ESSAYS IN EMPIRICAL ASSET PRICING

by

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ESSAYS IN EMPIRICAL ASSET PRICING

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ABSTRACT

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This dissertation consists of three articles. In the first article, I provide a literature survey on the cross-section and time-series of expected returns. I review some of the most significant empirical anomalies in the literature. The second article utilizes an international context and revisits the findings which argue that the positive relation between book-to-market ratio and future equity returns is driven by historical changes in firm size in the US. After confirming these results in the US setting, I find that they do not hold in regions outside the US. In the international sample, book-to-market ratio has a significantly positive relation with future equity returns even after changes in firm size are controlled for in regression analyses. This positive relation is again visible when the orthogonal component of book-to-market ratio is used as a sorting variable in portfolio analyses. The third article examines the predictive power of average skewness, defined as the average of monthly skewness values across stocks, in an international setting. First, after confirming the validity of the US results for the sample period between 1990 and 2016, I find that the intertemporal relation between average skewness and future market returns becomes either insignificant or marginally significant when the sample period is extended. Second, when I repeat the analysis in 22 developed non-US markets, I find that average skewness has no robust predictive power. The inability of average skewness to forecast market returns does not depend on the method used to calculate average skewness or the regression specification.

ÖZET

AMPİRİK VARLIK DEĞERLEMESİ ÜZERİNE MAKALELER

RABİA İMRA KIRLI ÖZİŞ

YÖNETİM BİLİMLERİ DOKTORA TEZİ, TEMMUZ 2020

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Anahtar Kelimeler: pay getirilerinin kesiti, değer primi, pay getirilerinin zaman serisi, ortalama çarpıklık, uluslararası finans

Bu tez üç makaleden oluşmaktadır. İlk makalede, beklenen pay getirilerinin kesiti ve zaman serisi üzerine bir literatür taraması gerçekleştirilmiştir. Literatürde yer alan en önemli ampirik anomalilerin bir kısmı gözden geçirilmiştir. İkinci makale, uluslararası bir çalışma sunmaktadır ve ABD için defter-piyasa değeri oranı ile beklenen pay getirileri arasındaki pozitif ilişkinin şirket büyüklüğündeki geçmiş değişimlerden kaynaklandığı bulgusunu tekrar ele almıştır. ABD için bu bulguları teyit ettikten sonra, bunların ABD dışındaki bölgelerde geçerli olmadığı bulunmuştur. Uluslararası örneklemde, regresyon analizlerinde şirket büyüklüğündeki değişimler kontrol edildikten sonra dahi defter-piyasa değeri oranı ile beklenen pay getirileri arasında istatiksel olarak anlamlı pozitif ilişki bulunmaktadır. Bu pozitif ilişki, defter-piyasa değeri oranının ortogonal bileşeni, portföy analizlerinde sıralama değişkeni olarak kullanıldığında da yine açık bir şekilde görülmektedir. Üçüncü makale, hisse senetlerinin aylık çarpıklık değerlerinin ortalaması olarak tanımlanan ortalama çarpıklığın öngörü gücünü uluslararası bağlamda incelemektedir. Öncelikle, ABD sonuçlarının geçerliliğini 1990-2016 örneklem aralığı için teyit ettikten sonra, örneklem aralığı genişletildiğinde, ortalama çarpıklık ve beklenen piyasa getirileri arasındaki dönemler arası ilişkinin ya istatiksel olarak anlamsız ya da sadece marjinal olarak anlamlı olduğu bulunmuştur. Daha sonra bu analiz, ABD dışındaki diğer 22 gelişmiş piyasa için tekrar edildiğinde, ortalama çarpıklığın sağlam bir öngörü gücüne sahip olmadığı bulunmuştur. Ortalama çarpıklığın piyasa getirilerini tahmin edememesi, ortalama çarpıklığı hesaplarken kullanılan yöntemden ya da regresyon modelinden kaynaklanmamaktadır.

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günışığım gülru'ya

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1. LITERATURE REVIEW ON THE CROSS-SECTION AND TIME-SERIES OF EXPECTED RETURNS

1.1 A Literature Review on the Cross-Section of Expected Returns

1.1.1 Introduction

An important part of empirical research in finance literature has dealt with the predictability of cross-section of stock returns. Beta, emerged from the asset pricing model of Sharpe (1964) and Lintner (1965), was used for a long time as the main indicator to explain the average return and risk of an asset. This model also paved the way for finding new variables to explain the predictability of stock returns. This part of the review aims to provide a literature survey on the determinants of the cross-section of stock returns by presenting the fundamental findings of notable studies in the area.

