are from the *RMW* slopes.

The profitability factor, *RMW*, is important for explaining average returns in all the countries except for South Africa and Singapore. The intercepts from the *RMW*

regressions for these countries are positive with a minimum standard error of 3.08 from zero. Similar results from Fama and French (2016) for the regions with significant *RMW* factor, though their standard errors were above 3.95 from zero.

Regression results for the investment factor, *CMA*, show that it is a redundant factor in China and Singapore. The intercept from *CMA* regression is positive for South Korea (0.11%, $t = 3.29$) and Australia (0.20%, $t = 2.35$) and is negative for South Africa (-0.54%, $t = -4.52$), India (-0.06%, $t = -2.17$), Malaysia (-0.19%, $t = -4.08$) and Indonesia (-0.20%, $t = -2.87$).

In summary, all the four factors added to the traditional CAPM are important in describing average returns depending on the country. *Mkt* is the redundant factor in all the countries studied except for India and South Korea, which is surprising for other countries considering the foundation of the five-factor model is the CAPM. The factor spanning tests results varies across regions, for South Africa, much of the average returns are captured by *HML* and *CMA*, then followed by *SMB*, with partial contribution from *RMW*. In China, the major contributor is *RMW*, *SMB* provides supports. For India all the factors are important in explaining the average returns, similar to NA in Fama and French (2016).

Furthermore, much of the average returns in Malaysia are described by *HML*, *RMW*, and *CMA*, and *SMB* perhaps providing some assistance. South Korea the only redundant factor is *HML*, similar to Fama and French (2015). Indonesia has all the factors excluding *Mkt* explaining average returns and for Australia, the major contributors to average returns are *SMB*, *RMW*, and *CMA*. Singapore's main contributors to average returns are *SMB*, then *HML* with *RMW* and *CMA* assisting. The performance of the five factor model is further examined in the section that follows.

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Table 4.8: Using four factors in regressions to explain average returns on the fifth

Mkt is market returns of a country minus the risk free rate. *SMB* (small minus big) is the size factor; *HML* (high minus low B/M) is the value factor; *RMW* (robust minus weak OP) is the profitability factor; and *CMA* (conservative minus aggressive Inv) is the investment factor. The factors are constructed using independent sorts of two *Size* groups, two *B/M* groups (*HML*), two *OP* groups (*RMW*), or two *Inv* groups (*CMA*).

	Coefficient						t-statistic						
	Int	Mkt	SMB	HML	RMW	CMA	Int	Mkt	SMB	HML	RMW	CMA	R ²
South Africa													
Mkt	-0.11		-0.36	0.04	-0.03	0.19	-0.99		-10.13	0.77	-0.71	4.18	0.23
SMB	-0.50	-0.62		0.26	0.00	0.44	-3.58	-10.13		4.15	0.00	7.81	0.35
HML	-0.47	0.04	0.17		-0.23	-0.08	-4.19	0.77	4.15		-4.78	-1.53	0.11
RMW	0.23	-0.04	0.00	-0.26		-0.21	1.96	-0.71	0.00	-4.78		-4.05	0.12
CMA	-0.54	0.25	0.33	-0.09	-0.21		-4.52	4.18	7.81	-1.53	-4.05		0.20
China													
Mkt	0.19		-0.30	0.91	-2.19	-1.61	1.20		-1.80	4.87	-8.42	-5.55	0.21
SMB	0.10	-0.03		-0.60	-0.97	0.49	1.96	-1.80		-11.66	-13.24	5.38	0.86
HML	-0.03	0.07	-0.47		0.42	1.37	-0.78	4.87	-11.66		5.56	33.96	0.88
RMW	0.10	-0.08	-0.34	0.19		-0.53	3.26	-8.42	-13.24	5.56		-10.90	0.86
CMA	0.01	-0.05	0.16	0.56	-0.48		0.21	-5.55	5.38	33.96	-10.90		0.84
India													
Mkt	-0.35		-0.70	0.07	0.09	-0.27	-3.50		-10.70	0.71	0.58	-1.45	0.57
SMB	0.22	-0.35		0.29	-1.42	-0.19	3.13	-10.70		4.40	-18.58	-1.48	0.79
HML	-0.38	0.02	0.18		0.23	0.84	-7.57	0.71	4.40		2.86	9.34	0.29
RMW	0.22	0.01	-0.35	0.10		-0.23	6.66	0.58	-18.58	2.86		-3.69	0.72
CMA	-0.06	-0.02	-0.03	0.24	-0.16		-2.17	-1.45	-1.48	9.34	-3.69		0.30

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Table 4.8 (continued)

	Coefficient						t-statistic						
	Int	Mkt	SMB	HML	RMW	CMA	Int	Mkt	SMB	HML	RMW	CMA	R ²
Malaysia													
Mkt	0.00		-0.01	0.24	-0.13	-0.30	-0.05		-0.16	3.33	-1.52	-3.56	0.06
SMB	-0.20	-0.01		0.43	-0.57	0.65	-1.63	-0.16		3.85	-4.40	4.94	0.25
HML	-0.14	0.13	0.09		-0.25	0.14	-2.41	3.33	3.85		-4.14	2.27	0.21
RMW	0.15	-0.05	-0.09	-0.18		-0.24	3.08	-1.52	-4.40	-4.14		-4.58	0.25
CMA	-0.19	-0.11	0.10	0.10	-0.23		-4.08	-3.56	4.94	2.27	-4.58		0.24
South Korea													
Mkt	0.24		-0.66	-0.09	-0.85	-0.58	2.27		-6.90	-0.95	-5.81	-3.46	0.18
SMB	0.14	-0.18		-0.05	-0.82	-0.29	2.44	-6.90		-1.00	-12.35	-3.34	0.45
HML	0.09	-0.03	-0.06		0.64	-1.20	1.46	-0.95	-1.00		8.21	-17.18	0.49
RMW	0.17	-0.10	-0.36	0.25		0.37	4.80	-5.81	-12.35	8.21		6.56	0.54
CMA	0.11	-0.06	-0.10	-0.38	0.29		3.29	-3.46	-3.34	-17.18	6.56		0.53
Indonesia													
Mkt	0.02		-0.37	0.58	0.54	-0.08	0.20		-5.53	6.60	5.78	-0.89	0.25
SMB	0.25	-0.21		0.62	-0.35	0.35	2.83	-5.53		9.99	-4.85	5.37	0.51
HML	-0.32	0.19	0.36		-0.20	0.12	-4.74	6.60	9.99		-3.64	2.29	0.40
RMW	0.26	0.16	-0.18	-0.18		0.02	4.12	5.78	-4.85	-3.64		0.41	0.31
CMA	-0.20	-0.03	0.21	0.12	0.02		-2.87	-0.89	5.37	2.29	0.41		0.20

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Table 4.8 (continued)

	Coefficient						t-statistic						R ²
	Int	Mkt	SMB	HML	RMW	CMA	Int	Mkt	SMB	HML	RMW	CMA	
Australia													
Mkt	0.17		-0.08	0.14	-0.29	-0.07	1.40		-2.85	2.38	-4.08	-0.94	0.07
SMB	-0.66	-0.27		0.34	-0.95	-0.35	-3.07	-2.85		3.26	-7.95	-2.61	0.23
HML	-0.11	0.11	0.09		-0.13	-0.37	-1.01	2.38	3.26		-1.93	-5.72	0.18
RMW	0.63	-0.15	-0.16	-0.08		-0.09	7.69	-4.08	-7.95	-1.93		-1.62	0.21
CMA	0.20	-0.04	-0.05	-0.23	-0.08		2.35	-0.94	-2.61	-5.72	-1.62		0.13
Singapore													
Mkt	0.04		0.02	0.14	-0.07	0.02	0.38		1.03	2.71	-1.24	0.34	0.04
SMB	-0.91	0.18		0.21	-0.79	0.63	-2.75	1.03		1.27	-4.55	3.92	0.16
HML	-0.24	0.15	0.02		-0.16	0.06	-2.26	2.71	1.27		-2.91	1.24	0.09
RMW	0.18	-0.06	-0.07	-0.14		-0.26	1.87	-1.24	-4.55	-2.91		-5.66	0.23
CMA	-0.18	0.02	0.07	0.07	-0.31		-1.70	0.34	3.92	1.24	-5.66		0.19

4.4 Regressions

The performance of the model is further examined by observing the intercepts and the slope of the factors. The regression details are acquired from equation (1) for the 16 *Size-B/M*, the 16 *Size-OP*, and the 16 *Size-Inv* portfolios. For some perspective on the results from the regression, the intercepts, or unexplained average returns for individual portfolios will be examined across the different countries. Table B.1 shows the regression results for the *Size-B/M* portfolios across all regions, Table B.2 for *Size-OP* portfolios, and Table B.3 for *Size-Inv* portfolios.

4.4.1 *Size-B/M* portfolios

For South Africa, the five-factor model is not rejected at 1% significant level for this portfolio sort according to the GRS test (Table 4.7). The intercepts are not close to zero for the portfolios that have an intercept as significant according to the t statistic. Though as indicated by the t statistics for all the portfolios, they are insufficient to support the GRS test to not reject the model in describing variations in excess returns for the 16 *Size-B/M* portfolios. From Table 4.8, the major contributors to the average returns are *SMB*, *HML* and *CMA*. The negative average returns can be explained by the large negative coefficients for *HML* (-3.31, $t = -18.84$) for the smallest cap extreme growth stocks which appears to outweigh the corresponding positive coefficient of *CMA* (1.27, $t = 7.75$).

China's *Size-B/M* portfolios do not reject the five-factor in explaining the variations in returns for the portfolios, this is further supported by the level of significance of the intercepts indicating standard errors are small. *RMW* is the only important factor in describing the variations in returns. Furthermore, firms invest less due to low profitability as indicated by the negative exposure to *RMW*. For smallest cap and biggest cap firms in highest *B/M* (extreme value) quartile, despite the low profitability. Though in South Korea, irrespective of profitability, smallest cap extreme growth firms invest more aggressively than the biggest cap value firms.

For India, greater negative exposure on the intercepts and *SMB* outweighs that of other factors, hence the average returns are below zero (Table 4.4) due to low average factor returns (Table 4.1). This is further highlighted by the fact that according to the factor spanning tests, *HML* factor contributes in explaining variations in returns, and it is accompanied by a large average negative return (-

0.58% per week), followed by the positive *RMW* average return (0.38% per week) which is outweighed by the *HML* factor. The positive exposures to *RMW* and *CMA* suggest that the returns of India's firms are like those of firms that invest low even though profitability is high.

For Malaysia, which the five-factor model is not rejected at 1%, and Australia, the portfolio of biggest cap firms in the lowest *B/M* pose a problem to the five-factor model. The intercept for Malaysia (0.20% per week, $t = 2.43$) and Australia (0.33% per week, $t = 2.86$) are sufficient to reject the model in explaining the variation of returns for the 16 *Size-B/M* portfolios. Singapore's threat to the five-factor model is in portfolio of smallest cap firms with lowest *B/M*. The intercept for this portfolio (-0.77% per week, $t = -3.31$) renders the five-factor model as insignificant in explaining the average returns at higher significance level. Based on the exposures to *RMW* and *CMA*, smallest cap firms in Malaysia invest a lot despite low levels of profitability, similar trend is followed in biggest cap firms in Australia. For Malaysia, it is different for smallest cap value firms, increased level of investment is due to increased profitability.

From the factor spanning tests, Indonesia had the four of the five factors explaining variations in returns, however, the five-factor model is rejected in explaining average returns. This can be seen by the regression intercepts on the extreme growth column, for smallest cap (-0.66% per week, $t = -3.22$) and for second size quartile (-0.44% per week, $t = -2.70$), which are problematic to the five-factor model. A strong size factor similar to average returns in Table 4.4 is seen here as with size the intercepts approach zero for these extreme growth firms.

4.4.2 *Size-OP* portfolios

According to the GRS test, the five-factor model explains variations in returns for *Size-OP* portfolios for Malaysia and Indonesia. The intercepts provide further insight to the GRS test results for Malaysia (Table B.2), though some of the portfolios such as big cap high OP firms are problematic for the five-factor model (0.19% per week, $t = 2.26$). For Indonesia the troublesome portfolio is of smallest cap, highest profitability firms providing the most extreme intercept (-0.52% per week, $t = -3.39$). This portfolio has a strong positive exposure to all the other factors but a moderate exposure to *CMA* (0.22% per week, $t = 1.91$).

The five-factor model explains variations in return for South Africa and India at 5% significance level. The negative intercepts especially for South Africa, contribute significantly to the negative portfolio average returns. Not surprising though that according to the factor spanning tests, *RMW* is a main contributor in explaining the variations in average returns. The five-factor model fails to explain average returns for lowest OP smallest cap and biggest cap firms for India. There is a strong presence of the profitability effect seen by an increase in the coefficients with increase in the level of OP. Low OP firms for India might be the reason for GRS test rejecting the model at 10% significance level.

The GRS tests on the 16 *Size-OP* portfolios show that the five factors perform poorly in explaining the variation in returns for South Korea, Australia and Singapore. The intercepts for these countries for the biggest cap stock portfolios in the highest OP quartile are creating problems for the five-factor model (-0.40% per week, $t = -3.57$ for South Korea; -1.40% per week, $t = -5.33$ for Australia; -0.65% per week, $t = -2.63$ for Singapore).

4.4.3 *Size-Inv* Portfolios

The five factor model explains variations in average returns for China and Indonesia for *Size-Inv* portfolios, according to the GRS test. For further insight, overall for Indonesia, the intercepts generated from the regressions are insignificant whereas for China the intercepts are significant despite the model not being rejected. There is a strong presence of the *CMA* factor of which the slopes vary from positive for lowest *Inv* portfolios to negative for highest *Inv* portfolios as displayed in Table B.3.

For India and Singapore, the five factor model is not rejected at a 5% significance level. For India, five-factor model is inefficient in explaining average returns for biggest cap lowest *Inv* stocks portfolios (-0.23% per week, $t = -2.54$). The troublesome portfolio is that which contains smallest cap stocks in the second quartile *Inv* portfolios which has an intercept of -0.42% per week, $t = -2.22$. Malaysia follows with the model not being rejected at 1% significance level. Portfolio of biggest cap high *Inv* stocks (0.23% per week, $t = 2.50$) seem to be one of the significant contributor to the five-factor model being rejected at higher significance levels.

Strong negative intercepts in Table B.3 show that for South Africa, South Korea and Australia, the five-factor model does an inadequate job in explaining the average

returns in those countries. The five-factor intercepts for smallest cap low Inv (-0.82% per week, $t = -4.78$ for South Africa; -0.34% per week, $t = -2.85$ for South Korea; -1.05% per week, $t = -4.14$ for Australia) are sufficient to reject the five-factor model.

In summary, to say the five-factor model does not explain variations in average returns in certain countries will be a bold statement. As indicated by different portfolio sorts, the model behaves differently as per the GRS test for different portfolio sorts. Therefore types of portfolios play a role in determining the performance of the model and based on the results of the GRS test (Table 4.7), portfolios that performed well overall are the *Size-Inv* portfolios, followed by the *Size-OP* portfolios.

4.5 Tests for diversified portfolios

Tests of the CAPM and the Fama and French (2015) five-factor augmented CAPM, produce more efficient results for portfolios that are more diversified than with the more “restricted” country-specific portfolios (Fama & French, 2016). Thus, in this section, we use two diversified portfolios of stocks from several countries: the Global portfolio, which is a portfolio of stocks of all the countries studied in this research, and the Emerging markets portfolio, which is the portfolio of all the countries excluding developed countries (Australia and Singapore). Table 4.9 *Panel A* shows the summary statistics of the factor returns on the two portfolios. The proxy for the market (*Mkt*) factor is the MSCI World Index for Global portfolios, and Emerging Markets Index for emerging market portfolios. The rationale for using the MSCI emerging market index is that the MSCI world market portfolio is heavily “bent” in favour of Japanese and US stocks with little presence of emerging markets stocks, which makes it probably inappropriate for testing the implications of the CAPM on emerging markets returns.

Table 4.9 reports the descriptive statistics for the two portfolios. Except for the *Mkt* portfolio, the rest of the portfolios have significant means. The MSCI emerging markets portfolio yields a negative average return with greater variability than the MSCI’s positive average return. *Panel B* reports the correlation matrix for the diversified portfolios’ factors. There is a negative correlation between *Mkt* and *SMB*, and *CMA* for both markets, and a positive but small correlation between *Mkt* and *RMW* for emerging markets. A positive correlation can be seen between the *SMB* factor and *HML*, and *CMA*, and a negative correlation between *SMB* and *RMW*.

CMA factor has a positive correlation with *HML* and a negative correlation with *RMW*.

Table 4.9: Factor summary statistics for diversified portfolios

The Global market portfolios consisted of a combination of all the countries studied in this research and Emerging market portfolios consisted of emerging market countries, those excluded Australia and Singapore. Proxy for the market returns (*Mkt*) for the Global market and emerging market is MSCI World Index and MSCI Emerging Markets Index respectively. For portfolio diversification, the stocks were grouped in accordance with their properties in their respective country, that is, a big cap stock in its domestic country was a big cap stock in the global portfolio irrespective of the size of the market cap, *SMB* is the size factors for Global market portfolios or Emerging market portfolios. For the formation of *HML*, similar grouping is formed, stocks at the end of December of year *t* are sorted from low to high based on their book-to-market (B/M) equity in their respective countries. Low B/M stocks are those in the bottom 25% and high B/M stocks are those in the top 75%. The other B/M breakpoint for the countries studied is at 50%. *HML* is the average returns of high B/M stocks minus the average returns of low B/M stocks. Similar procedure is followed in creating *RMW* and *CMA* except for using *RMW* (ratio of operating profit to book equity, sorted from robust to weak), and *CMA* (rate of growth of total assets from year *t*-1 to year *t*, sorted from conservative to aggressive). *Mean* and *Std Dev* are the mean and standard deviation of the return, and *t-Mean* is ratio of the mean to its standard error.

Panel A: Mean, standard deviation and *t-Mean* of factor average returns for diversified portfolio

	<i>Mkt</i>	<i>SMB</i>	<i>HML</i>	<i>RMW</i>	<i>CMA</i>	<i>Mkt</i>	<i>SMB</i>	<i>HML</i>	<i>RMW</i>	<i>CMA</i>
	Global					Emerging				
<i>Mean</i>	0.11	-0.52	-0.36	0.40	-0.10	-0.04	-0.46	-0.33	0.32	-0.18
<i>Std Dev</i>	2.06	1.25	0.77	0.56	0.50	2.60	1.44	0.81	0.63	0.51
<i>t-Mean</i>	0.98	-7.92	-8.95	13.37	-3.75	-0.26	-6.05	-7.82	9.80	-6.88

Panel B: Correlation between different factors for diversified portfolios

	<i>Mkt_G</i>	<i>SMB_G</i>	<i>HML_G</i>	<i>RMW_G</i>	<i>CMA_G</i>	<i>Mkt_E</i>	<i>SMB_E</i>	<i>HML_E</i>	<i>RMW_E</i>	<i>CMA_E</i>
	Global					Emerging				
<i>Mkt</i>	1.00					1.00				
<i>SMB</i>	-0.43	1.00				-0.53	1.00			
<i>HML</i>	0.03	0.19	1.00			0.00	0.22	1.00		
<i>RMW</i>	-0.01	-0.41	-0.19	1.00		0.14	-0.50	-0.09	1.00	
<i>CMA</i>	-0.31	0.23	0.22	-0.39	1.00	-0.27	0.25	0.39	-0.49	1.00

A strong size effect can be seen in Table 4.10 with an increase in average returns for all the portfolio sorts. There is a decrease in average returns from growth stocks to value stocks for third quartile size portfolios for Global, and the big cap portfolios of both Global and Emerging. Third quartile and big cap portfolios of Global and Emerging markets show an increase in average returns with OP. Big cap portfolios show a similar pattern with Inv for Global portfolios.

Table 4.10: Average monthly percent excess returns for diversified portfolios

Panel A, B and C show average weekly excess returns for the portfolios of the three 4x4 sorts, January 2010 – November 2016, 361 weeks. Based on the accounting data of December of each year, stocks are allocated to 16 Size-B/M portfolios for Global markets and Emerging markets. The four size groups (Small to Big) are created using the 25th, 50th, and 75th percentile of market cap as breakpoints. They are further allocated independently to four B/M groups (Low to High) using these breakpoints. The intersection of these two sorts produces 16 value-weight *Size-B/M* portfolios. The 16 *Size-OP* and *Size-Inv* portfolios are formed in the same way except that the second sort is on *OP* (profitability) or *Inv* (investment).

	Low	2	3	High	Low	2	3	High
	Global				Emerging			
Panel A: Size-B/M portfolios								
Small	-0.63	-0.46	-0.46	-0.68	-2.46	-1.72	-1.75	-2.02
2	-0.39	-0.34	-0.34	-0.51	-1.51	-1.31	-1.14	-1.36
3	-0.16	-0.18	-0.24	-0.41	-0.83	-0.67	-0.64	-0.90
Big	0.11	-0.07	-0.17	-0.25	-0.04	-0.12	-0.23	-0.58
Panel B: Size-OP portfolios								
Small	-0.64	-0.47	-0.36	-0.82	-2.22	-1.77	-1.77	-2.47
2	-0.55	-0.43	-0.23	-0.27	-1.59	-1.31	-0.94	-1.14
3	-0.42	-0.27	-0.16	-0.10	-1.05	-0.99	-0.56	-0.47
Big	-0.32	-0.17	-0.04	0.07	-0.66	-0.47	-0.18	-0.02
Panel C: Size-Inv portfolios								
Small	-0.59	-0.47	-0.51	-0.84	-2.35	-1.95	-1.93	-2.09
2	-0.53	-0.32	-0.33	-0.45	-1.74	-1.15	-1.06	-1.38
3	-0.38	-0.22	-0.18	-0.18	-1.03	-0.56	-0.68	-0.81
Big	-0.14	-0.06	-0.04	0.00	-0.11	-0.08	-0.26	-0.69

The empirical results are reported in Table 4.10. Since the difference in the number of countries used between the portfolios is small, not much difference is witnessed

between the statistics of the two diversified portfolios. The average *Mkt* factor return is positive for the Global portfolio (0.11% per week) and negative for the Emerging markets portfolio (-0.04% per week). The *SMB* factor average returns are the lowest (-0.52% per week for Global, -0.46% per week for Emerging) with highest average returns from the *RMW* factor (0.40% per week for Global, 0.32% per week for Emerging).

Fama and French (2012) make an alteration from the Fama and French (1993) three-factor model consisting of country specific factors to a model consisting of global factors to explain the returns in North America, Europe, Japan and Asia Pacific. Based on their results, the global version of the three-factor model is rejected in explaining regional expected returns. Fama and French (2016) test the global version of Fama and French (2015) five-factor model on the same regions. The global five-factor model proved to be inefficient in explaining regional expected returns.

Table 4.11 gives GRS test results of the performance of the Global five-factor model and the Emerging market five-factor model on their respective portfolios. Further GRS test results are displayed for the performance of the emerging market five-factor model in explaining each developing country's expected portfolio returns. Fama and French (2016) highlight that lack of global integration of the markets is the reason the Global five factors fail to explain returns of Global and regional portfolios. A similar situation is witnessed here with the Global five-factor model failing to explain expected returns of Global portfolios for all portfolio sorts in the results in Table 4.11.

Although Fama and French (2016) portfolios consisted of only developed countries, in this research it is a combination of two developed countries and several developing countries. Different results are obtained when looking at emerging market portfolios. The emerging market five-factor model is not rejected at 1% significance for *Size-B/M* portfolios, and it is not rejected at high level of significance for *Size-OP* and *Size-Inv* portfolios. This might be due to lack of market efficiency in emerging market returns as the reason why emerging market returns are explained by the Emerging market factors.

Table 4.11: Summary statistics for the five factor model for diversified portfolios

Panel A shows the performance of GRS test on portfolios consisting of Global market and Emerging market countries. The left hand side of the regression equation consists of the returns of the Global market portfolios or Emerging market countries' portfolios and the right hand side returns are from the Global market five-factor returns or Emerging market five-factor returns. The *GRS* statistic and the p-value, $p(GRS)$, tests whether the expected of all 16 intercept estimates in the regressions for country are zero. Furthermore, what is determined in evaluating the performance of the model are, the average absolute value of the intercepts $A|a_i|$, $Aa_i^2/A\bar{r}_i^2$, the average squared value of the intercepts over the average square of $\bar{r}_i$, which is the average return on portfolio i , minus the average value-weight market portfolio return. $As^2(a_i)/Aa_i^2$, the average of the estimates of the variances of the sampling errors of the estimated intercepts over the average squared values of intercepts. Panel B shows the test result of the Emerging market five-factor model in explaining average excess returns across different countries for *Size-BM*, *Size-OP*, and *Size-Inv* portfolios.

	<i>GRS</i>	$p(GRS)$	$A a_i $	$\frac{Aa_i^2}{A\bar{r}_i^2}$	$\frac{As^2(a_i)}{Aa_i^2}$
<i>Size-B/M Portfolios</i>					
Global	4.85	0.00	0.23	0.28	0.19
Emerging	1.81	0.03	0.19	0.03	0.18
<i>Size-OP Portfolios</i>					
Global	7.28	0.00	0.23	0.26	0.20
Emerging	0.46	0.96	0.17	0.02	0.22
<i>Size-Inv Portfolios</i>					
Global	5.26	0.00	0.23	0.27	0.19
Emerging	0.65	0.84	0.17	0.02	0.21
<i>Size-B/M Portfolios</i>					
South Africa	3.55	0.00	0.89	3.27	0.36
China	0.80	0.69	1.19	66.00	0.04
India	4.79	0.00	1.49	9.42	0.02
Malaysia	1.51	0.09	0.30	0.84	0.53
South Korea	2.48	0.00	0.35	1.58	0.42
Indonesia	1.49	0.10	0.47	3.58	0.32

Table 4.11 (continued)

	GRS	$p(GRS)$	$A a_i $	$\frac{Aa_i^2}{A\bar{r}_i^2}$	$\frac{As^2(a_i)}{Aa_i^2}$
<i>Size-OP Portfolios</i>					
South Africa	3.38	0.00	1.26	9.19	0.20
China	1.34	0.17	1.21	75.36	0.04
India	5.08	0.00	1.50	11.25	0.02
Malaysia	1.47	0.11	0.32	1.23	0.39
South Korea	2.04	0.01	0.37	2.19	0.36
Indonesia	1.80	0.03	0.57	6.76	0.22
<i>Size-Inv Portfolios</i>					
South Africa	3.48	0.00	0.78	2.61	0.31
China	3.84	0.00	1.20	67.31	0.04
India	3.99	0.00	1.47	11.59	0.02
Malaysia	0.95	0.51	0.31	1.03	0.47
South Korea	2.20	0.01	0.34	1.93	0.41
Indonesia	1.31	0.19	0.46	4.35	0.29

For *Size-B/M* portfolios, the model performs well in explaining expected returns in China and Indonesia, while for Malaysia the model is not rejected at 5% significance level. For *Size-OP* portfolios, China and Malaysia do not reject the model at 10% significance level whereas South Korea and Indonesia do not reject the model at 1% significance level. For *Size-Inv* portfolios, the model is not rejected in Malaysia and Indonesia, South Korea at 1% significance level. Overall, South Africa and India reject the Emerging Market five-factor model for all portfolio sorts. Relative to the country specific five-factor model GRS test results, the Emerging Market five-factor model leaves very large dispersion of intercepts unexplained, especially for China.

Table 4.12 is of factor spanning test results for diversified portfolios with *Panel A* displaying the results for factor spanning amongst the Global factors, and amongst the Emerging Market factors. For the Global factors, *Mkt* and *SMB* are the redundant factors in explaining average returns in Global portfolios (0.13% per week, $t = 1.19$ for *Mkt*; -0.05% per week, $t = -0.82$ for *SMB*). For Emerging Market portfolios, the important factors are *HML* (-0.21% per week, $t = -4.91$) and *RMW* (0.15% per week, t

= 5.43). *Panel B* and *Panel C* give the results of regressions in which the left hand side are for country specific factors, and the right hand side are the Global factors, and Emerging Market factors. Similar results are obtained for developing countries in *Panel B* and *Panel C* excluding the Mkt which used independent variables as a proxy (MSCI World Index and Emerging Market Index), therefore interpretation of results shall be based on the results from *Panel B* since it includes all the countries and for *Panel C*, an overview of the results.

The market factor, *Mkt*, is not fully explained in China (0.55%, $t = 2.78$) and India (-0.57%, $t = -5.88$). For countries whereby *Mkt* is not fully explained, South Africa, South Korea, Indonesia, and Singapore, the MSCI World Index returns are carrying the most weight in explaining the average domestic market returns. The Emerging Market Index in *Panel C* carries most of the weight irrespective of whether the developing country *Mkt* factor returns are explained or not.

From *Panel B*, the size factor, *SMB*, is fully explained in South Korea (0.10%, $t = 1.20$) and Indonesia (-0.13%, $t = -0.90$). The value factor, *HML*, is fully explained in China (-0.06%, $t = -0.56$), Australia (0.08%, $t = 0.81$), and Singapore (-0.12%, $t = -0.56$). The profitability factor, *RMW*, is fully explained in South Africa (0.19%, $t = 1.41$), India (-0.06%, $t = -1.41$) and Singapore (-0.22%, $t = 1.64$). The investment factor, *CMA*, is fully explained in South Korea (-0.05%, $t = -1.10$), Indonesia (-0.17%, $t = -1.93$), Australia (0.12%, $t = 1.55$), and Singapore (-0.25%, $t = -1.77$). From *Panel C*, overall the developing countries had a lot of their local factors not fully explained by the Emerging Market five factors. This is what contributed to the large dispersion of intercepts being not fully explained by the average returns (Table 4.11).

Furthermore regression results in APPENDIX B look further into the performance of the Global and Emerging Market five-factor model. The *Size B/M* and *Size-Inv* diversified portfolios, the five-factor model fails to explain the average returns in Global portfolios and Emerging Market portfolios containing big cap growth stocks as well as small cap value stocks. For *Size-OP* portfolios, the threat to the five-factor model is from the small cap high OP portfolios.

Testing the Fama-French five-factor model emerging and developed markets

Table 4.12: Factor spanning tests involving diversified portfolios

Panel A: Four factors in regressions to explain average returns on the fifth for diversified portfolios

Mkt is market returns (MSCI World index for Global market portfolios; MSCI Emerging market index for emerging market portfolios) minus the risk free rate. *SMB* (small minus big) is the size factor; *HML* (high minus low B/M) is the value factor; *RMW* (robust minus weak OP) is the profitability factor; and *CMA* (conservative minus aggressive Inv) is the investment factor. The factors are constructed using independent sorts of two *Size* groups, two *B/M* groups (*HML*), two *OP* groups (*RMW*), or two *Inv* groups (*CMA*). From Panel B and Panel C, the regression equation consists of the left hand side returns being country specific factors (five local factors for each of the eight countries) and the right hand side returns are the Global market five-factors, and Emerging market five-factors respectively.

	Coefficient						t-statistic						R ²
	Int	Mkt	SMB	HML	RMW	CMA	Int	Mkt	SMB	HML	RMW	CMA	
Global													
Mkt	0.13		-0.85	0.36	-1.22	-1.46	1.19		-10.80	3.04	-6.64	-7.50	0.34
SMB	-0.05	-0.29		0.24	-0.96	-0.31	-0.82	-10.80		3.37	-9.42	-2.53	0.38
HML	-0.26	0.07	0.13		-0.02	0.34	-5.45	3.04	3.37		-0.20	3.76	0.09
RMW	0.25	-0.09	-0.21	-0.01		-0.43	8.99	-6.64	-9.42	-0.20		-8.32	0.34
CMA	0.07	-0.09	-0.06	0.11	-0.37		2.46	-7.50	-2.53	3.76	-8.32		0.29
Emerging													
Mkt	-0.18		-1.21	0.85	-1.53	-1.97	-1.42		-13.89	5.73	-6.83	-7.46	0.41
SMB	-0.05	-0.29		0.49	-1.24	-0.75	-0.74	-13.89		6.92	-12.81	-5.63	0.54
HML	-0.21	0.10	0.24		0.46	0.87	-4.91	5.73	6.92		5.81	10.08	0.28
RMW	0.15	-0.08	-0.26	0.19		-0.65	5.43	-6.83	-12.81	5.81		-12.33	0.49
CMA	0.00	-0.07	-0.11	0.26	-0.46		-0.12	-7.46	-5.63	10.08	-12.33		0.46

Testing the Fama-French five-factor model emerging and developed markets

Panel B: Using the five factors of Global portfolios in regressions to explain average returns of regional five factors