CAPM is the asset pricing model presented to the field by Sharpe (1964) and Lintner (1965) which mainly argues that the expected return of an asset is a linear function of market beta. According to the model, beta is the sensitivity of the expected excess asset return, also known as risk premium, to the expected excess market return, known as market premium. Thus, it proposes a simple positive linear relationship between the expected return and the market risk of the asset. Although it has been used as the main model to explain the relation between the risk and return of an asset, it also came under heavy criticism. One of the most significant criticisms of the model was introduced by Richard Roll (1977), which is known as Roll's critique, through analysis of the validity of empirical tests of the model. He argues that any valid test of CAPM assumes complete knowledge of the composition of the market portfolio which implies that every individual asset must be considered in the market portfolio. Thus, he criticizes the model due to the impossibility of creating a fully diversified market portfolio. He concludes that this leads to incomplete tests of the model and wrong inferences.

According to the CAPM model of Sharpe (1964) and Lintner (1965), market beta is sufficient to explain the cross-section of expected returns. Hence, it had been long assumed as the only variable that has explanatory power for returns. However, in the later literature, the empirical importance of additional factors to explain the cross-section of expected returns was recognized. Numerous studies came up with evidence of additional relevant factors to be included in the asset pricing model.

Fama (1965) and Fama (1970) introduce an important concept on market structure into the field, which is the efficient market hypothesis (EMH). Fama (1970) argues that in an efficient market, security prices at any time fully reflect all available information. In other words, all information available is embedded in security prices in efficient markets. Therefore, no investor can make excess profits or outperform the market by using this available information. According to Fama (1970), there are three forms of market efficiency and three relevant information sets to test EMH: In the weak form of market efficiency, the information set only consists of historical prices and trading data. In tests of the semi-strong form of market efficiency, the information set is all publicly available information and the main concern is whether prices fully reflect all publicly available information. Finally, in the strong form of market efficiency tests, information set of investors who have monopolistic access to any information relevant to stock prices, known as insiders, is considered.

The impact of new variables that are introduced into the field as determinants of the cross-section of returns on the concept of market efficiency has different interpretations. On one hand, it is argued that the predictive power of these new variables contradicts market efficiency since, according to EMH, future returns cannot be predicted based on past information. On the other hand, these variables can be interpreted as risk proxies because they may capture unobservable risk factors. So, according to some studies, it can be argued that they are compatible with market efficiency.

1.1.2 Determinants of the Cross-Section of Stock Returns

After the debates on market beta's insufficiency to explain the predictability of the cross-section of stock returns, new variables have been introduced into the literature. This part of the paper aims to cover some of the most scrutinized empirical regularities in the asset pricing literature that focuses on the cross-section of equity returns.

1.1.2.1 Size effect

One of the biggest contradictions to market beta being sufficient for the predictability of cross-section of expected returns is the size effect of Banz (1981). The size effect proposes that small stocks, stocks with smaller market capitalizations, have higher returns compared to large stocks, stocks with larger market capitalization. Banz (1981) reveals that the size effect presents clear evidence for the misspecification of CAPM. This study analyzes the empirical relationship between the total market value of the common stock of a firm which is measured as stock price times the number of shares outstanding and its return.

The main results of the paper show that, on average, small NYSE firms' common stocks had significantly higher risk-adjusted returns than those of large NYSE firms in the 1926-1975 period. This finding has been referred to as 'size effect' of Banz in the literature. Thus, together with beta, the size effect has explanatory power for the cross-section of expected returns. Besides, Banz states that the size effect is not linear in market capitalization and it is most apparent for the smallest firms. When he analyzes the reasons of size effect, after pointing out different reasons suggested by different studies, he concludes that the picture is not clear at all.

Fama and French (1992, 1993) also confirm the ability of market capitalization to predict future stock returns by showing that small stocks have higher returns than large stocks. In addition to that, Fama and French (1993) create SMB (small-minus-big) portfolio, which is called a factor-mimicking portfolio, that consists of long positions in small stocks and short positions in large stocks. Returns of SMB portfolio mimic the returns associated with the size effect and Fama and French (1993) argue that the returns of this portfolio can be used as a risk factor in their three-factor model. This model is designed to capture the patterns in US average returns related to size, and also book-to-market ratio. They also find that this model outperforms the CAPM of Sharpe (1964) and Lintner (1965) to explain the cross-section of expected returns.