	Coefficient						t-statistic						
Global:	Int	Mkt	SMB	HML	RMW	CMA	Int	Mkt	SMB	HML	RMW	CMA	R ²
South Africa													
Mkt	0.02	0.61	-0.29	0.16	-0.31	-0.27	0.22	15.20	-4.25	1.71	-2.11	-1.69	0.58
SMB	-0.85	-0.15	0.76	-0.35	0.07	0.75	-4.96	-1.95	5.61	-1.96	0.25	2.38	0.20
HML	-0.41	-0.07	0.04	0.40	-0.47	-0.36	-3.21	-1.16	0.36	2.94	-2.15	-1.50	0.05
RMW	0.19	-0.07	0.00	-0.30	0.75	-0.36	1.41	-1.15	0.03	-2.16	3.34	-1.48	0.09
CMA	-0.70	0.22	0.24	0.11	-0.17	0.68	-4.88	3.27	2.08	0.72	-0.70	2.60	0.07
China													
Mkt	0.55	0.43	-0.51	0.40	-1.58	1.59	2.78	4.71	-3.30	1.93	-4.71	4.39	0.26
SMB	0.42	-0.04	-0.58	-1.27	-2.96	0.57	3.46	-0.72	-6.19	-9.91	-14.29	2.55	0.51
HML	-0.06	0.03	0.04	2.24	1.77	0.72	-0.56	0.56	0.52	20.94	10.30	3.90	0.62
RMW	-0.30	-0.03	0.38	0.37	1.92	-0.58	-4.58	-0.99	7.59	5.43	17.57	-4.92	0.60
CMA	0.14	0.00	-0.28	0.83	-0.33	0.86	2.07	-0.14	-5.42	11.71	-2.92	7.02	0.46
India													
Mkt	-0.57	0.37	-0.97	0.08	0.11	-0.31	-5.88	8.24	-12.76	0.77	0.70	-1.76	0.61
SMB	0.42	0.01	1.63	-0.08	-0.12	-0.03	6.05	0.19	29.76	-1.05	-1.06	-0.24	0.80
HML	-0.28	0.02	0.31	0.44	0.09	0.12	-5.33	0.80	7.30	7.83	0.97	1.27	0.33
RMW	-0.06	0.04	-0.47	-0.08	0.45	0.21	-1.41	1.80	-14.08	-1.72	6.19	2.69	0.59
CMA	-0.11	0.02	0.13	0.15	0.05	0.29	-3.87	1.33	5.71	4.68	0.97	5.34	0.28

Testing the Fama-French five-factor model emerging and developed markets

Panel B: (continued)

	Coefficient						t-statistic						
Global:	Int	Mkt	SMB	HML	RMW	CMA	Int	Mkt	SMB	HML	RMW	CMA	R ²
Malaysia													
Mkt	-0.10	0.14	-0.38	0.14	-0.35	-0.57	-1.22	3.77	-6.08	1.63	-2.65	-3.95	0.28
SMB	-0.54	0.21	0.24	-0.23	-0.59	0.55	-3.49	2.92	1.99	-1.39	-2.23	1.95	0.08
HML	-0.21	0.04	-0.07	0.32	-0.24	-0.02	-2.97	1.20	-1.22	4.29	-1.96	-0.13	0.08
RMW	0.17	0.05	0.13	-0.09	0.73	0.33	2.84	1.73	2.73	-1.38	7.04	2.92	0.13
CMA	-0.29	0.02	0.05	0.04	-0.11	0.35	-4.79	0.78	1.08	0.55	-1.05	3.19	0.07
South Korea													
Mkt	-0.10	0.53	-0.40	0.13	-0.54	-0.57	-1.01	11.25	-4.99	1.21	-3.16	-3.10	0.50
SMB	0.10	0.01	0.24	0.14	-0.46	-0.50	1.20	0.20	3.56	1.55	-3.25	-3.28	0.13
HML	0.39	-0.08	-0.27	1.19	-0.15	-0.42	4.99	-2.19	-4.31	14.30	-1.14	-2.94	0.37
RMW	0.14	-0.04	0.00	-0.07	0.58	0.44	2.37	-1.58	0.09	-1.04	5.55	3.90	0.13
CMA	-0.05	-0.02	0.09	-0.57	0.43	0.74	-1.10	-0.86	2.54	-12.12	5.71	9.12	0.41
Indonesia													
Mkt	0.05	0.35	-0.28	0.31	-0.23	-0.94	0.34	5.36	-2.53	2.12	-1.00	-3.71	0.24
SMB	-0.13	-0.07	-0.19	0.65	-0.32	0.02	-0.90	-1.09	-1.69	4.20	-1.29	0.09	0.06
HML	-0.31	0.02	-0.23	0.58	-0.50	-0.24	-3.18	0.54	-3.01	5.67	-3.04	-1.39	0.13
RMW	0.34	0.11	0.16	-0.23	0.26	0.04	3.80	2.78	2.32	-2.41	1.70	0.25	0.04
CMA	-0.17	-0.03	-0.09	0.10	-0.42	0.17	-1.93	-0.74	-1.21	1.03	-2.76	1.02	0.04

Testing the Fama-French five-factor model emerging and developed markets

Panel B: (continued)

	Coefficient						t-statistic						
Global:	Int	Mkt	SMB	HML	RMW	CMA	Int	Mkt	SMB	HML	RMW	CMA	R ²
Australia													
Mkt	-0.17	0.63	-0.32	0.06	-0.27	-0.22	-2.02	15.82	-4.69	0.66	-1.85	-1.41	0.60
SMB	-1.17	-0.02	0.08	1.06	-0.94	-1.45	-4.68	-0.20	0.42	3.95	-2.20	-3.15	0.08
HML	0.08	-0.02	-0.28	1.34	-1.00	-1.34	0.81	-0.34	-3.49	12.41	-5.78	-7.20	0.38
RMW	0.49	-0.08	0.18	-0.33	1.25	0.60	5.28	-1.94	2.50	-3.32	7.90	3.50	0.23
CMA	0.12	0.12	0.14	-0.51	0.68	1.82	1.55	3.36	2.21	-6.04	5.03	12.43	0.33
Singapore													
Mkt	-0.11	0.42	-0.49	0.24	-0.58	-0.43	-1.24	10.15	-6.94	2.52	-3.81	-2.58	0.50
SMB	-0.97	-0.10	-0.29	0.29	-2.06	-0.61	-2.20	-0.49	-0.82	0.63	-2.76	-0.75	0.02
HML	-0.12	-0.02	-0.40	0.36	-1.00	-0.41	-0.90	-0.27	-3.89	2.62	-4.58	-1.72	0.10
RMW	0.22	0.01	0.23	-0.29	0.71	-0.04	1.64	0.20	2.14	-2.00	3.11	-0.16	0.05
CMA	-0.25	0.18	0.27	0.23	0.09	0.60	-1.77	2.79	2.41	1.50	0.38	2.28	0.06

Testing the Fama-French five-factor model emerging and developed markets

Panel C: Using the five factors of Emerging market portfolios in regressions to explain average returns of regional five factors

	Coefficient						t-statistic						
Emerging:	Int	Mkt	SMB	HML	RMW	CMA	Int	Mkt	SMB	HML	RMW	CMA	R ²
South Africa													
Mkt	0.10	0.51	-0.10	0.01	-0.19	-0.13	1.14	14.44	-1.34	0.13	-1.17	-0.67	0.53
SMB	-0.99	-0.16	0.64	-0.47	0.40	0.98	-6.29	-2.37	4.74	-2.45	1.34	2.77	0.20
HML	-0.55	-0.06	0.03	0.35	-0.31	-0.22	-4.56	-1.10	0.33	2.41	-1.39	-0.82	0.04
RMW	0.29	-0.01	0.06	-0.25	0.60	-0.42	2.38	-0.17	0.55	-1.64	2.58	-1.51	0.07
CMA	-0.77	0.26	0.47	-0.30	0.47	1.22	-5.92	4.84	4.20	-1.85	1.89	4.17	0.10
China													
Mkt	0.64	0.52	-0.25	0.27	-1.26	1.68	3.63	7.17	-1.71	1.25	-3.71	4.22	0.31
SMB	0.32	0.02	-0.51	-1.26	-2.70	0.78	3.04	0.44	-5.84	-9.91	-13.49	3.31	0.58
HML	0.09	0.00	-0.02	2.15	1.44	0.52	1.01	0.12	-0.30	20.74	8.82	2.68	0.69
RMW	-0.22	-0.04	0.37	0.35	1.79	-0.64	-4.10	-1.85	7.96	5.22	16.99	-5.18	0.66
CMA	0.16	0.01	-0.27	0.74	-0.28	0.97	2.74	0.26	-5.46	10.27	-2.51	7.35	0.52
India													
Mkt	-0.40	0.41	-0.71	-0.15	0.15	-0.08	-5.16	12.78	-10.76	-1.58	1.02	-0.49	0.71
SMB	0.23	0.03	1.56	-0.06	0.08	0.05	5.24	1.58	41.04	-1.05	0.93	0.51	0.91
HML	-0.32	0.01	0.21	0.50	-0.03	-0.10	-6.51	0.53	5.01	8.26	-0.36	-0.90	0.32
RMW	0.03	0.03	-0.41	-0.15	0.55	0.34	0.79	1.83	-14.31	-3.70	8.68	4.54	0.71
CMA	-0.12	0.02	0.13	0.11	0.09	0.33	-4.35	1.91	5.39	3.29	1.76	5.34	0.28

Testing the Fama-French five-factor model emerging and developed markets

Panel C: (continued)

	Coefficient						t-statistic						
Emerging:	Int	Mkt	SMB	HML	RMW	CMA	Int	Mkt	SMB	HML	RMW	CMA	R ²
Malaysia													
Mkt	-0.07	0.30	-0.08	0.00	-0.08	-0.29	-1.05	10.89	-1.39	0.02	-0.67	-1.99	0.42
SMB	-0.59	0.14	0.23	-0.24	-0.47	0.47	-4.05	2.36	1.83	-1.34	-1.70	1.43	0.06
HML	-0.23	0.05	-0.06	0.33	-0.31	-0.20	-3.57	1.66	-1.07	4.12	-2.51	-1.37	0.08
RMW	0.24	-0.01	0.11	-0.11	0.71	0.30	4.23	-0.40	2.31	-1.64	6.76	2.39	0.14
CMA	-0.29	0.02	0.05	-0.06	-0.04	0.51	-5.34	0.94	1.06	-0.94	-0.38	4.13	0.09
South Korea													
Mkt	-0.04	0.64	-0.03	-0.08	-0.24	-0.32	-0.56	20.86	-0.46	-0.94	-1.76	-1.94	0.69
SMB	-0.03	-0.03	0.09	0.26	-0.61	-0.80	-0.37	-0.77	1.38	2.78	-4.12	-4.59	0.12
HML	0.40	-0.06	-0.32	1.28	-0.57	-0.72	5.70	-1.91	-5.17	14.74	-4.28	-4.50	0.40
RMW	0.22	-0.05	0.05	-0.15	0.68	0.67	4.06	-2.06	1.12	-2.24	6.59	5.45	0.18
CMA	0.01	-0.01	0.15	-0.70	0.68	1.02	0.22	-0.76	4.43	-14.75	9.31	11.70	0.47
Indonesia													
Mkt	0.04	0.60	0.17	-0.02	0.37	-0.30	0.36	12.83	1.83	-0.12	1.75	-1.20	0.43
SMB	-0.18	-0.14	-0.33	0.67	-0.60	-0.21	-1.33	-2.61	-2.92	4.17	-2.41	-0.70	0.07
HML	-0.38	0.02	-0.25	0.56	-0.56	-0.35	-4.25	0.42	-3.31	5.11	-3.31	-1.76	0.11
RMW	0.36	0.19	0.33	-0.41	0.63	0.48	4.52	5.80	4.94	-4.26	4.24	2.73	0.12
CMA	-0.20	-0.02	-0.10	0.01	-0.39	0.35	-2.49	-0.73	-1.45	0.11	-2.52	1.92	0.06

5 Conclusion

The research is focused on testing the five-factor model of Fama and French (2015) on selected developing and developed markets. The results from the different tests carried out provided mixed results. The stand out being the weakness of *Mkt* factor as a potential variable in explaining equity returns in the countries examined during the period of January 2010 until November 2016 as per the factor spanning tests in all the countries except for India and South Korea. Though as mentioned, the factor spanning tests are sample specific as per the different answers obtained when comparing Fama and French (2015), and Fama and French (2016). Our sample is from post 2008/9 recession, which calls for tests to be carried out pre 2008/9 to further provide proof of the factor spanning tests being sample specific. Furthermore, relative to Fama and French (2016), the sample sizes are small and not highly diversified since the focus is on individual countries though mixed results are obtained based on the performance of the Global five-factor model and the Emerging market five-factor model.

Across all portfolio sorts and countries, there exist some form of relations between average returns that is related to Size, Value, Profitability and Investment. Though these patterns are not transparent in some of the portfolio sorts, and the level of transparency may vary with countries. Furthermore, among the five factors, overall, low correlations are observed except for China with Size and Profitability. Low correlations are also observed among factors at different regions, although the *Mkt* factor correlations are relatively higher.

For the regions studied in this research, looking at the overall picture, the average returns of big stocks outweigh those of small stocks. Similarly for those stocks with low *B/M* ratio, their average returns outweigh those of stocks with high *B/M* ratio. For Profitability, those firms that are robust are generating greater returns than those firms that have weak profitability margin. Aggressive firms are those that purchase a lot of assets, their returns are superior to those that exercise caution for South Africa, China, India, Malaysia, Indonesia and Singapore.

Across these countries, there are patterns in average returns related to the added factors on the CAPM. For *Size-B/M* portfolios, there is a decrease in average returns

from low *B/M* to high *B/M* portfolios though for South Korea, Indonesia, and Australia, the significant decrease are for portfolios consisting of big cap stocks. For these portfolio sorts all countries except for South Africa are having an increase in average returns with size. China, India, South Korea and Indonesia have these increase in average returns on low *B/M* portfolios.

All size stocks of South Africa, Indonesia, and Australia, there is a significant increase in average returns with *OP*. China the increases are marginal whereas in India, Malaysia, South Korea, and Singapore the increases are only for big stocks. For small stocks of Malaysia, average returns decline from low *OP* to high *OP* portfolios. Increase in average returns with size is seen across the regions except for China. Countries such as India, Malaysia, and South Korea, these increases are only seen in high *OP* portfolios.

In *Size-Inv* portfolio sorts, average returns increase with size except for China, and for South Korea it is only for low *Inv* portfolios. Average returns and *Inv* produced mixed results. Malaysia, Indonesia, and Singapore no pattern is observed. South Africa and China, and big stocks of India, average returns increase with *Inv*. The big stocks of South Korea and Australia have average returns decreasing from low *Inv* to high *Inv*.

These patterns in average returns across different portfolio sorts, at 10% significance level, according to the GRS test, the five factor model is not rejected as a model that explains average returns for portfolio sorts in China for *Size-B/M* portfolios, Malaysia and Indonesia for *Size-OP* portfolio, China and Indonesia for *Size-Inv* portfolios. If the significance level is lowered to 1%, South Korea and Australia reject the five factor model across all portfolio sorts. Griffin (2002) uses absolute values of intercepts to examine the model's capabilities of explaining average portfolio returns. Using that logic, the five-factor model captures variations in average returns for portfolios in South Korea, but the GRS test gives different results.

The factor spanning tests had the *Mkt* factor as the redundant factor across all the countries except for India and South Korea, which could make one wonder what the results would be if the Morgan Stanley Country Index (MSCI) was used as a proxy for market returns. Overall mixed results are obtained across the regions regarding each factor being able to explain average returns at that particular country. The

country that followed is Indonesia, which had the remaining four factors being able to explain the average returns, though for South Korea, the redundant factor is *HML*. For all the countries, most of the domestic factors were not fully explained by the diversified portfolios.

Furthermore, for all the countries, observing the two added factors to the three-factor model, *RMW* and *CMA*, either or both of them are significant in each of the regions except for Singapore. If one of them is insignificant, its contribution normally captured by the other factor. Therefore these factors added to the three-factor model play a role in explaining some of the variations in average returns of the portfolios.

The regression results provide further insight into the performance of the five-factor model. Interpretation of the intercepts provided support for the GRS test results for some of the countries and for different portfolio sorts. Other countries produced insignificant and low values of intercepts despite the five-factor model being rejected in those countries, which is a conundrum. Overall there is no consistent relationship that can be noticed across the countries to conclude the model's performance based on the state of the market, that is, emerging or developed, the results differ substantially. Although the Emerging Market five-factor model proved to be efficient in explaining the returns of portfolios developed using Emerging Market countries. For further studies, more countries need to be included for emerging market, and frontier market portfolios that will be divided into regions similar to Fama and French (2012; 2016).

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APPENDIX A

Table A.1: Number of firms per country used in the analysis as per the portfolio sorts

Table below lists in accordance with the portfolio sorts, the number of firms per country that had satisfactory amount of data not to be subject to exclusion for the prescribed period. The form of data included the share prices of the companies, and accounting data.

Developing Market	Portfolio		
	<i>Size-B/M</i>	<i>Size-OP</i>	<i>Size-Inv</i>
South Africa	323	317	313
China	2609	2608	2590
India	3068	2695	2829
Malaysia	956	924	892
South Korea	1765	1716	1595
Indonesia	484	491	490
Developed Market			
Australia	1330	1330	1423
Singapore	542	530	522

Table A.2: Number of stocks in *Size-B/M* portfolios

Table below lists in accordance with the 4x4 *Size-B/M* portfolios, the number of firms per country that had satisfactory amount of data not to be subject to exclusion for the prescribed period. The form of data included the share prices of the companies, and accounting data.