When international stock returns are considered, some of the studies that explore the size effect, together with book-to-market ratio (B/M), are conducted by Chan, Hamao, and Lakonishok (1991), Hou, Karolyi, and Kho (2011) and Fama and French (2012).

Chan, Hamao, and Lakonishok (1991) focus on the Japanese market by examining the relationship between size, book-to-market ratio, earnings yield, and cash flow yield. This study confirms significant explanatory power of size, along with the three other variables.

Hou, Karolyi, and Kho (2011) examine a large number of firm-level characteristics that can explain global stock returns by using data from 49 countries. Along with size, they focus on book-to-market equity, momentum, dividend yield, earnings yield, cash flow-to-price and leverage. The paper postulates that, compared to the global CAPM or a factor model that includes size and book-to-market factors, a multifactor model which includes momentum and cash flow-to-price factor-mimicking portfolios, in addition to the global market factor, has a better performance in terms of explaining variation in global stock returns.

Fama and French (2012) examine 23 countries grouped into four regions: North America (the United States and Canada), Europe (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom), Japan and Asia-Pacific (Australia, New Zealand, Hong Kong and Singapore). In each region, the stocks are sorted based on size and momentum, and size and B/M by constructing 5x5 portfolios. They find that, except Japan, there exists a size effect in the extreme value (high B/M) portfolios. In other words, in the extreme value portfolio, small stocks have higher returns compared to large stocks. However, for extreme growth stocks, small stocks have lower returns than large stocks, which is called a reverse size effect.

1.1.2.2 Value premium

In addition to the size effect introduced by Banz (1981), another important empirical regularity that focuses on the cross-section of expected returns is the value premium. Empirical analyses show that value stocks defined as stocks with high measures of fundamental value relative to their market value produce higher future returns compared to growth stocks defined as equities with low measures of fundamental value relative to their market value. This effect is called the value premium. Book-to-market equity ratio (B/M) is one of the variables that is widely used as a measure of the value premium. There are also various variables that are used to determine value and growth stocks, such as dividend-to-price ratio, earnings-to-price ratio, and cash flow-to-price ratio. In my discussion, I will focus mainly on B/M.

While there is a consensus on the existence of value premium in the cross-section of equity returns, there are two conflicting explanations on the source of this anomaly. The first one is a risk-based explanation which suggests that higher returns of value stocks are due to higher exposures of these stocks to a priced risk factor. The other explanation is the behavioral one which argues that the value premium is mainly due to mispricing caused by forecasting errors of investors.

Book-to-market ratio (B/M) which is used as an explanatory variable for the value premium is thoroughly analyzed by Fama and French (1992). They examine the role of market beta, size, earnings-price ratio and leverage, along with B/M in explaining the cross-section of expected returns of NYSE, AMEX and NASDAQ stocks. According to the tests conducted by Fama and French (1992), contrary to the CAPM implication that average stock return is positively related to market beta, beta does not contribute to the prediction of cross-section of returns. Instead, there exists a strong univariate relation between average return and size, earnings-price ratio, leverage, and most importantly, B/M.

When the regression analysis conducted in the paper is considered, size and B/M stand as the variables of primary importance in the sense that they subsume the effect of other explanatory variables for the 1963-1990 period. One of the most striking results of these regressions is that market beta does not have a role to explain average stock returns in Fama-MacBeth (1973) regressions that use only beta and also different combinations of beta with other variables as explanatory variables. Thus, beta has no power when used alone or with other variables to explain average returns. Among univariate and multivariate regressions, results show that value and size effect help explain the cross-section of stock returns. Besides, t-statistics of the regression of average returns on B/M is larger than those of average returns on ME. Thus, the authors conclude that B/M has more explanatory power than the market value of equity.

The stronger explanatory power of B/M compared to size is also confirmed by portfolio analysis of Fama and French (1992). They analyze the interaction of size and B/M and its impact on average returns. For analysis, 10 size portfolios are subdivided into 10 portfolios based on B/M. They conclude from this analysis that B/M still has strong explanatory power when controlling for size. On the other hand, controlling for B/M allows a size effect but not as strong as in the previous case. Hence, Fama and French (1992) suggest that B/M is more powerful than the size in explaining the cross-section of returns.