	Low B/M	2	3	High B/M	Low B/M	2	3	High B/M
South Africa					China			
Small	10	16	15	40	169	182	163	139
2	10	22	26	24	163	176	171	143
3	21	22	27	12	170	168	169	146
Big	39	22	12	5	150	128	151	221
India					Malaysia			
Small	87	130	199	312	41	40	61	97
2	83	138	247	272	36	64	62	79
3	184	238	219	144	57	70	67	45
Big	415	264	102	34	105	65	49	18
South Korea					Indonesia			
Small	62	99	144	128	12	19	26	60
2	76	140	108	118	10	29	44	39
3	151	100	101	92	38	38	30	17
Big	157	102	90	97	59	36	23	4
Australia					Singapore			
Small	56	48	68	133	30	21	32	53
2	76	88	86	81	30	31	38	37
3	97	91	87	65	25	40	38	33
Big	104	123	101	26	52	45	27	10

Table A.3: Number of stocks in *Size-OP* portfolios

Table below lists in accordance with the 4x4 *Size-OP* portfolios, the number of firms per country that had satisfactory amount of data not to be subject to exclusion for the prescribed period. The form of data included the share prices of the companies, and accounting data.

	Low OP	2	3	High OP	Low OP	2	3	High OP
South Africa					China			
Small	28	17	13	20	260	192	133	68
2	20	29	19	12	176	185	176	116
3	14	19	30	18	134	175	186	158
Big	11	15	19	33	97	113	163	276
India					Malaysia			
Small	229	151	69	59	107	52	29	22
2	160	201	149	126	66	72	57	43
3	193	179	189	176	43	54	71	72
Big	93	145	267	309	16	54	75	91
South Korea					Indonesia			
Small	167	96	77	63	51	34	15	23
2	118	130	106	79	35	41	28	19
3	103	112	122	100	27	31	43	22
Big	45	91	124	183	10	19	38	55
Australia					Singapore			
Small	121	93	35	58	59	26	13	31
2	114	119	56	34	39	30	34	30
3	74	95	107	65	23	40	36	35
Big	22	33	144	160	11	37	49	37

Table A.4: Number of stocks in *Size-Inv* portfolios

Table below lists in accordance with the 4x4 *Size-Inv* portfolios, the number of firms per country that had satisfactory amount of data not to be subject to exclusion for the prescribed period. The form of data included the share prices of the companies, and accounting data.

	Low Inv	2	3	High Inv	Low Inv	2	3	High Inv
South Africa					China			
Small	42	17	11	7	249	188	115	100
2	14	17	21	26	175	182	145	151
3	13	27	13	27	145	146	172	188
Big	6	18	36	18	86	131	205	212
India					Malaysia			
Small	216	174	111	112	96	61	29	30
2	177	172	155	177	64	67	49	49
3	204	187	174	177	43	51	70	63
Big	111	175	266	241	22	45	75	78
South Korea					Indonesia			
Small	63	60	99	147	63	23	18	19
2	90	94	111	110	29	44	22	28
3	115	106	110	72	21	24	44	33
Big	115	142	91	70	10	33	42	37
Australia					Singapore			
Small	52	52	84	173	62	33	10	24
2	103	63	91	96	35	35	33	30
3	109	87	91	65	25	34	37	33
Big	78	161	96	22	8	30	51	42

APPENDIX B

Table B.1: Regressions for 16 value-weight *Size-B/M* portfolios

We construct 16 *Size-B/M* portfolios for each region at the end of December of each year. The *Size* breakpoints are 25th, 50th, and 75th percentiles of market cap for each country. Similarly for the breakpoints of *B/M* (book-to-market equity) quartiles. The intersection of the 4x4 independent *Size* and *B/M* sorts for each country produce 16 value-weight *Size-B/M* portfolios. The table shows the five-factor slopes and *t*-statistics for these portfolios. The five-factor model is

$$R_{it} - R_{Ft} = a_i + b_i(R_{Mt} - R_{Ft}) + s_iSMB_t + h_iHML_t + r_iRMW_t + c_iCMA_t + e_{it}$$

	Low B/M	2	3	High B/M	Low B/M	2	3	High B/M
South Africa								
	<i>a</i>				<i>t(a)</i>			
Small	-0.90	-0.46	-0.91	-0.49	-2.37	-1.86	-2.86	-2.66
2	-0.50	-0.44	-0.44	-0.59	-1.96	-2.78	-2.89	-3.58
3	-0.35	-0.40	-0.44	-0.29	-2.00	-2.67	-2.78	-1.61
Big	-0.50	-0.54	-0.58	-0.86	-3.15	-3.29	-3.22	-3.34
	<i>b</i>				<i>t(b)</i>			
Small	0.27	0.98	0.89	0.80	1.45	7.96	5.65	8.80
2	0.76	0.52	0.50	0.58	5.97	6.63	6.57	7.04
3	0.55	0.80	0.61	0.81	6.34	10.66	7.76	8.99
Big	0.90	1.02	0.80	0.79	11.39	12.48	9.04	6.18
	<i>s</i>				<i>t(s)</i>			
Small	1.08	0.74	0.64	0.22	7.59	7.93	5.34	3.17
2	0.10	-0.11	-0.16	-0.18	1.09	-1.83	-2.76	-2.87
3	-0.11	-0.19	-0.17	-0.18	-1.61	-3.29	-2.85	-2.59
Big	-0.25	-0.31	-0.34	-0.60	-4.11	-4.97	-5.04	-6.21
	<i>h</i>				<i>t(h)</i>			
Small	-3.31	-0.21	-0.52	0.63	-18.84	-1.79	-3.56	7.47
2	-0.56	-0.09	-0.04	0.20	-4.70	-1.22	-0.53	2.61
3	-0.15	-0.02	-0.06	0.15	-1.91	-0.29	-0.82	1.83
Big	-0.19	-0.07	-0.08	0.20	-2.56	-0.95	-0.98	1.69
	<i>r</i>				<i>t(r)</i>			
Small	-0.82	0.88	-0.31	0.19	-4.87	7.98	-2.21	2.30
2	-0.04	0.17	0.10	0.03	-0.40	2.46	1.42	0.47
3	0.14	0.10	0.10	-0.08	1.78	1.56	1.45	-1.02
Big	0.23	0.18	0.10	-0.28	3.30	2.46	1.24	-2.49

	<i>c</i>				<i>t(c)</i>			
Small	1.27	0.24	0.26	0.21	7.75	2.22	1.91	2.63
2	-0.13	0.08	0.13	0.22	-1.19	1.09	1.96	3.08
3	0.09	0.17	0.17	0.30	1.24	2.56	2.46	3.85
Big	0.15	0.24	0.26	0.43	2.15	3.34	3.32	3.86

Table B.1 (continued)

	Low B/M	2	3	High B/M	Low B/M	2	3	High B/M
China								
	<i>a</i>				<i>t(a)</i>			
Small	-0.06	-0.13	-0.15	-0.14	-0.99	-1.90	-2.21	-2.03
2	-0.14	-0.18	-0.20	-0.16	-2.08	-2.54	-2.69	-2.40
3	-0.16	-0.18	-0.21	-0.15	-2.72	-2.45	-2.69	-2.28
Big	-0.18	-0.18	-0.16	-0.09	-2.55	-2.24	-2.25	-2.28
	<i>b</i>				<i>t(b)</i>			
Small	1.01	1.02	1.01	0.96	50.39	43.94	44.22	43.16
2	1.05	1.01	0.99	1.02	47.74	41.77	39.57	46.07
3	1.02	1.01	1.03	1.03	50.78	40.47	39.56	46.51
Big	1.03	0.99	1.01	1.06	44.20	36.15	43.38	79.18
	<i>s</i>				<i>t(s)</i>			
Small	0.94	0.95	1.06	1.06	14.91	12.84	14.60	15.03
2	0.74	0.92	0.95	0.96	10.60	11.93	11.96	13.75
3	0.66	0.84	0.82	0.80	10.38	10.65	9.97	11.45
Big	0.48	0.54	0.55	0.29	6.51	6.26	7.48	6.78
	<i>h</i>				<i>t(h)</i>			
Small	-0.80	-0.53	-0.33	0.05	-11.14	-6.38	-4.00	0.66
2	-0.92	-0.56	-0.40	0.09	-11.63	-6.46	-4.49	1.14
3	-0.85	-0.54	-0.48	0.11	-11.78	-6.04	-5.11	1.39
Big	-1.05	-0.55	-0.42	0.11	-12.52	-5.60	-4.97	2.23
	<i>r</i>				<i>t(r)</i>			
Small	-0.12	-0.35	-0.24	-0.43	-1.18	-2.84	-1.94	-3.58
2	-0.36	-0.34	-0.27	-0.31	-3.07	-2.66	-2.04	-2.67
3	-0.55	-0.22	-0.03	-0.36	-5.21	-1.68	-0.23	-3.08
Big	-0.15	-0.07	0.01	-0.18	-1.23	-0.51	0.07	-2.55
	<i>c</i>				<i>t(c)</i>			
Small	0.17	-0.23	-0.18	-0.44	1.52	-1.74	-1.40	-3.53
2	-0.20	-0.46	-0.30	-0.32	-1.63	-3.38	-2.10	-2.53
3	-0.59	-0.45	-0.09	-0.30	-5.25	-3.20	-0.59	-2.41
Big	-0.34	-0.49	-0.01	-0.03	-2.61	-3.19	-0.04	-0.45

Table B.1 (continued)

	Low B/M	2	3	High B/M	Low B/M	2	3	High B/M
India								
	<i>a</i>				<i>t(a)</i>			
Small	-0.24	-0.17	-0.21	-0.14	-2.33	-1.98	-2.34	-1.62
2	-0.24	-0.21	-0.15	-0.09	-2.18	-1.95	-1.48	-0.87
3	-0.19	-0.15	-0.14	-0.20	-1.77	-1.43	-1.29	-1.78
Big	-0.08	-0.18	-0.25	-0.36	-0.95	-2.14	-2.69	-3.00
	<i>b</i>				<i>t(b)</i>			
Small	0.48	0.46	0.41	0.46	8.76	10.38	8.72	10.03
2	0.40	0.36	0.40	0.37	6.93	6.37	7.51	6.91
3	0.32	0.35	0.34	0.39	5.56	6.19	6.11	6.70
Big	0.45	0.42	0.52	0.54	9.62	9.47	10.50	8.50
	<i>s</i>				<i>t(s)</i>			
Small	0.04	0.03	0.01	0.02	0.47	0.49	0.20	0.37
2	-0.22	-0.33	-0.38	-0.71	-2.71	-4.19	-4.96	-9.23
3	-0.73	-0.87	-0.98	-1.21	-8.88	-10.77	-12.22	-14.66
Big	-0.67	-1.08	-1.43	-1.84	-10.01	-17.09	-20.24	-20.53
	<i>h</i>				<i>t(h)</i>			
Small	0.60	0.64	0.71	1.11	5.93	7.77	8.25	13.19
2	0.60	1.09	1.36	2.09	5.69	10.61	13.84	21.07
3	0.91	1.34	1.63	2.10	8.61	12.79	15.76	19.66
Big	0.62	1.09	1.36	1.85	7.18	13.32	14.89	15.98
	<i>r</i>				<i>t(r)</i>			
Small	0.17	0.20	0.40	0.47	1.05	1.59	2.99	3.60
2	0.32	0.55	0.83	0.81	1.94	3.45	5.38	5.21
3	0.77	0.87	0.84	0.61	4.63	5.27	5.19	3.67
Big	0.64	0.41	0.01	-0.41	4.72	3.17	0.04	-2.27
	<i>c</i>				<i>t(c)</i>			
Small	0.55	0.39	0.34	0.26	2.90	2.54	2.12	1.65
2	0.46	0.20	0.31	0.37	2.35	1.03	1.65	1.99
3	0.49	0.47	0.49	0.43	2.47	2.38	2.51	2.15
Big	0.24	0.38	0.57	0.56	1.46	2.48	3.28	2.56

Table B.1 (continued)

	Low B/M	2	3	High B/M	Low B/M	2	3	High B/M
Malaysia								
	<i>a</i>				<i>t(a)</i>			
Small	0.09	0.09	0.15	0.16	0.59	0.66	1.16	1.44
2	0.14	0.28	0.19	0.17	0.90	2.53	2.04	1.68
3	0.17	0.23	0.22	0.24	1.52	2.29	2.32	2.28
Big	0.20	0.15	0.05	0.06	2.43	1.72	0.60	0.46
	<i>b</i>				<i>t(b)</i>			
Small	1.29	1.09	1.10	1.04	13.17	11.57	13.06	14.09
2	1.13	1.20	1.07	1.15	10.85	16.36	17.00	17.21
3	1.11	1.09	1.24	1.30	14.69	16.46	19.17	18.28
Big	1.16	1.31	1.38	1.43	21.43	22.24	22.61	16.66
	<i>s</i>				<i>t(s)</i>			
Small	0.50	0.57	0.48	0.40	7.96	9.41	8.95	8.50
2	0.38	0.33	0.19	0.21	5.73	7.02	4.74	5.04
3	0.30	0.19	0.21	0.16	6.22	4.51	5.00	3.45
Big	0.09	0.06	0.06	0.05	2.66	1.49	1.46	0.86
	<i>h</i>				<i>t(h)</i>			
Small	-0.74	0.12	0.04	0.96	-5.60	0.96	0.39	9.53
2	-0.50	0.16	0.21	0.79	-3.50	1.65	2.44	8.70
3	-0.08	0.26	0.33	0.67	-0.81	2.95	3.73	6.97
Big	0.05	0.27	0.31	0.64	0.73	3.39	3.73	5.53
	<i>r</i>				<i>t(r)</i>			
Small	-1.11	-0.60	-0.72	-0.27	-7.14	-3.98	-5.40	-2.34
2	-0.54	-0.43	-0.41	-0.41	-3.25	-3.70	-4.11	-3.90
3	-0.16	-0.26	-0.31	-0.41	-1.36	-2.49	-3.02	-3.66
Big	-0.13	-0.21	-0.21	-0.30	-1.50	-2.23	-2.12	-2.24
	<i>c</i>				<i>t(c)</i>			
Small	0.55	-0.25	-0.08	0.36	3.41	-1.61	-0.59	2.96
2	0.13	-0.06	-0.07	-0.24	0.77	-0.51	-0.65	-2.19
3	-0.21	-0.25	-0.08	-0.03	-1.70	-2.33	-0.72	-0.26
Big	-0.09	-0.06	-0.04	-0.10	-1.03	-0.63	-0.38	-0.73

Table B.1 (continued)

	Low B/M	2	3	High B/M	Low B/M	2	3	High B/M
South Korea								
	<i>a</i>				<i>t(a)</i>			
Small	-0.33	-0.18	-0.04	-0.09	-2.71	-1.65	-0.47	-0.98
2	-0.18	0.07	0.02	0.05	-1.67	0.71	0.22	0.53
3	-0.04	0.06	0.05	-0.05	-0.35	0.54	0.44	-0.44
Big	0.06	-0.05	-0.07	-0.12	0.61	-0.53	-0.84	-1.38
	<i>b</i>				<i>t(b)</i>			
Small	1.08	1.18	1.10	1.15	17.98	22.51	23.86	25.66
2	1.07	1.22	1.23	1.14	20.30	24.91	24.54	23.39
3	1.22	1.25	1.25	1.12	24.73	22.64	24.01	22.27
Big	1.15	1.13	1.12	1.21	23.51	24.07	26.91	29.16
	<i>s</i>				<i>t(s)</i>			
Small	0.95	1.19	1.05	0.97	8.22	11.81	11.82	11.16
2	0.72	1.06	1.02	0.81	7.06	11.15	10.60	8.67
3	0.74	0.85	0.85	0.56	7.78	8.04	8.43	5.77
Big	0.34	0.31	0.06	-0.01	3.59	3.47	0.73	-0.07
	<i>h</i>				<i>t(h)</i>			
Small	-1.14	-0.76	-0.57	-0.33	-10.43	-7.98	-6.85	-4.01
2	-1.23	-0.90	-0.69	-0.36	-12.79	-10.05	-7.55	-4.11
3	-1.27	-0.97	-0.66	-0.31	-14.14	-9.62	-6.98	-3.43
Big	-1.31	-0.72	-0.29	0.01	-14.64	-8.48	-3.80	0.07
	<i>r</i>				<i>t(r)</i>			
Small	0.04	0.12	0.35	0.24	0.21	0.82	2.64	1.85
2	-0.04	0.07	0.28	0.20	-0.26	0.51	1.90	1.39
3	-0.02	0.27	0.43	0.25	-0.17	1.67	2.85	1.70
Big	0.44	0.42	0.16	-0.05	3.06	3.08	1.31	-0.38
	<i>c</i>				<i>t(c)</i>			
Small	-0.78	-0.25	-0.31	-0.22	-4.03	-1.48	-2.06	-1.50
2	-0.51	-0.46	-0.30	-0.38	-3.00	-2.86	-1.84	-2.42
3	-0.11	-0.33	-0.33	-0.29	-0.68	-1.85	-1.94	-1.78
Big	-0.24	-0.31	-0.30	-0.34	-1.51	-2.06	-2.22	-2.52

Table B.1 (continued)