Fama and French (2012) also explore the interaction of size and beta effect on double-sorted portfolios. Through these portfolios, they document a strong relation between average cross-sectional returns and size, but they find no significant relation between returns and beta. In other words, when portfolios are formed on size alone, there is a strong negative relation between average return and size, and a positive relation between average return and beta. However, when portfolios are formed on both size and beta, the relation between average return and beta disappears. Thus, when controlled for size, beta has no role in explaining the cross-section of returns. Also, when portfolios are formed on beta alone, beta again does not explain average returns.

The authors also aim to provide the rationale behind these effects. They argue that size and B/M are proxies for risk under the assumption that investors are concerned for long-term average returns and thus, asset-pricing is rational. Under these assumptions, B/M is thought to be an indicator of firms' return prospects. In addition to the strong and tenacious explanatory power of B/M, there exists persistent empirical evidence on high-B/M firms' tendency to have systematically low earnings (relative to low-B/M firms). Thus, according to their argument, these persistent patterns in fundamentals confirm that B/M can be interpreted as a proxy for risk factors. Thus, they argue that B/M can be considered as a ratio that captures the relative distress effect, which is proposed by Chan and Chen (1991). In other words, according to the market, the prospects for value firms are poor and this is reflected by the low prices relative to measures of fundamental value.

Chen and Zhang (1998) also support this risk-based interpretation of the positive relation between B/M and expected stock returns. They argue that higher returns of value stocks are driven by higher exposure to a priced risk factor. They show that value firms have systematically low earnings and high leverage.

As mentioned in the size effect section of this chapter, in addition to the SMB portfolio, Fama and French (1993) construct the HML (high-minus-low) portfolio, which is called a factor-mimicking portfolio, that consists of long positions in stocks with high B/M and short position in stocks with low B/M. Returns of the HML portfolio mimic the returns associated with the value premium. So, Fama and French (1993) argue that the returns of this portfolio can be used as a risk factor in their three-factor model, which consists of market, size, and value factors. Thus, Fama and French (1993) analyze the value premium through the multifactor asset pricing model.

Some of the proponents of the risk-based explanation of value premium, such as Lettau and Ludvigson (2001) and Zhang (2005), analyze the value premium in the context of a time-varying risk model. They argue that the portfolio that takes a long position in value stocks and a short position in growth stocks exhibits a high (low) risk when economic conditions are getting worse (better) and thus, risk premia are high (low).

Another important analysis on B/M is conducted by Lakonishok, Shleifer and Vishny (1994). This paper mainly analyzes why value strategies, buying stocks with low prices relative to book value, earnings, and other measures, produce higher returns, which is one of the most debated topics in the asset pricing literature. Although most of the studies conclude that value strategies provide higher returns, the interpretation of this result is different. As opposed to the risk-based interpretation of Fama and French (1992), Lakonishok, Shleifer and Vishny (1994) argue that B/M is not a clean variable in the sense that it captures many different characteristics of the firm and thus, cannot represent a unique characteristic of a firm that can provide a clean economic interpretation. In this sense, they claim that the most important characteristics of a firm are market's expectation of future growth and realized past growth of the firm. Instead of B/M, they use ratios of profitability-to-price, such as cash flow-to-price or earnings-to-price ratios, so that they can use them as a proxy for expected growth. They also look at the growth in sales as a measurement of past growth. They conclude that sorting stocks based on profitability-to-price ratios and creating value portfolios based on both past and future growth rates provide larger returns than sorting based on B/M ratios.

Lakonishok, Shleifer and Vishny (1994) document suboptimal behavior of naive investors and argue that contrarian investors who bet against naive investors constitute the reason for higher returns of value strategies. They argue against the risk explanation suggested by Fama and French (1992) that links higher returns of value strategies with the fundamental riskiness of these strategies. Lakonishok, Shleifer and Vishny (1994) claim that contrarian strategies invest in underpriced stocks that have performed poorly in the past. Naive investors expect low future growth for these stocks. However, actual data shows that they have higher actual future growth rates and, thus, outperform the market. These stocks are called value stocks and according to Lakonishok, Shleifer and Vishny (1994), they are underpriced and out-of-favor. Since naive investors believe that poor performance of value stocks will also continue in the future for a long time, which is called extrapolation, this provides superior returns for contrarian investors. Conversely, glamour stocks are the stocks that have performed well in the past and market expects that these stocks will continue their favorable performance in the future. According to the evidence documented by the paper, due to the fact that market players systematically overestimate the future growth rates of glamour stocks relative to value stocks based on their past performance, value stocks outperform glamour stocks. Therefore, contrarian investors benefit from the mistakes of naive investors who are extrapolating past growth rates too far into the future. This mispricing explanation is also supported by further studies conducted by La Porta (1996), La Porta, Lakonishok, Shleifer and Vishny (1997), and Griffin and Lemmon (2002).