	Low B/M	2	3	High B/M	Low B/M	2	3	High B/M
Indonesia								
	<i>a</i>				<i>t(a)</i>			
Small	-0.66	-0.10	-0.12	-0.07	-3.22	-0.60	-0.88	-0.87
2	-0.44	-0.04	-0.21	-0.12	-2.70	-0.27	-1.94	-1.19
3	-0.09	0.10	-0.14	-0.06	-0.79	0.89	-1.32	-0.47
Big	0.01	0.00	-0.09	-0.07	0.12	-0.02	-0.85	-0.42
	<i>b</i>				<i>t(b)</i>			
Small	0.96	0.85	0.85	0.95	10.40	11.33	14.22	25.11
2	0.73	0.73	0.77	0.93	9.92	10.77	15.86	20.08
3	0.85	0.89	0.91	1.06	16.06	17.59	19.31	19.36
Big	1.07	1.14	1.12	1.07	29.36	28.88	23.85	15.35
	<i>s</i>				<i>t(s)</i>			
Small	0.67	-0.04	0.14	0.19	5.51	-0.43	1.78	3.83
2	0.14	0.06	0.14	-0.12	1.44	0.70	2.23	-1.91
3	0.06	-0.12	-0.05	-0.22	0.81	-1.84	-0.81	-3.03
Big	-0.12	-0.18	-0.28	-0.20	-2.57	-3.51	-4.46	-2.16
	<i>h</i>				<i>t(h)</i>			
Small	-0.28	0.08	0.24	0.77	-1.74	0.62	2.31	11.72
2	-0.59	0.42	0.16	0.78	-4.66	3.59	1.90	9.72
3	-0.38	0.39	0.53	0.85	-4.13	4.38	6.41	8.96
Big	-0.03	0.26	0.66	1.10	-0.48	3.78	8.09	9.03
	<i>r</i>				<i>t(r)</i>			
Small	-0.19	-0.25	-0.08	-0.04	-1.14	-1.82	-0.71	-0.60
2	-0.34	-0.10	-0.18	-0.23	-2.48	-0.78	-2.03	-2.75
3	-0.26	-0.34	0.06	-0.25	-2.64	-3.58	0.74	-2.45
Big	-0.03	-0.17	-0.09	0.06	-0.37	-2.27	-1.08	0.48
	<i>c</i>				<i>t(c)</i>			
Small	-0.36	0.33	0.03	-0.04	-2.31	2.59	0.26	-0.60
2	0.01	-0.41	-0.27	-0.14	0.05	-3.59	-3.23	-1.82
3	-0.10	-0.35	-0.07	-0.31	-1.11	-4.04	-0.81	-3.36
Big	-0.14	-0.18	-0.15	-0.22	-2.33	-2.74	-1.86	-1.82

Table B.1 (continued)

	Low B/M	2	3	High B/M	Low B/M	2	3	High B/M
Australia								
	<i>a</i>				<i>t(a)</i>			
Small	-0.91	-0.14	-0.30	-0.40	-3.60	-0.57	-1.57	-2.57
2	-0.50	-0.17	-0.14	-0.05	-2.75	-0.94	-0.95	-0.30
3	-0.09	0.10	0.14	0.05	-0.60	0.73	1.00	0.33
Big	0.33	0.21	0.17	0.31	2.86	1.98	1.61	1.89
	<i>b</i>				<i>t(b)</i>			
Small	0.94	0.68	0.87	0.82	8.52	6.36	10.50	12.23
2	0.97	1.00	0.93	1.03	12.20	12.45	14.30	15.56
3	1.01	0.98	1.00	1.07	14.86	15.78	17.10	17.52
Big	1.02	1.19	1.07	1.39	20.50	25.81	23.21	19.35
	<i>s</i>				<i>t(s)</i>			
Small	0.21	0.17	0.28	0.25	3.36	2.89	6.03	6.62
2	0.16	0.17	0.13	0.09	3.60	3.70	3.49	2.29
3	0.17	0.09	0.11	0.08	4.35	2.55	3.36	2.42
Big	0.08	0.04	0.03	0.02	2.93	1.43	1.31	0.58
	<i>h</i>				<i>t(h)</i>			
Small	-0.41	0.19	0.51	0.92	-3.34	1.63	5.51	12.31
2	-0.14	0.38	0.48	0.88	-1.55	4.31	6.58	12.04
3	-0.12	0.32	0.41	0.75	-1.59	4.63	6.36	11.12
Big	-0.03	0.18	0.25	0.73	-0.54	3.53	4.95	9.17
	<i>r</i>				<i>t(r)</i>			
Small	-1.38	-1.22	-0.67	-0.76	-9.09	-8.28	-5.84	-8.15
2	-0.88	-0.83	-0.59	-0.82	-8.02	-7.48	-6.52	-9.04
3	-0.64	-0.56	-0.45	-0.48	-6.75	-6.52	-5.53	-5.68
Big	-0.29	-0.19	-0.24	-0.53	-4.24	-2.93	-3.74	-5.32
	<i>c</i>				<i>t(c)</i>			
Small	-0.09	0.05	-0.01	0.21	-0.59	0.34	-0.09	2.16
2	0.24	0.59	0.25	0.37	2.13	5.17	2.67	3.91
3	0.45	0.38	0.33	0.28	4.59	4.29	3.89	3.16
Big	0.25	0.17	0.19	0.26	3.47	2.56	2.90	2.57

Table B.1 (continued)

	Low B/M	2	3	High B/M	Low B/M	2	3	High B/M
Singapore								
	<i>a</i>				<i>t(a)</i>			
Small	-0.77	-0.36	-0.14	0.05	-3.31	-0.96	-0.78	0.40
2	0.05	-0.02	-0.13	-0.09	0.36	-0.12	-1.26	-0.72
3	0.23	-0.01	0.01	-0.10	2.12	-0.09	0.16	-0.76
Big	0.11	0.04	-0.02	-0.03	1.60	0.60	-0.28	-0.26
	<i>b</i>				<i>t(b)</i>			
Small	1.18	0.68	0.87	0.66	9.86	3.53	9.44	9.63
2	0.77	0.59	0.72	0.88	10.89	7.51	13.42	13.71
3	0.74	0.75	0.82	1.03	13.08	14.98	18.76	14.51
Big	0.83	0.95	0.97	1.20	24.19	28.65	24.75	17.41
	<i>s</i>				<i>t(s)</i>			
Small	0.29	0.09	0.10	0.20	7.91	1.56	3.67	9.59
2	0.03	-0.02	0.01	-0.03	1.41	-0.73	0.47	-1.71
3	0.00	-0.01	-0.02	0.00	0.10	-0.65	-1.24	-0.11
Big	0.00	0.00	-0.01	-0.01	-0.38	0.02	-1.10	-0.30
	<i>h</i>				<i>t(h)</i>			
Small	-1.40	0.34	-0.10	1.16	-12.07	1.84	-1.14	17.49
2	-0.14	0.13	0.14	0.56	-2.04	1.66	2.61	9.03
3	-0.01	0.16	0.11	0.48	-0.17	3.23	2.73	6.97
Big	0.01	0.08	0.09	0.26	0.34	2.46	2.47	3.90
	<i>r</i>				<i>t(r)</i>			
Small	-0.22	-0.18	-0.50	0.31	-1.78	-0.90	-5.26	4.43
2	0.05	-0.18	-0.25	-0.31	0.67	-2.27	-4.46	-4.72
3	-0.06	-0.06	-0.10	-0.25	-0.97	-1.08	-2.21	-3.41
Big	-0.05	-0.04	-0.08	-0.08	-1.47	-1.19	-1.99	-1.17
	<i>c</i>				<i>t(c)</i>			
Small	1.28	1.05	0.10	0.50	11.38	5.84	1.18	7.81
2	0.17	0.20	0.10	0.35	2.59	2.66	1.98	5.75
3	0.26	0.06	0.07	0.19	4.87	1.37	1.79	2.89
Big	0.04	0.03	0.01	0.18	1.39	0.87	0.31	2.75

Table B.1 (continued)

	Low B/M	2	3	High B/M	Low B/M	2	3	High B/M
Global								
	<i>a</i>				<i>t(a)</i>			
Small	-0.15	-0.04	-0.14	-0.34	-1.28	-0.33	-1.42	-3.64
2	-0.14	-0.13	-0.22	-0.38	-1.16	-1.17	-1.98	-3.25
3	-0.30	-0.31	-0.28	-0.26	-2.66	-2.60	-2.43	-2.21
Big	-0.32	-0.38	-0.14	0.19	-3.27	-3.81	-1.46	1.49
	<i>b</i>				<i>t(b)</i>			
Small	0.53	0.52	0.50	0.52	9.45	9.27	10.58	11.84
2	0.54	0.59	0.50	0.52	9.80	11.15	9.82	9.70
3	0.57	0.54	0.53	0.55	10.97	9.85	10.08	9.90
Big	0.52	0.54	0.56	0.57	11.27	11.80	12.26	9.69
	<i>s</i>				<i>t(s)</i>			
Small	-0.40	-0.38	-0.38	-0.33	-4.19	-4.06	-4.74	-4.38
2	-0.54	-0.50	-0.59	-0.73	-5.80	-5.65	-6.79	-7.96
3	-0.66	-0.84	-0.88	-0.95	-7.44	-8.99	-9.74	-10.06
Big	-0.81	-0.96	-0.91	-0.85	-10.35	-12.29	-11.70	-8.44
	<i>h</i>				<i>t(h)</i>			
Small	-0.73	-0.47	-0.12	0.38	-5.75	-3.68	-1.08	3.73
2	-0.80	-0.40	-0.09	0.44	-6.37	-3.30	-0.75	3.57
3	-0.69	-0.18	0.02	0.35	-5.78	-1.47	0.16	2.74
Big	-0.34	0.04	0.12	0.52	-3.18	0.34	1.19	3.80
	<i>r</i>				<i>t(r)</i>			
Small	-2.43	-2.07	-1.51	-1.10	-11.92	-10.19	-8.76	-6.83
2	-2.22	-1.74	-1.28	-1.01	-10.99	-9.08	-6.86	-5.10
3	-1.30	-1.06	-1.14	-1.38	-6.79	-5.31	-5.91	-6.80
Big	-0.41	-0.63	-1.27	-1.75	-2.44	-3.75	-7.61	-8.10
	<i>c</i>				<i>t(c)</i>			
Small	0.45	0.18	0.07	-0.14	2.03	0.81	0.38	-0.82
2	0.03	-0.12	0.11	0.07	0.14	-0.60	0.53	0.31
3	0.06	0.09	0.15	0.25	0.27	0.43	0.72	1.16
Big	-0.01	-0.11	0.07	0.62	-0.07	-0.63	0.36	2.66

Table B.1 (continued)

	Low B/M	2	3	High B/M	Low B/M	2	3	High B/M
Emerging								
	<i>a</i>				<i>t(a)</i>			
Small	0.02	0.02	-0.08	-0.26	0.19	0.15	-1.03	-3.49
2	-0.04	-0.10	-0.19	-0.34	-0.39	-1.06	-1.98	-3.52
3	-0.27	-0.28	-0.25	-0.21	-2.91	-2.80	-2.62	-2.13
Big	-0.26	-0.36	-0.11	0.26	-3.38	-4.42	-1.37	2.39
	<i>b</i>				<i>t(b)</i>			
Small	0.56	0.58	0.57	0.56	12.86	14.03	16.90	18.06
2	0.58	0.63	0.55	0.55	13.13	16.41	14.04	13.55
3	0.61	0.58	0.56	0.58	15.49	13.78	13.85	13.88
Big	0.56	0.55	0.61	0.66	17.64	16.26	17.62	14.40
	<i>s</i>				<i>t(s)</i>			
Small	-1.20	-0.83	-0.54	-0.10	-9.45	-6.88	-5.56	-1.13
2	-1.32	-0.83	-0.49	0.07	-10.22	-7.41	-4.29	0.60
3	-1.09	-0.59	-0.39	-0.05	-9.56	-4.84	-3.32	-0.41
Big	-0.70	-0.33	-0.29	0.17	-7.58	-3.37	-2.90	1.29
	<i>h</i>				<i>t(h)</i>			
Small	-1.20	-0.83	-0.54	-0.10	-9.45	-6.88	-5.56	-1.13
2	-1.32	-0.83	-0.49	0.07	-10.22	-7.41	-4.29	0.60
3	-1.09	-0.59	-0.39	-0.05	-9.56	-4.84	-3.32	-0.41
Big	-0.70	-0.33	-0.29	0.17	-7.58	-3.37	-2.90	1.29
	<i>r</i>				<i>t(r)</i>			
Small	-2.00	-1.71	-1.04	-0.53	-10.15	-9.20	-6.83	-3.84
2	-1.82	-1.32	-0.84	-0.58	-9.09	-7.61	-4.75	-3.14
3	-0.80	-0.60	-0.77	-1.00	-4.55	-3.21	-4.19	-5.26
Big	0.00	-0.32	-1.01	-1.36	0.02	-2.10	-6.45	-6.56
	<i>c</i>				<i>t(c)</i>			
Small	1.19	0.66	0.71	0.49	5.07	2.99	3.94	3.00
2	0.71	0.38	0.67	0.48	3.00	1.84	3.20	2.21
3	0.54	0.60	0.69	0.81	2.59	2.70	3.16	3.62
Big	0.48	0.34	0.65	1.12	2.82	1.90	3.51	4.53

Table B.2: Regressions for 16 value-weight *Size-OP* portfolios

We construct 16 *Size-OP* portfolios for each region at the end of December of each year. The *Size* breakpoints are 25th, 50th, and 75th percentiles of market cap for each country. Similarly for the breakpoints of *OP* (profitability) quartiles. The intersection of the 4x4 independent *Size* and *OP* sorts for each country produce 16 value-weight *Size-OP* portfolios. The table shows the five-factor slopes and *t*-statistics for these portfolios. The five factor model is

$$R_{it} - R_{Ft} = a_i + b_i(R_{Mt} - R_{Ft}) + s_iSMB_t + h_iHML_t + r_iRMW_t + c_iCMA_t + e_{it}$$

	Low OP	2	3	High OP	Low OP	2	3	High OP
South Africa								
	<i>a</i>				<i>t(a)</i>			
Small	-0.73	-0.35	-0.63	-0.68	-3.49	-1.61	-1.87	-3.22
2	-0.59	-0.53	-0.37	-0.51	-3.47	-3.36	-2.09	-2.48
3	-0.36	-0.43	-0.40	-0.39	-2.12	-2.42	-2.49	-2.43
Big	-0.53	-0.56	-0.48	-0.61	-2.80	-3.31	-2.97	-3.66
	<i>b</i>				<i>t(b)</i>			
Small	1.03	0.72	0.20	0.96	9.98	6.70	1.19	9.19
2	0.53	0.51	0.62	0.61	6.26	6.52	7.08	5.91
3	0.88	0.58	0.67	0.67	10.50	6.67	8.42	8.47
Big	1.17	0.79	0.84	0.94	12.50	9.44	10.57	11.42
	<i>s</i>				<i>t(s)</i>			
Small	0.69	0.17	0.32	0.75	8.87	2.07	2.57	9.49
2	-0.25	-0.11	-0.08	-0.03	-3.86	-1.92	-1.14	-0.36
3	-0.21	-0.16	-0.12	-0.17	-3.39	-2.48	-1.98	-2.87
Big	-0.41	-0.34	-0.23	-0.28	-5.85	-5.36	-3.80	-4.54
	<i>h</i>				<i>t(h)</i>			
Small	-0.24	0.21	-1.56	0.12	-2.46	2.08	-9.99	1.22
2	0.12	0.03	-0.17	-0.25	1.55	0.41	-2.14	-2.59
3	0.00	-0.01	-0.05	-0.07	-0.04	-0.10	-0.65	-0.91
Big	-0.03	-0.11	-0.14	-0.13	-0.36	-1.44	-1.95	-1.70
	<i>r</i>				<i>t(r)</i>			
Small	-0.78	0.14	0.07	1.37	-8.42	1.49	0.50	14.65
2	0.01	0.11	0.03	0.23	0.16	1.52	0.44	2.48
3	-0.05	0.10	0.08	0.20	-0.72	1.32	1.08	2.89
Big	-0.24	0.11	0.20	0.31	-2.84	1.43	2.80	4.25

Testing the Fama-French five-factor model emerging and developed markets

	<i>c</i>				<i>t(c)</i>			
Small	0.06	0.03	0.99	0.68	0.62	0.31	6.78	7.40
2	0.21	0.07	0.11	0.05	2.89	1.06	1.42	0.58
3	0.38	0.08	0.09	0.20	5.16	1.06	1.35	2.93
Big	0.34	0.22	0.14	0.19	4.13	3.04	2.05	2.67

Table B.2 (continued)