To support their claim against Fama and French, they also analyze whether value stocks are fundamentally riskier than glamour stocks as suggested by Fama and French (1992). They examine the frequency of superior performance of value stocks, their performance in bad states of the world, such as economic recessions, and traditional measures of risk, namely betas and standard deviations of value and glamour strategies for comparison. They conclude after these analyses that value strategies produce higher returns frequently and perform well in bad states. For beta and standard deviation analysis, the difference between the betas and standard deviations of value and glamour strategies fails to explain superior returns. Thus, they argue that there is only little evidence to support the idea of fundamental riskiness of value strategies.

In addition to the portfolio method, they also perform Fama-MacBeth (1973) regression analysis. Although growth in sales, B/M, earnings-to-price and cash flow-to-price are statistically significant explanatory variables in univariate regressions, the variables that are still significant in multivariate regressions are growth in sales and cash flow-to-price.

Another significant study that supports the behavioral interpretation is conducted by Bali, Demirtas and Hovakimian (2010) which also incorporate corporate financing activities. This paper examines whether superior returns of contrarian strategies are explained by risk factors or mispricing by allowing interaction between value-to-market indicators and corporate financing transactions that impact a firm's outstanding equity. In this sense, they incorporate equity repurchasing and equity issuing activities of the firms into their analysis and document their interaction with contrarian strategies.

First, they look at simple contrarian portfolios. They construct portfolios based on book-to-market, cash-flow-to-market, earnings-to-market ratios, and net equity issuance to assets ratio (NISA) to identify equity issues or repurchases. For each portfolio, size-adjusted one-year-ahead returns up to four years after portfolio formation and four-year average annual size-adjusted returns are computed. Their study documents that stocks with the highest value-to-market ratios (value stocks) produce higher returns than stocks with the lowest value-to-market ratios (growth stocks). This outperformance holds even four years after portfolio formation. Thus, they conclude that contrarian strategies are still profitable as suggested by previous studies. Results also show that net equity repurchasers have significantly superior returns than net equity issuers and this return difference is still valid for up to four years after portfolio formation.

Then, they examine interacted portfolios. Each contrarian portfolio is subdivided into two portfolios for negative NISA (repurchasers) and positive NISA (issuers) to allow interaction between contrarian strategies and corporate financing activities. They prove that there are substantial differences between issue and repurchase portfolios which belong to the same growth or value portfolio. Returns of repurchasers are greater than returns of issuers for each growth and value portfolio. The evidence suggests that superior returns of value stocks are driven by value repurchasers (VP) and unfavorable returns of growth stocks are driven by growth issuers (GI). VP minus GI (VP-GI) portfolios' positive and significant returns also confirm this conclusion. Hence, they conclude that superior returns due to contrarian strategies become significantly larger for a long position in value repurchasers portfolio and a short position in growth issuers portfolio.

In addition to the portfolio formation method, they also perform Fama-MacBeth (1973) cross-sectional regressions by including value-to-market ratios as defined above and NISA as independent variables. The results of the regression analysis show that NISA stands out as a highly significant explanatory variable with a negative coefficient estimate after controlling for B/M, cash-flow-to-market, earnings-to-market, and control variables. Besides, when NISA is introduced into a univariate regression of cash-flow-to-market or earnings-to-market, it decreases the magnitude and significance of the coefficient estimate.

Then, they conduct regressions separately for VP-GI portfolio and VI-GP portfolio to examine whether the findings can be attributed to the mispricing explanation proposed by Lakonishok, Shleifer and Vishny (1994) or risk explanation proposed by Fama and French (1992). They conclude that when value-to-market and issue/repurchase variables affect cross-section of returns in opposite directions, value-to-market ratios do not explain cross-section of returns which is not compatible with the risk explanation. On the other hand, when the mispricing hypothesis is considered, since equity issuance indicates overvaluation and equity repurchase indicates undervaluation, it is expected that both value/growth and issue/repurchase variables will be significant in VP-GI analysis, whereas the significance of both variables will be decreased in VI-GP analysis. These hypotheses are supported by the evidence presented in the paper.

When international studies are considered, there exists a considerable number of papers that utilize international data to examine the value premium on the cross-section of expected returns in countries other than the United States. I will mention some of these studies.