	Low OP	2	3	High OP	Low B/M	2	3	High OP
China								
	<i>a</i>				<i>t(a)</i>			
Small	-0.13	-0.14	-0.10	-0.07	-2.23	-2.11	-1.29	-1.04
2	-0.16	-0.23	-0.16	-0.15	-2.51	-3.33	-2.06	-2.16
3	-0.12	-0.20	-0.20	-0.19	-1.89	-2.84	-2.96	-2.48
Big	-0.10	-0.19	-0.17	-0.14	-1.57	-3.04	-2.52	-2.71
	<i>b</i>				<i>t(b)</i>			
Small	1.01	1.01	1.00	0.98	52.19	44.43	40.26	42.88
2	1.02	1.02	1.00	1.02	49.46	44.72	37.95	43.53
3	1.01	1.04	1.04	0.99	47.97	43.74	45.86	39.94
Big	1.04	1.03	1.04	1.03	51.57	50.70	47.14	61.00
	<i>s</i>				<i>t(s)</i>			
Small	0.96	1.04	1.04	1.06	15.66	14.48	13.26	14.66
2	0.74	0.97	0.95	1.03	11.35	13.36	11.44	13.87
3	0.69	0.81	0.79	0.88	10.32	10.74	10.97	11.19
Big	0.31	0.49	0.49	0.46	4.85	7.56	7.03	8.65
	<i>h</i>				<i>t(h)</i>			
Small	-0.44	-0.38	-0.39	-0.41	-6.34	-4.64	-4.39	-5.05
2	-0.56	-0.41	-0.31	-0.38	-7.52	-5.02	-3.31	-4.44
3	-0.27	-0.48	-0.45	-0.49	-3.51	-5.62	-5.56	-5.41
Big	-0.15	-0.40	-0.53	-0.36	-2.05	-5.45	-6.62	-6.01
	<i>r</i>				<i>t(r)</i>			
Small	-0.46	-0.22	-0.03	-0.11	-4.48	-1.80	-0.22	-0.91
2	-0.56	-0.37	-0.26	0.13	-5.15	-3.03	-1.84	1.07
3	-0.85	-0.43	-0.18	0.31	-7.58	-3.40	-1.46	2.38
Big	-1.10	-0.34	-0.27	0.45	-10.32	-3.12	-2.26	5.01
	<i>c</i>				<i>t(c)</i>			
Small	-0.04	-0.26	-0.28	-0.19	-0.34	-2.01	-1.98	-1.47
2	0.05	-0.48	-0.65	-0.24	0.39	-3.75	-4.37	-1.81
3	-0.28	-0.47	-0.45	-0.14	-2.35	-3.49	-3.51	-1.00
Big	-0.33	-0.28	-0.29	-0.02	-2.88	-2.41	-2.36	-0.21

Table B.2 (continued)

	Low OP	2	3	High OP	Low OP	2	3	High OP
India								
	<i>a</i>				<i>t(a)</i>			
Small	-0.19	-0.16	-0.05	-0.18	-2.11	-1.72	-0.46	-1.68
2	-0.06	-0.20	-0.14	-0.19	-0.65	-1.90	-1.41	-1.75
3	-0.18	-0.17	-0.11	-0.21	-1.74	-1.62	-1.03	-1.88
Big	-0.21	-0.23	-0.12	-0.12	-2.19	-2.52	-1.39	-1.41
	<i>b</i>				<i>t(b)</i>			
Small	0.42	0.45	0.47	0.47	8.74	9.15	8.47	8.51
2	0.42	0.38	0.35	0.36	7.94	6.96	6.45	6.21
3	0.40	0.36	0.34	0.32	7.09	6.42	5.79	5.37
Big	0.43	0.44	0.45	0.47	8.50	9.24	10.13	10.44
	<i>s</i>				<i>t(s)</i>			
Small	-0.07	0.06	-0.02	0.16	-1.07	0.85	-0.23	2.05
2	-0.53	-0.54	-0.48	-0.40	-7.08	-6.96	-6.38	-4.87
3	-1.10	-0.92	-0.92	-0.81	-13.87	-11.67	-11.07	-9.64
Big	-1.29	-1.15	-0.89	-0.80	-18.01	-17.08	-13.96	-12.54
	<i>h</i>				<i>t(h)</i>			
Small	0.83	0.90	1.21	1.14	9.48	9.83	11.81	11.27
2	1.33	1.66	1.43	1.60	13.84	16.42	14.53	14.91
3	1.37	1.50	1.43	1.50	13.40	14.73	13.34	13.77
Big	1.20	1.06	0.89	0.80	12.94	12.17	10.75	9.62
	<i>r</i>				<i>t(r)</i>			
Small	0.12	0.56	0.61	0.98	0.88	3.90	3.82	6.19
2	-0.07	0.75	0.87	1.31	-0.46	4.74	5.62	7.79
3	0.07	0.80	0.96	1.41	0.41	5.01	5.67	8.22
Big	-0.13	0.16	0.48	0.71	-0.88	1.20	3.70	5.47
	<i>c</i>				<i>t(c)</i>			
Small	0.25	0.35	0.34	0.40	1.52	2.01	1.76	2.12
2	0.16	0.27	0.26	0.47	0.90	1.42	1.43	2.31
3	0.61	0.48	0.41	0.44	3.13	2.48	2.04	2.13
Big	0.49	0.41	0.31	0.28	2.79	2.50	2.01	1.81

Table B.2 (continued)

	Low OP	2	3	High OP	Low OP	2	3	High OP
Malaysia								
	<i>a</i>				<i>t(a)</i>			
Small	0.20	0.04	0.19	0.26	1.98	0.31	1.20	1.52
2	0.21	0.18	0.28	0.15	2.04	1.92	2.57	1.15
3	0.25	0.22	0.17	0.26	2.30	2.27	1.72	2.42
Big	0.03	0.12	0.13	0.19	0.33	1.28	1.47	2.26
	<i>b</i>				<i>t(b)</i>			
Small	1.13	1.13	1.04	1.17	16.43	13.80	9.89	10.24
2	1.21	1.13	1.08	1.10	17.67	17.86	14.78	12.48
3	1.19	1.19	1.15	1.19	16.68	18.27	17.73	16.39
Big	1.30	1.33	1.31	1.20	19.26	20.95	22.73	21.68
	<i>s</i>				<i>t(s)</i>			
Small	0.33	0.36	0.51	1.13	7.45	6.88	7.58	15.64
2	0.26	0.24	0.22	0.35	5.91	5.91	4.76	6.22
3	0.21	0.19	0.20	0.25	4.71	4.53	4.73	5.49
Big	0.03	0.10	0.06	0.07	0.76	2.36	1.56	2.06
	<i>h</i>				<i>t(h)</i>			
Small	0.12	0.38	0.00	0.41	1.30	3.38	0.02	2.67
2	0.25	0.28	0.31	0.40	2.68	3.28	3.10	3.35
3	0.37	0.34	0.28	0.19	3.86	3.88	3.13	1.96
Big	0.35	0.35	0.20	0.12	3.86	4.06	2.53	1.59
	<i>r</i>				<i>t(r)</i>			
Small	-1.17	-0.43	-0.57	1.44	-10.74	-3.34	-3.43	8.00
2	-0.83	-0.42	-0.36	0.07	-7.61	-4.16	-3.08	0.49
3	-0.61	-0.31	-0.27	-0.05	-5.41	-3.05	-2.60	-0.42
Big	-0.37	-0.27	-0.19	-0.08	-3.47	-2.64	-2.13	-0.86
	<i>c</i>				<i>t(c)</i>			
Small	0.06	-0.19	-0.18	1.37	0.50	-1.44	-1.06	7.32
2	-0.07	-0.09	-0.11	-0.23	-0.65	-0.89	-0.91	-1.58
3	-0.03	-0.10	-0.21	-0.18	-0.27	-0.92	-1.97	-1.51
Big	0.06	-0.09	-0.06	-0.09	0.50	-0.88	-0.67	-1.00

Table B.2 (continued)

	Low OP	2	3	High OP	Low OP	2	3	High OP
South Korea								
	<i>a</i>				<i>t(a)</i>			
Small	-0.09	-0.11	-0.05	-0.40	-0.94	-1.18	-0.48	-3.57
2	-0.03	0.07	0.04	0.01	-0.31	0.68	0.38	0.10
3	-0.04	0.02	0.03	0.00	-0.35	0.23	0.27	0.00
Big	-0.04	-0.06	-0.03	-0.02	-0.35	-0.59	-0.38	-0.27
	<i>b</i>				<i>t(b)</i>			
Small	1.14	1.22	1.06	1.06	24.57	26.19	22.12	19.11
2	1.16	1.12	1.22	1.28	23.65	22.47	25.18	25.21
3	1.22	1.19	1.19	1.25	24.22	23.00	22.94	23.66
Big	1.26	1.12	1.18	1.13	24.06	24.34	28.20	25.52
	<i>s</i>				<i>t(s)</i>			
Small	0.97	1.18	1.03	1.02	10.83	13.11	11.12	9.62
2	0.69	0.93	1.00	1.19	7.27	9.71	10.68	12.19
3	0.59	0.71	0.80	0.88	6.06	7.17	7.96	8.68
Big	0.10	0.06	0.13	0.32	0.96	0.66	1.66	3.74
	<i>h</i>				<i>t(h)</i>			
Small	-0.70	-0.51	-0.51	-0.68	-8.28	-6.01	-5.87	-6.76
2	-0.80	-0.67	-0.73	-0.76	-8.89	-7.38	-8.32	-8.22
3	-0.86	-0.83	-0.79	-0.93	-9.35	-8.82	-8.29	-9.65
Big	-0.70	-0.66	-0.57	-0.71	-7.32	-7.89	-7.51	-8.74
	<i>r</i>				<i>t(r)</i>			
Small	-0.22	0.42	0.42	0.83	-1.63	3.14	3.01	5.21
2	-0.37	0.14	0.33	0.60	-2.59	1.00	2.33	4.08
3	-0.45	0.23	0.32	0.74	-3.06	1.54	2.14	4.84
Big	-0.45	0.07	0.19	0.57	-2.94	0.54	1.60	4.41
	<i>c</i>				<i>t(c)</i>			
Small	-0.45	-0.11	-0.24	-0.50	-2.96	-0.72	-1.53	-2.80
2	-0.44	-0.33	-0.39	-0.44	-2.76	-2.05	-2.48	-2.70
3	0.01	-0.31	-0.34	-0.33	0.08	-1.87	-2.01	-1.92
Big	-0.50	-0.28	-0.34	-0.21	-2.93	-1.88	-2.53	-1.48

Table B.2 (continued)

	Low OP	2	3	High OP	Low OP	2	3	High OP
Indonesia								
	<i>a</i>				<i>t(a)</i>			
Small	-0.15	-0.03	-0.02	-0.52	-1.67	-0.25	-0.11	-3.39
2	-0.23	-0.19	-0.06	-0.06	-2.06	-1.89	-0.46	-0.49
3	-0.10	0.01	-0.05	-0.06	-0.79	0.09	-0.45	-0.48
Big	0.11	0.01	-0.02	-0.06	0.76	0.06	-0.22	-0.74
	<i>b</i>				<i>t(b)</i>			
Small	1.02	0.88	0.88	0.82	25.20	18.86	10.36	12.03
2	0.90	0.85	0.75	0.66	18.52	18.72	11.92	11.26
3	0.97	0.87	0.99	0.81	16.80	15.12	20.94	15.85
Big	0.90	1.02	1.10	1.16	13.44	19.59	28.58	33.43
	<i>s</i>				<i>t(s)</i>			
Small	0.15	0.28	-0.05	0.35	2.90	4.54	-0.41	3.92
2	-0.15	0.13	0.08	0.05	-2.35	2.09	1.01	0.62
3	-0.14	-0.01	-0.12	0.01	-1.80	-0.14	-1.95	0.10
Big	-0.16	-0.18	-0.17	-0.18	-1.77	-2.68	-3.43	-3.92
	<i>h</i>				<i>t(h)</i>			
Small	0.35	0.57	1.02	0.38	4.95	7.05	6.90	3.24
2	0.34	0.31	0.62	0.47	3.97	3.88	5.68	4.62
3	0.10	0.37	0.39	0.26	1.03	3.70	4.79	2.94
Big	0.41	0.30	0.23	0.22	3.51	3.35	3.46	3.69
	<i>r</i>				<i>t(r)</i>			
Small	-0.56	0.07	0.27	0.68	-7.49	0.81	1.73	5.43
2	-0.71	-0.15	-0.01	0.42	-7.91	-1.80	-0.10	3.92
3	-0.90	-0.13	-0.08	0.29	-8.45	-1.22	-0.91	3.04
Big	-0.61	-0.26	-0.21	0.15	-4.91	-2.67	-2.90	2.28
	<i>c</i>				<i>t(c)</i>			
Small	-0.04	-0.06	0.04	0.22	-0.64	-0.74	0.29	1.91
2	0.04	-0.26	-0.63	-0.06	0.53	-3.35	-5.96	-0.62
3	-0.22	-0.31	-0.18	-0.09	-2.27	-3.15	-2.27	-1.06
Big	-0.27	-0.15	-0.16	-0.16	-2.32	-1.66	-2.42	-2.64

Table B.2 (continued)

	Low OP	2	3	High OP	Low OP	2	3	High OP
Australia								
	<i>a</i>				<i>t(a)</i>			
Small	-0.32	-0.31	-0.36	-1.40	-2.12	-1.67	-1.33	-5.33
2	-0.28	-0.28	-0.07	-0.43	-1.79	-1.70	-0.42	-2.00
3	0.04	-0.03	0.17	0.00	0.27	-0.20	1.35	-0.01
Big	0.25	0.19	0.24	0.25	1.40	1.28	2.21	2.37
	<i>b</i>				<i>t(b)</i>			
Small	0.82	0.85	0.74	0.86	12.54	10.59	6.27	7.51
2	1.00	0.97	0.88	0.96	14.89	13.63	12.34	10.24
3	1.11	1.08	0.95	0.89	16.28	16.12	16.95	13.57
Big	1.28	1.26	1.12	1.07	16.58	19.58	23.77	23.92
	<i>s</i>				<i>t(s)</i>			
Small	0.23	0.24	0.29	0.30	6.19	5.36	4.34	4.73
2	0.04	0.15	0.15	0.15	1.00	3.81	3.78	2.89
3	0.10	0.14	0.09	0.10	2.60	3.60	2.77	2.79
Big	0.05	0.11	0.04	0.04	1.05	2.95	1.32	1.75
	<i>h</i>				<i>t(h)</i>			
Small	0.23	0.68	0.77	0.54	3.18	7.63	5.90	4.23
2	0.26	0.54	0.50	0.40	3.51	6.84	6.34	3.84
3	0.17	0.40	0.44	0.30	2.22	5.36	7.03	4.10
Big	0.16	0.20	0.26	0.13	1.81	2.80	4.92	2.53
	<i>r</i>				<i>t(r)</i>			
Small	-1.38	-0.79	-0.64	-0.08	-15.30	-7.16	-3.97	-0.48
2	-1.20	-0.66	-0.41	-0.33	-12.93	-6.70	-4.17	-2.56
3	-0.90	-0.67	-0.43	-0.20	-9.53	-7.25	-5.50	-2.22
Big	-0.83	-0.41	-0.26	-0.14	-7.82	-4.65	-3.97	-2.22
	<i>c</i>				<i>t(c)</i>			
Small	-0.08	0.36	0.45	-0.35	-0.85	3.11	2.70	-2.13
2	0.21	0.58	0.27	0.38	2.22	5.65	2.68	2.86
3	0.24	0.51	0.28	0.32	2.43	5.32	3.49	3.41
Big	0.29	0.26	0.22	0.16	2.62	2.88	3.32	2.54

Table B.2 (continued)

	Low OP	2	3	High OP	Low OP	2	3	High OP
Singapore								
	<i>a</i>				<i>t(a)</i>			
Small	0.01	-0.19	-0.42	-0.65	0.09	-1.03	-1.94	-2.63
2	-0.24	-0.08	0.08	0.05	-1.60	-0.87	0.82	0.37
3	-0.12	0.02	0.08	0.07	-0.84	0.24	0.81	0.76
Big	-0.10	-0.01	0.05	0.13	-0.71	-0.12	0.73	1.88
	<i>b</i>				<i>t(b)</i>			
Small	0.81	0.72	0.90	0.82	11.09	7.51	7.91	6.37
2	0.82	0.70	0.66	0.87	10.75	13.94	12.48	12.28
3	0.86	0.79	0.89	0.80	12.06	16.33	16.61	16.45
Big	1.12	0.89	0.95	0.88	15.04	24.49	27.21	25.16
	<i>s</i>				<i>t(s)</i>			
Small	0.16	0.24	0.04	0.25	7.30	8.02	1.17	6.40
2	-0.06	0.00	-0.01	0.06	-2.38	0.14	-0.39	2.75
3	0.00	0.00	-0.03	0.00	-0.07	-0.30	-1.57	-0.06
Big	0.03	-0.01	0.00	-0.01	1.26	-0.66	-0.18	-1.32
	<i>h</i>				<i>t(h)</i>			
Small	0.05	0.56	0.18	0.57	0.75	5.98	1.63	4.56
2	0.44	0.18	0.09	0.11	5.98	3.81	1.70	1.63
3	0.25	0.16	0.14	0.21	3.65	3.46	2.68	4.48
Big	0.04	0.08	0.08	0.06	0.50	2.41	2.24	1.63
	<i>r</i>				<i>t(r)</i>			
Small	-0.78	0.00	-0.29	1.78	-10.40	0.00	-2.52	13.47
2	-0.63	-0.05	-0.07	0.05	-8.06	-0.93	-1.36	0.70
3	-0.46	-0.06	-0.09	0.03	-6.25	-1.12	-1.58	0.50
Big	-0.33	-0.08	-0.04	0.02	-4.37	-2.08	-1.18	0.63
	<i>c</i>				<i>t(c)</i>			
Small	0.65	0.04	-0.09	1.71	9.48	0.42	-0.89	14.15
2	0.33	0.13	0.17	0.19	4.57	2.67	3.38	2.89
3	0.18	0.06	0.25	0.05	2.63	1.38	4.90	1.11
Big	0.02	0.01	0.06	0.05	0.32	0.24	1.85	1.65

Table B.2 (continued)

	Low OP	2	3	High OP	Low OP	2	3	High OP
Global								
	<i>a</i>				<i>t(a)</i>			
Small	-0.16	-0.08	-0.01	-0.47	-1.54	-0.73	-0.10	-4.02
2	-0.19	-0.26	-0.10	-0.25	-1.78	-2.31	-0.84	-2.05
3	-0.41	-0.25	-0.21	-0.25	-3.55	-2.13	-1.84	-2.13
Big	-0.25	-0.32	-0.22	-0.19	-2.14	-3.20	-2.29	-1.96
	<i>b</i>				<i>t(b)</i>			
Small	0.51	0.52	0.54	0.57	10.81	9.96	9.63	10.44
2	0.54	0.54	0.52	0.54	11.01	10.33	9.79	9.61
3	0.55	0.55	0.56	0.53	10.41	10.06	10.83	9.51
Big	0.57	0.53	0.55	0.53	10.61	11.38	12.40	11.93
	<i>s</i>				<i>t(s)</i>			
Small	-0.45	-0.48	-0.40	-0.22	-5.59	-5.38	-4.17	-2.40
2	-0.64	-0.60	-0.61	-0.63	-7.66	-6.76	-6.76	-6.68
3	-0.91	-0.81	-0.79	-0.81	-10.11	-8.74	-8.95	-8.56
Big	-1.12	-0.93	-0.88	-0.78	-12.30	-11.68	-11.66	-10.36
	<i>h</i>				<i>t(h)</i>			
Small	-0.14	-0.19	-0.33	0.04	-1.33	-1.58	-2.55	0.29
2	-0.08	-0.12	-0.25	-0.15	-0.73	-1.01	-2.06	-1.15
3	-0.08	-0.23	-0.12	-0.20	-0.67	-1.84	-1.04	-1.58
Big	0.05	-0.02	0.00	-0.04	0.38	-0.22	0.00	-0.38
	<i>r</i>				<i>t(r)</i>			
Small	-2.06	-1.90	-1.79	-1.33	-11.92	-9.92	-8.76	-6.63
2	-1.98	-1.49	-1.50	-1.13	-11.10	-7.74	-7.68	-5.54
3	-1.42	-1.44	-1.21	-0.94	-7.29	-7.24	-6.34	-4.60
Big	-1.64	-0.99	-0.86	-0.55	-8.37	-5.78	-5.26	-3.37
	<i>c</i>				<i>t(c)</i>			
Small	0.02	0.12	0.19	-0.17	0.11	0.60	0.88	-0.81
2	-0.04	-0.07	0.10	0.19	-0.21	-0.36	0.47	0.86
3	0.22	0.13	-0.03	0.22	1.03	0.60	-0.13	1.03
Big	0.50	0.03	-0.04	0.07	2.34	0.18	-0.23	0.42

Table B.2 (continued)

	Low OP	2	3	High OP	Low OP	2	3	High OP
Emerging								
	<i>a</i>				<i>t(a)</i>			
Small	-0.07	0.03	0.05	-0.27	-0.86	0.28	0.52	-3.02
2	-0.10	-0.23	-0.09	-0.20	-1.17	-2.38	-0.95	-2.02
3	-0.35	-0.21	-0.20	-0.22	-3.74	-2.12	-2.09	-2.20
Big	-0.17	-0.27	-0.19	-0.12	-1.80	-3.43	-2.50	-1.55
	<i>b</i>				<i>t(b)</i>			
Small	0.58	0.58	0.60	0.59	16.73	15.02	14.23	15.59
2	0.57	0.58	0.59	0.60	15.89	14.68	14.34	14.14
3	0.58	0.58	0.59	0.59	14.94	13.84	14.88	13.84
Big	0.60	0.60	0.57	0.58	15.24	18.52	17.71	18.21
	<i>s</i>				<i>t(s)</i>			
Small	-0.18	-0.19	-0.15	0.01	-2.50	-2.36	-1.75	0.19
2	-0.38	-0.38	-0.37	-0.38	-5.13	-4.67	-4.37	-4.39
3	-0.71	-0.59	-0.56	-0.56	-8.85	-6.86	-6.89	-6.49
Big	-0.87	-0.65	-0.66	-0.51	-10.69	-9.69	-9.94	-7.83
	<i>h</i>				<i>t(h)</i>			
Small	-0.60	-0.64	-0.77	-0.64	-5.95	-5.68	-6.24	-5.76
2	-0.51	-0.56	-0.63	-0.53	-4.81	-4.82	-5.22	-4.32
3	-0.44	-0.69	-0.55	-0.61	-3.90	-5.59	-4.71	-4.96
Big	-0.28	-0.39	-0.40	-0.40	-2.40	-4.14	-4.28	-4.34
	<i>r</i>				<i>t(r)</i>			
Small	-1.55	-1.43	-1.35	-0.81	-9.88	-8.20	-7.07	-4.70
2	-1.59	-1.06	-1.08	-0.68	-9.76	-5.91	-5.81	-3.60
3	-1.03	-1.02	-0.78	-0.45	-5.90	-5.35	-4.33	-2.38
Big	-1.34	-0.64	-0.51	-0.16	-7.54	-4.38	-3.52	-1.10
	<i>c</i>				<i>t(c)</i>			
Small	0.73	0.72	0.82	0.72	3.88	3.45	3.62	3.54
2	0.49	0.45	0.58	0.71	2.51	2.13	2.63	3.15
3	0.71	0.71	0.48	0.79	3.43	3.14	2.26	3.48
Big	0.91	0.51	0.46	0.62	4.29	2.93	2.68	3.64

Table B.3: Regressions for 16 value-weight *Size-Inv* portfolios

We construct 16 *Size-Inv* portfolios for each region at the end of December of each year. The *Size* breakpoints are 25th, 50th, and 75th percentiles of market cap for each country. Similarly for the breakpoints of *Inv* (Investment) quartiles. The intersection of the 4x4 independent *Size* and *Inv* sorts for each country produce 16 value-weight *Size-Inv* portfolios. The table shows the five-factor slopes and *t*-statistics for these portfolios. The five factor model is

$$R_{it} - R_{Ft} = a_i + b_i(R_{Mt} - R_{Ft}) + s_iSMB_t + h_iHML_t + r_iRMW_t + c_iCMA_t + e_{it}$$

	Low Inv	2	3	High Inv	Low Inv	2	3	High Inv
South Africa								
	<i>a</i>				<i>t(a)</i>			
Small	-0.82	-0.47	-0.37	-0.68	-4.78	-1.61	-1.57	-2.21
2	-0.50	-0.54	-0.34	-0.58	-3.03	-3.37	-1.98	-3.25
3	-0.29	-0.41	-0.36	-0.45	-1.67	-2.62	-2.18	-2.76
Big	-0.40	-0.66	-0.58	-0.44	-2.18	-3.77	-3.55	-2.68
	<i>b</i>				<i>t(b)</i>			
Small	0.68	0.86	0.84	1.14	8.01	5.95	7.07	7.47
2	0.64	0.55	0.49	0.56	7.84	6.93	5.73	6.35
3	0.83	0.69	0.59	0.62	9.62	8.91	7.25	7.71
Big	1.24	0.86	0.92	0.85	13.85	9.86	11.27	10.53
	<i>s</i>				<i>t(s)</i>			
Small	0.44	0.81	0.37	0.60	6.84	7.38	4.09	5.23
2	-0.19	-0.16	-0.18	0.02	-3.05	-2.59	-2.72	0.25
3	-0.28	-0.14	-0.15	-0.13	-4.34	-2.42	-2.42	-2.11
Big	-0.35	-0.41	-0.30	-0.17	-5.14	-6.25	-4.79	-2.80
	<i>h</i>				<i>t(h)</i>			
Small	-0.45	-0.08	-0.03	-0.11	-5.68	-0.60	-0.30	-0.76
2	0.08	-0.01	-0.02	-0.21	1.09	-0.08	-0.20	-2.60
3	0.11	-0.03	-0.10	-0.12	1.31	-0.47	-1.25	-1.54
Big	-0.08	-0.07	-0.11	-0.19	-1.00	-0.82	-1.47	-2.55
	<i>r</i>				<i>t(r)</i>			
Small	0.33	-0.33	0.28	-0.09	4.37	-2.57	2.66	-0.65
2	0.08	0.12	-0.01	0.14	1.14	1.65	-0.13	1.81
3	-0.06	0.16	0.11	0.08	-0.75	2.26	1.47	1.08
Big	-0.05	0.07	0.25	0.20	-0.68	0.96	3.36	2.74

	<i>c</i>				<i>t(c)</i>			
Small	1.00	-0.35	-0.09	-0.70	13.39	-2.77	-0.91	-5.24
2	0.28	0.18	0.19	-0.15	3.92	2.59	2.54	-1.90
3	0.47	0.16	0.16	0.00	6.21	2.44	2.24	0.06
Big	0.36	0.37	0.18	0.02	4.56	4.92	2.58	0.34

Table B.3 (continued)

	Low Inv	2	3	High Inv	Low Inv	2	3	High Inv
China								
	<i>a</i>				<i>t(a)</i>			
Small	-0.12	-0.16	-0.13	0.00	-2.09	-2.44	-1.91	-0.05
2	-0.15	-0.18	-0.20	-0.17	-2.36	-2.52	-2.79	-2.22
3	-0.17	-0.20	-0.20	-0.16	-2.53	-2.82	-2.67	-2.31
Big	-0.12	-0.10	-0.15	-0.19	-2.02	-1.69	-2.49	-3.05
	<i>b</i>				<i>t(b)</i>			
Small	1.02	1.01	1.01	0.94	52.57	45.39	44.00	34.74
2	1.02	1.02	1.00	1.01	47.66	42.58	41.78	40.81
3	1.05	1.00	1.03	1.00	48.31	42.65	41.60	44.91
Big	1.00	1.02	1.01	1.07	50.57	52.00	51.24	52.49
	<i>s</i>				<i>t(s)</i>			
Small	0.96	1.05	1.06	0.93	15.65	14.98	14.55	10.87
2	0.82	0.89	0.97	0.97	12.12	11.68	12.75	12.29
3	0.74	0.75	0.83	0.82	10.78	10.04	10.52	11.60
Big	0.34	0.38	0.42	0.59	5.43	6.03	6.68	9.18
	<i>h</i>				<i>t(h)</i>			
Small	-0.50	-0.43	-0.33	-0.20	-7.20	-5.39	-3.99	-2.03
2	-0.48	-0.44	-0.40	-0.35	-6.19	-5.07	-4.63	-3.89
3	-0.38	-0.43	-0.47	-0.44	-4.84	-5.11	-5.32	-5.45
Big	-0.08	-0.29	-0.45	-0.53	-1.13	-4.13	-6.29	-7.20
	<i>r</i>				<i>t(r)</i>			
Small	-0.26	-0.20	-0.16	-0.74	-2.48	-1.73	-1.35	-5.12
2	-0.38	-0.23	-0.33	-0.41	-3.32	-1.81	-2.60	-3.07
3	-0.23	-0.36	-0.05	-0.50	-1.96	-2.91	-0.38	-4.20
Big	-0.70	-0.19	0.10	-0.03	-6.61	-1.80	0.97	-0.30
	<i>c</i>				<i>t(c)</i>			
Small	0.19	-0.16	-0.37	-1.03	1.70	-1.24	-2.83	-6.77
2	0.14	-0.19	-0.47	-1.14	1.15	-1.39	-3.47	-8.16
3	0.10	-0.26	-0.26	-0.93	0.85	-2.00	-1.90	-7.37
Big	-0.08	0.02	0.01	-0.61	-0.72	0.18	0.13	-5.29

Table B.3 (continued)

	Low Inv	2	3	High Inv	Low Inv	2	3	High Inv
India								
	<i>a</i>				<i>t(a)</i>			
Small	-0.15	-0.17	-0.15	-0.19	-1.67	-1.92	-1.63	-1.99
2	-0.15	-0.11	-0.10	-0.20	-1.43	-1.05	-0.99	-1.94
3	-0.20	-0.15	-0.13	-0.18	-1.86	-1.41	-1.15	-1.65
Big	-0.23	-0.14	-0.13	-0.14	-2.54	-1.51	-1.49	-1.66
	<i>b</i>				<i>t(b)</i>			
Small	0.47	0.42	0.44	0.45	10.08	9.04	9.14	9.06
2	0.43	0.40	0.35	0.35	7.85	7.26	6.39	6.43
3	0.33	0.37	0.35	0.37	5.74	6.69	6.01	6.51
Big	0.39	0.49	0.47	0.45	8.27	10.45	10.51	9.77
	<i>s</i>				<i>t(s)</i>			
Small	0.07	-0.01	0.12	-0.04	0.99	-0.15	1.74	-0.61
2	-0.40	-0.46	-0.52	-0.51	-5.23	-5.81	-6.78	-6.53
3	-1.08	-0.94	-0.91	-0.77	-13.22	-11.94	-10.85	-9.57
Big	-1.24	-1.18	-0.85	-0.77	-18.38	-17.66	-13.54	-11.80
	<i>h</i>				<i>t(h)</i>			
Small	0.82	0.79	0.87	1.03	9.67	9.21	9.77	11.37
2	1.39	1.48	1.46	1.64	13.91	14.55	14.66	16.16
3	1.43	1.47	1.57	1.38	13.53	14.38	14.52	13.20
Big	1.11	1.13	0.84	0.80	12.65	13.04	10.27	9.48
	<i>r</i>				<i>t(r)</i>			
Small	0.44	0.32	0.69	0.21	3.30	2.40	4.99	1.47
2	0.95	0.65	0.73	0.58	6.06	4.08	4.68	3.68
3	0.70	0.72	0.92	0.85	4.22	4.52	5.41	5.19
Big	0.25	0.16	0.49	0.64	1.81	1.19	3.85	4.82
	<i>c</i>				<i>t(c)</i>			
Small	0.78	0.39	0.28	-0.27	4.86	2.39	1.69	-1.60
2	1.06	0.28	0.42	-0.34	5.66	1.45	2.25	-1.80
3	1.02	0.46	0.34	0.04	5.10	2.39	1.67	0.20
Big	0.70	0.47	0.34	0.07	4.22	2.86	2.24	0.45

Table B.3 (continued)

	Low Inv	2	3	High Inv	Low Inv	2	3	High Inv
Malaysia								
	<i>a</i>				<i>t(a)</i>			
Small	0.16	0.17	0.07	0.08	1.36	1.50	0.51	0.58
2	0.20	0.26	0.31	0.07	1.82	2.46	2.85	0.62
3	0.20	0.26	0.20	0.22	1.87	2.64	2.07	1.94
Big	0.10	0.11	0.11	0.23	0.93	1.17	1.32	2.50
	<i>b</i>				<i>t(b)</i>			
Small	1.17	1.07	1.04	1.17	15.24	13.90	11.26	13.16
2	1.21	1.15	1.15	1.05	16.54	16.49	16.00	13.31
3	1.28	1.19	1.08	1.23	17.64	18.35	16.93	16.30
Big	1.27	1.24	1.25	1.32	18.41	19.68	23.04	21.63
	<i>s</i>				<i>t(s)</i>			
Small	0.50	0.37	0.40	0.60	10.21	7.51	6.84	10.52
2	0.23	0.23	0.29	0.33	4.97	5.16	6.25	6.64
3	0.18	0.19	0.15	0.33	3.99	4.60	3.82	6.90
Big	0.02	0.02	0.05	0.14	0.39	0.44	1.46	3.62
	<i>h</i>				<i>t(h)</i>			
Small	0.14	0.31	0.02	0.29	1.32	2.97	0.15	2.38
2	0.25	0.28	0.32	0.33	2.55	2.96	3.30	3.12
3	0.43	0.34	0.27	0.15	4.40	3.83	3.18	1.50
Big	0.20	0.26	0.21	0.23	2.16	3.04	2.90	2.75
	<i>r</i>				<i>t(r)</i>			
Small	-0.42	-0.66	-0.79	-0.90	-3.43	-5.39	-5.44	-6.33
2	-0.38	-0.41	-0.41	-0.58	-3.33	-3.73	-3.60	-4.60
3	-0.32	-0.32	-0.24	-0.23	-2.83	-3.13	-2.37	-1.94
Big	-0.28	-0.14	-0.16	-0.18	-2.58	-1.39	-1.82	-1.83
	<i>c</i>				<i>t(c)</i>			
Small	0.93	-0.20	-0.09	-0.98	7.33	-1.58	-0.62	-6.67
2	0.37	-0.09	-0.21	-0.69	3.07	-0.79	-1.76	-5.32
3	0.11	-0.03	-0.18	-0.36	0.92	-0.27	-1.71	-2.93
Big	0.29	0.02	-0.05	-0.23	2.57	0.16	-0.55	-2.35