One of the most prominent international studies on value premium is conducted by Fama and French (1998). This paper confirms the value premium in markets around the world (the US, Europe, Australia, and the Far East) by using B/M, earnings-to-price ratio, cash-flow-to-price ratio, and dividend yield to determine value and growth stocks. Their findings also indicate that the international CAPM fails to explain the returns on value and growth portfolios. Chan, Hamao, and Lakonishok (1991) also confirm the significant explanatory power of book-to-market ratio in Japanese markets.

In addition to the size effect, Fama and French (2012) examine B/M in international stock returns by analyzing 5x5 size-B/M portfolios. They find that value premium exists in all size groups and in all regions, namely North America, Europe, Asia Pacific and, Japan.

Asness, Moskowitz, and Pedersen (2013) examine value and momentum jointly across eight different markets and asset classes (four equity markets, including individual stocks in the US, the UK, continental Europe, and Japan; government bonds; country equity index futures; currencies; and commodity futures). They claim that there exist consistent value and momentum return premia across all the markets and asset classes. Furthermore, they find that value (momentum) strategies are positively correlated with other value (momentum) strategies across diverse asset classes. On the other hand, value and momentum returns have a negative correlation with each other within and across different asset classes.

Fama and French (2017) conduct tests of a five-factor asset pricing model by utilizing international stock return data. In addition to size and B/M, this paper studies the relation of profitability and investment with international stock returns. For North America, Europe and Asia-Pacific, B/M and profitability are positively related to stock returns, whereas there is a negative relation between investment and average stock returns. The five-factor model they create adds profitability and investment factors to the Fama and French (1993) three-factor model. They analyze whether this model can be used to explain the size, book-to-market ratio, profitability, and investment patterns in international stock returns.

1.1.2.3 Short term reversal

Apart from the impact of fundamentals, such as size effect, B/M or other value-to-market ratios, past returns also stand out as an important potential explanatory variable for predictability of stock returns. As empirical evidence of profitable strategies based on past returns has emerged, notable papers have been published in this area.

Jegadeesh (1990) provides evidence of profitable strategies based on the previous month's returns. He investigates the predictability of individual stock returns on a monthly basis and documents evidence of stock return predictability through short-term reversal of stock returns. He suggests that there exists a highly significant negative first-order serial correlation in monthly stock returns. In this sense, he argues that trading strategies based on prior-month performance (buying stocks with low one-month lagged returns and selling stocks with high one-month lagged returns) and holding them for one month produces profits of about 2.49% per month over the 1934-1987 period. Thus, he concludes that results are economically significant. He also points out positive serial correlation at longer lags, especially a strong 12-month serial correlation.

He performs monthly Fama-MacBeth (1973) regressions. The regressions include monthly returns from lag 1 to lag 12, lag 24 and lag 36. He finds that coefficient estimates at lag 1 and 12 are high in magnitude (the absolute value of coefficient at lag 1 is biggest among all coefficients) with negative and positive signs respectively and are statistically highly significant. In addition to some other coefficient estimates, the coefficients at lag 24 and 36, with positive signs, are also significant.

Furthermore, he repeats his analysis within and outside January since stock returns in January are generally documented to be predictable by earlier literature, which is known as January effect. This way, he examines whether the results are solely due to January effect or not. He concludes that the significance of coefficient estimates, especially at lags 1 and 12, still holds with or without January. Thus, results are not caused by January effect. He also points out that the pattern of returns in and outside of January is significantly different from each other.

Then, he conducts his regression analysis by constructing different size groups of stocks based on their market value of equity. His results suggest that while the serial correlations of returns outside January are similar across all size-based groups, the absolute value of coefficients for small firms are generally larger than other firms in January.

To evaluate the economic significance of serial correlation in returns, 10 portfolios are formed based on predicted returns. Abnormal returns on these portfolios are calculated. It is observed that five portfolios with low one-month lagged returns produce positive abnormal returns, whereas other portfolios with high one-month lagged returns experience negative abnormal returns. The difference between extreme portfolios is 2.49% per month.

To sum up, he argues that evidence provided in the paper is against the random walk hypothesis which states that stock market prices follow a random walk procedure and so, they cannot be predicted. According to his arguments, predictability of stock returns can be attributed either to the inefficiency of market or systematic changes in expected returns.