Table B.3 (continued)

	Low Inv	2	3	High Inv	Low Inv	2	3	High Inv
South Korea								
	<i>a</i>				<i>t(a)</i>			
Small	-0.34	-0.05	-0.02	-0.17	-2.85	-0.44	-0.27	-1.83
2	-0.05	0.03	0.05	0.03	-0.45	0.30	0.47	0.30
3	-0.08	0.04	0.05	-0.01	-0.78	0.34	0.50	-0.10
Big	-0.03	0.01	-0.04	-0.13	-0.28	0.13	-0.41	-1.32
	<i>b</i>				<i>t(b)</i>			
Small	1.09	1.12	1.14	1.17	18.74	20.61	25.95	25.30
2	1.27	1.17	1.19	1.14	24.23	24.68	23.74	22.92
3	1.20	1.24	1.19	1.24	24.37	23.86	22.74	23.24
Big	1.15	1.12	1.15	1.24	24.54	26.56	25.97	25.70
	<i>s</i>				<i>t(s)</i>			
Small	1.14	1.08	1.03	1.03	10.11	10.30	12.13	11.56
2	1.05	0.97	0.98	0.75	10.35	10.57	10.17	7.82
3	0.76	0.83	0.72	0.73	7.99	8.30	7.14	7.10
Big	0.26	0.21	0.11	0.13	2.91	2.55	1.31	1.45
	<i>h</i>				<i>t(h)</i>			
Small	-0.35	-0.69	-0.44	-0.83	-3.25	-6.95	-5.56	-9.80
2	-0.72	-0.67	-0.65	-0.90	-7.55	-7.69	-7.18	-9.91
3	-0.93	-0.92	-0.70	-0.86	-10.40	-9.75	-7.39	-8.84
Big	-0.92	-0.52	-0.54	-0.60	-10.73	-6.73	-6.73	-6.86
	<i>r</i>				<i>t(r)</i>			
Small	-0.08	0.31	0.31	0.27	-0.48	1.97	2.47	2.03
2	0.17	0.33	0.15	-0.06	1.10	2.42	1.02	-0.39
3	0.04	0.40	0.18	0.31	0.28	2.63	1.16	1.98
Big	0.34	0.34	0.19	0.07	2.51	2.77	1.49	0.48
	<i>c</i>				<i>t(c)</i>			
Small	0.71	-0.37	-0.20	-0.84	3.77	-2.10	-1.40	-5.57
2	0.03	-0.34	-0.27	-0.91	0.15	-2.23	-1.70	-5.65
3	0.21	-0.37	-0.23	-0.69	1.32	-2.22	-1.34	-3.96
Big	0.02	-0.19	-0.38	-0.83	0.13	-1.38	-2.64	-5.30

Table B.3 (continued)

	Low Inv	2	3	High Inv	Low Inv	2	3	High Inv
Indonesia								
	<i>a</i>				<i>t(a)</i>			
Small	-0.09	-0.19	-0.29	-0.16	-0.92	-1.51	-2.13	-1.29
2	-0.20	-0.09	-0.28	-0.11	-1.69	-0.85	-2.07	-0.93
3	-0.08	-0.07	0.07	-0.14	-0.60	-0.59	0.62	-1.21
Big	0.04	0.02	-0.06	-0.03	0.27	0.25	-0.76	-0.28
	<i>b</i>				<i>t(b)</i>			
Small	0.98	0.87	0.99	0.79	23.54	15.44	16.46	13.95
2	0.91	0.81	0.83	0.72	16.87	16.67	13.83	13.87
3	0.82	0.95	0.96	0.91	14.76	16.83	19.91	17.88
Big	0.93	0.98	1.16	1.17	16.01	23.03	32.41	26.44
	<i>s</i>				<i>t(s)</i>			
Small	0.20	0.12	0.28	0.17	3.72	1.57	3.48	2.34
2	-0.07	-0.01	0.11	0.15	-1.05	-0.20	1.36	2.20
3	-0.09	-0.15	-0.11	0.07	-1.29	-1.98	-1.72	1.08
Big	-0.28	-0.20	-0.17	-0.14	-3.58	-3.49	-3.52	-2.46
	<i>h</i>				<i>t(h)</i>			
Small	0.53	0.66	0.38	0.31	7.34	6.71	3.65	3.18
2	0.45	0.40	0.27	0.42	4.78	4.75	2.58	4.61
3	-0.02	0.36	0.39	0.37	-0.18	3.66	4.64	4.19
Big	-0.04	0.33	0.18	0.37	-0.40	4.47	2.97	4.79
	<i>r</i>				<i>t(r)</i>			
Small	-0.03	-0.02	0.02	-0.44	-0.38	-0.17	0.15	-4.29
2	-0.34	-0.22	0.01	-0.16	-3.47	-2.49	0.08	-1.68
3	-0.35	-0.37	-0.05	-0.17	-3.39	-3.60	-0.52	-1.86
Big	-0.21	-0.08	-0.04	-0.09	-1.99	-1.06	-0.65	-1.11
	<i>c</i>				<i>t(c)</i>			
Small	0.39	-0.14	-0.27	-0.81	5.57	-1.45	-2.60	-8.48
2	0.21	-0.11	-0.20	-0.81	2.26	-1.36	-1.97	-9.20
3	0.28	-0.18	-0.16	-0.66	2.96	-1.92	-1.98	-7.63
Big	0.39	-0.05	-0.12	-0.47	3.95	-0.71	-2.00	-6.25

Table B.3 (continued)

	Low Inv	2	3	High Inv	Low Inv	2	3	High Inv
Australia								
	<i>a</i>				<i>t(a)</i>			
Small	-1.05	-0.61	-0.47	-0.46	-4.14	-2.50	-2.40	-2.87
2	-0.55	-0.18	-0.06	-0.18	-2.96	-1.02	-0.42	-1.11
3	-0.20	0.20	0.06	0.12	-1.28	1.53	0.44	0.87
Big	0.45	0.21	0.18	0.07	3.42	2.01	1.70	0.44
	<i>b</i>				<i>t(b)</i>			
Small	0.83	0.81	0.75	0.86	7.58	7.63	8.87	12.43
2	0.97	0.86	0.93	1.05	12.01	11.35	15.02	15.32
3	1.07	0.90	0.93	1.19	15.74	15.50	15.42	19.05
Big	1.07	1.05	1.22	1.47	18.76	23.37	25.85	22.43
	<i>s</i>				<i>t(s)</i>			
Small	0.24	0.12	0.19	0.30	3.83	2.05	3.92	7.68
2	0.17	0.10	0.14	0.07	3.72	2.34	3.87	1.73
3	0.17	0.09	0.09	0.09	4.46	2.68	2.68	2.43
Big	0.11	0.04	0.03	0.04	3.42	1.40	1.10	1.16
	<i>h</i>				<i>t(h)</i>			
Small	0.54	0.61	0.74	0.31	4.40	5.22	7.89	4.12
2	0.39	0.48	0.46	0.41	4.39	5.69	6.75	5.39
3	0.31	0.39	0.34	0.31	4.15	6.15	5.06	4.50
Big	0.20	0.14	0.24	0.30	3.19	2.78	4.59	4.08
	<i>r</i>				<i>t(r)</i>			
Small	-0.93	-0.90	-0.94	-0.79	-6.12	-6.19	-8.06	-8.32
2	-1.01	-0.63	-0.61	-0.88	-9.02	-6.00	-7.17	-9.27
3	-0.62	-0.48	-0.47	-0.58	-6.63	-6.02	-5.64	-6.73
Big	-0.40	-0.16	-0.28	-0.49	-5.06	-2.62	-4.25	-5.38
	<i>c</i>				<i>t(c)</i>			
Small	0.97	0.25	0.56	-0.41	6.19	1.68	4.62	-4.21
2	0.93	0.26	0.33	0.04	8.07	2.36	3.72	0.41
3	0.83	0.29	0.25	-0.05	8.50	3.49	2.87	-0.57
Big	0.51	0.16	0.14	0.00	6.22	2.48	2.13	0.01

Table B.3 (continued)

	Low Inv	2	3	High Inv	Low Inv	2	3	High Inv
Singapore								
	<i>a</i>				<i>t(a)</i>			
Small	0.05	-0.42	-0.15	-0.46	0.34	-2.22	-0.43	-2.04
2	-0.18	-0.07	-0.11	0.16	-1.19	-0.63	-1.12	1.25
3	0.07	-0.03	0.03	0.01	0.55	-0.35	0.31	0.10
Big	-0.06	0.02	0.05	0.07	-0.62	0.22	0.78	1.01
	<i>b</i>				<i>t(b)</i>			
Small	0.81	0.87	0.67	0.83	10.84	8.76	3.74	7.03
2	0.92	0.69	0.70	0.71	11.99	11.37	13.56	10.45
3	0.88	0.76	0.85	0.87	13.67	16.49	18.38	15.29
Big	0.90	0.91	0.96	0.92	16.92	25.00	26.55	24.43
	<i>s</i>				<i>t(s)</i>			
Small	0.20	0.07	0.20	0.30	8.66	2.37	3.72	8.39
2	-0.06	-0.01	0.01	0.05	-2.38	-0.43	0.78	2.24
3	-0.02	-0.01	-0.01	0.01	-1.19	-0.39	-1.00	0.39
Big	-0.01	-0.01	-0.01	0.00	-0.46	-0.81	-0.46	0.18
	<i>h</i>				<i>t(h)</i>			
Small	0.05	0.36	1.14	0.18	0.76	3.76	6.62	1.60
2	0.41	0.18	0.03	0.23	5.60	3.11	0.62	3.57
3	0.25	0.12	0.14	0.29	3.99	2.63	3.09	5.36
Big	0.07	0.06	0.05	0.11	1.29	1.76	1.40	3.06
	<i>r</i>				<i>t(r)</i>			
Small	0.15	-0.29	0.64	-0.34	1.94	-2.84	3.47	-2.83
2	-0.33	-0.31	-0.08	-0.05	-4.18	-5.04	-1.49	-0.65
3	-0.22	-0.10	-0.07	-0.08	-3.28	-2.21	-1.52	-1.37
Big	-0.13	-0.03	-0.04	-0.08	-2.44	-0.88	-1.20	-1.95
	<i>c</i>				<i>t(c)</i>			
Small	1.55	0.04	0.27	-0.33	22.18	0.40	1.59	-3.01
2	0.67	0.09	0.13	-0.13	9.24	1.58	2.71	-2.05
3	0.42	0.06	0.10	-0.01	6.95	1.30	2.19	-0.17
Big	-0.04	0.03	0.10	-0.01	-0.81	0.90	3.00	-0.24

Table B.3 (continued)

	Low Inv	2	3	High Inv	Low Inv	2	3	High Inv
Global								
	<i>a</i>				<i>t(a)</i>			
Small	-0.14	-0.07	-0.17	-0.41	-1.27	-0.65	-1.55	-3.73
2	-0.27	-0.09	-0.17	-0.35	-2.31	-0.81	-1.54	-3.11
3	-0.44	-0.26	-0.20	-0.22	-3.68	-2.29	-1.74	-1.84
Big	-0.31	-0.23	-0.21	-0.20	-2.94	-2.46	-2.17	-1.83
	<i>b</i>				<i>t(b)</i>			
Small	0.49	0.47	0.55	0.60	9.76	9.20	10.80	11.51
2	0.56	0.49	0.55	0.56	10.19	9.42	10.57	10.60
3	0.56	0.55	0.54	0.54	10.02	10.55	10.05	9.88
Big	0.59	0.60	0.52	0.49	12.08	13.89	11.78	9.61
	<i>s</i>				<i>t(s)</i>			
Small	-0.42	-0.43	-0.39	-0.32	-4.92	-4.94	-4.54	-3.63
2	-0.64	-0.63	-0.61	-0.60	-6.89	-7.08	-6.89	-6.72
3	-0.91	-0.82	-0.79	-0.83	-9.51	-9.24	-8.70	-8.82
Big	-0.89	-0.82	-0.89	-0.93	-10.69	-11.28	-11.87	-10.61
	<i>h</i>				<i>t(h)</i>			
Small	-0.24	-0.31	-0.12	0.29	-2.13	-2.68	-1.08	2.41
2	-0.08	-0.12	-0.19	-0.09	-0.67	-0.99	-1.59	-0.74
3	-0.04	-0.12	-0.13	-0.33	-0.27	-1.02	-1.09	-2.62
Big	-0.04	0.13	0.07	-0.28	-0.32	1.36	0.72	-2.35
	<i>r</i>				<i>t(r)</i>			
Small	-1.86	-1.90	-1.68	-1.66	-10.16	-10.11	-9.06	-8.78
2	-1.60	-1.59	-1.52	-1.40	-8.00	-8.36	-8.05	-7.30
3	-1.09	-1.22	-1.25	-1.48	-5.31	-6.42	-6.39	-7.32
Big	-0.83	-0.70	-0.82	-1.09	-4.61	-4.44	-5.09	-5.83
	<i>c</i>				<i>t(c)</i>			
Small	0.75	0.37	-0.17	-1.14	3.79	1.82	-0.85	-5.56
2	0.49	0.18	-0.05	-0.54	2.28	0.85	-0.24	-2.59
3	0.51	0.11	0.08	-0.13	2.30	0.52	0.37	-0.61
Big	0.40	0.05	0.03	-0.03	2.06	0.29	0.15	-0.14

Table B.3 (continued)

	Low Inv	2	3	High Inv	Low Inv	2	3	High Inv
Emerging								
	<i>a</i>				<i>t(a)</i>			
Small	-0.07	0.01	-0.03	-0.21	-0.74	0.06	-0.32	-2.43
2	-0.16	-0.07	-0.14	-0.33	-1.61	-0.75	-1.52	-3.43
3	-0.37	-0.25	-0.16	-0.20	-3.74	-2.63	-1.61	-2.02
Big	-0.27	-0.19	-0.14	-0.14	-3.23	-2.57	-1.85	-1.62
	<i>b</i>				<i>t(b)</i>			
Small	0.55	0.53	0.59	0.64	14.64	13.52	16.38	18.03
2	0.58	0.57	0.60	0.57	14.13	14.23	14.95	14.15
3	0.58	0.59	0.58	0.57	13.75	14.66	14.14	13.64
Big	0.63	0.62	0.56	0.56	17.77	19.74	17.80	15.24
	<i>s</i>				<i>t(s)</i>			
Small	-0.18	-0.21	-0.11	-0.03	-2.33	-2.59	-1.43	-0.37
2	-0.42	-0.38	-0.37	-0.36	-5.06	-4.71	-4.55	-4.30
3	-0.70	-0.60	-0.57	-0.59	-8.16	-7.37	-6.78	-6.78
Big	-0.63	-0.62	-0.63	-0.63	-8.67	-9.69	-9.76	-8.32
	<i>h</i>				<i>t(h)</i>			
Small	-0.66	-0.71	-0.57	-0.39	-6.07	-6.28	-5.43	-3.80
2	-0.56	-0.50	-0.61	-0.50	-4.73	-4.35	-5.24	-4.27
3	-0.50	-0.53	-0.54	-0.73	-4.07	-4.52	-4.51	-5.93
Big	-0.43	-0.23	-0.30	-0.61	-4.21	-2.58	-3.26	-5.65
	<i>r</i>				<i>t(r)</i>			
Small	-1.42	-1.49	-1.13	-1.12	-8.45	-8.50	-6.94	-6.98
2	-1.12	-1.17	-1.09	-0.98	-6.06	-6.54	-6.07	-5.40
3	-0.61	-0.80	-0.87	-1.03	-3.23	-4.43	-4.70	-5.42
Big	-0.41	-0.39	-0.48	-0.71	-2.58	-2.76	-3.37	-4.25
	<i>c</i>				<i>t(c)</i>			
Small	1.31	0.97	0.45	-0.30	6.54	4.64	2.31	-1.58
2	1.13	0.69	0.49	-0.12	5.18	3.24	2.32	-0.55
3	1.06	0.64	0.61	0.43	4.73	2.99	2.75	1.89
Big	0.92	0.62	0.55	0.42	4.89	3.71	3.24	2.14