1.1.2.4 Momentum

Jegadeesh and Titman (1993) look further than the past one-month return analysis of Jegadeesh (1990) and present evidence of profitable strategies based on past 3 to 12 months' returns. They examine relative trading strategies over a 3- to 12-month period which are based on buying past winners and selling past losers. They analyze NYSE and AMEX stocks in the period of 1965-1989 and find that relative trading strategies produce significant profits. When they analyze the sources of this profit, the results of the tests show that profits are not attributable to the systematic risk of trading strategies. They argue that profit is not due to the lead-lag effect arising from delayed stock price reaction to common factor information but due to delayed price reaction to firm-specific information.

12 months after the formation of relative strength portfolios, they find that stocks in these portfolios experience negative abnormal returns starting from around month 12 and this continues until month 36.

Buy-and-hold portfolios based on returns over the past 3, 6, 9 and 12 months and holding periods of 3, 6, 9 and 12 months are formed. Extreme portfolios based on past returns are named as 'losers' and 'winners' portfolios. The authors calculate the returns to a strategy of buying winners and selling losers and holding this position for various holding periods. The results demonstrate that this strategy realizes significantly positive returns. The strategy of selecting stocks based on the previous 12 months return and holding a portfolio for 3 months stands out as the most profitable strategy. However, according to the paper, half of the excess return produced by this strategy following portfolio formation disappears within the following 2 years.

When international studies on momentum are considered, one of the notable studies is conducted by Rouwenhorst (1998). This paper argues that there exist momentum premia in international equity markets by presenting medium-term return continuation in several countries. This paper also finds that medium-term return continuation and firm size are negatively related.

Griffin, Ji, and Martin (2003) also investigate momentum profits internationally and analyze whether macroeconomic risk drives momentum. They find that momentum profits are statistically reliable and economically meaningful across countries both in good and bad business cycle states. Thus, according to their paper, macroeconomic risk cannot explain international momentum profits.

Chui, Titman, and Wei (2010) provide a different perspective on momentum strategies by exploring the impact of cultural differences on momentum returns. They employ the individualism index of Hofstede (2001) and find that there is a positive relation between momentum profits and individualism.

As stated above in the size effect and value premium sections, Fama and French (2012) examine momentum along with the size and B/M in international stock returns. Except Japan, momentum returns exist in all size groups which means that last year's winners have higher returns compared to last year's losers.

Asness, Moskowitz, and Pedersen (2013) also examine momentum jointly with value premium across eight different markets and asset classes and find significant value and momentum return premia, which is mentioned in more detail above.

1.1.2.5 Liquidity

Another important determinant of the cross-section of equity returns is liquidity. There are various liquidity proxies suggested by the empirical literature. Amihud and Mendelson (1986) present the bid-ask spread as a measure of liquidity, which is one of the most popular measures of liquidity in the literature. The theoretical model provided by this paper expects a positive relation between the cross-section of expected equity returns and the bid-ask spread. After controlling for other variables, such as beta, size and idiosyncratic volatility, that have explanatory power for stock returns, this prediction is confirmed by empirical evidence in this paper.

Another widely used liquidity measure is provided by Amihud (2002). This paper's main contribution to the literature is a new measure for illiquidity, ILLIQ, which is the daily ratio of absolute stock return to its dollar volume, averaged over some period. There are other measures of illiquidity in the literature, but this measure suggested by Amihud (2002) is much easier to compute. He examines both cross-section and time-series relationship between stock returns and illiquidity.

For cross-sectional analysis, the paper examines NYSE stocks over the period of 1964-1997 and shows that ILLIQ is a significant explanatory variable with a positive effect on expected returns. For time-series analysis, the impact of market illiquidity on the excess aggregate return (in excess of Treasury bill rate) over time is analyzed. The paper reports that expected market illiquidity has a positive impact on expected market excess return. Thus, in addition to compensation for risk, expected stock excess returns also incorporate compensation for expected market illiquidity. Hence, the results demonstrate that, both in the cross-section and time-series, there is a positive relation between stock returns and expected illiquidity.

In time-series analysis, he also examines the impact of unexpected market illiquidity and finds that it has a negative effect on stock prices. Furthermore, the paper reports that market illiquidity has a greater impact on small and thus illiquid firms' stocks. This implies that the variations of the excess return of small firms' stocks (size effect of Banz (1981)) over time are parallel to changes in market liquidity over time. The paper concludes that in addition to higher risk, stock excess returns also reflect the lower liquidity of stocks compared to Treasury securities.

Another important study on liquidity is conducted by Chordia et al. (2001). In contrast to most of the earlier studies, this paper focuses on long time horizons. They examine trading activity, along with market spread and depth, for US stocks over an extended period. They conclude that there exists a strong negative relation between liquidity and equity returns. Chordia et al. (2001) also contribute to the literature by examining the time-series behavior of liquidity with macroeconomic variables.

Since there are various liquidity measures suggested in the literature, Goyenko et al. (2009) analyze different liquidity measures thoroughly and document that the Amihud’s measure of illiquidity is successful for capturing the price impact.

Pastor and Stambaugh (2003) provide a different perspective on liquidity literature by examining marketwide liquidity. They find that the cross-section of expected returns is related to sensitivities of returns to changes in aggregate liquidity. They show that stocks with high sensitivity to aggregate liquidity produce higher expected returns compared to stocks with low sensitivity.

When international studies on the explanatory power of liquidity on the cross-section of expected returns are considered, one of the prominent studies is conducted by Bekaert et al. (2007). This paper examines the liquidity premium in emerging markets where the impact of liquidity is particularly strong. They use a modified version of the zeros measure which is based on the occurrence of zero daily returns as an illiquidity proxy, which is previously suggested by Lesmond et al. (1999) and Lesmond (2005).

They find that this measure has significant predictive power for future returns. They also report that unexpected liquidity shocks are positively correlated with returns.

Another important international study on liquidity is conducted by Lee (2011). In addition to considering liquidity as a characteristic of asset returns, this study also takes liquidity as a separate risk factor into consideration. The paper analyzes the liquidity-adjusted capital asset pricing model, which is proposed by Acharya and Pedersen (2005) that considers three different forms of liquidity risk, in international markets. Lee (2011) concludes that liquidity risk is priced in global markets. This study also confirms the important role of the US as driving power of liquidity risk in global markets.

1.1.2.6 Profitability and investment

The relation between accounting ratios such as profitability and investment ratios and expected stock returns has also been examined in the literature. Haugen and Baker (1996) find that past returns, trading volume and accounting ratios of return on equity and price-to-earnings ratio stand out as the most significant determinants of the cross-section of expected returns. Cohen, Gompers, and Vuolteenaho (2002) also use return on equity as a profitability ratio and find a strong positive relation between return on equity and stock returns. Conversely, investment is found to be negatively related to future stock returns. Fairfield, Whisenant, and Yohn (2003) employ net operating assets and accruals as investment variables and show that both are negatively related to returns. Titman, Wei, and Xie (2004) examine growth in capital investment, the ratio of recent capital expenditures to historical capital expenditures and find a significant negative relation between this ratio and expected stock returns. According to this paper, managers may take bad investment decisions due to the motive of empire building and investors do not understand this motive of managers for investment. This constitutes the reason of the negative relation between investment and stock returns.

Fama and French (2015) provide a theoretical model that confirms the previously reported empirical results. They argue that the expected stock return has a positive relation with book-to-market ratio, positive relation with profitability, and a negative relation with investment. Thus, they develop a five-factor model that adds new profitability and investment factors to their previous three-factor model which includes market, size, and value factors. They confirm the better performance of the five-factor model compared to the three-factor model. Hou, Xue and Zhang (2014) also incorporate profitability and investment to their four-factor q-model.

When international studies on profitability and investment are considered, Titman, Wei, and Xie (2013) argue that high investment leads to low average returns in many markets. Fama and French (2017) make further analysis and show how the profitability and investment patterns in average returns are different across size groups. They also show that local versions of the five-factor model perform well in international markets.

1.1.2.7 Skewness

According to the mean-variance paradigm introduced to the literature by Markowitz (1952), the risk of investors' portfolios is fully captured by the variance of the return of the portfolio. However, the empirical failure of this idea leads to the discovery of new variables to explain expected security returns. The idea that the third moment, or the skewness, of returns can be used as an explanatory variable for expected returns has attracted great attention in the literature. This idea is introduced to the literature by Arditti (1967, 1971) who demonstrates that if the return distribution of an investment is negatively (positively) skewed, then investors require a higher (lower) return on that investment. Scott and Horvath (1980) go further and include all higher moments of the return distribution to examine whether they have a significant relation with expected returns. They show that higher (lower) values of odd moments, such as skewness, are related to lower (higher) expected returns. On the other hand, higher (lower) values of even moments, such as variance and kurtosis, produce higher (lower) expected returns.

Another notable study is conducted by Harvey and Siddique (2000). They introduce conditional coskewness in the asset pricing framework, where they define coskewness as the component of stock-specific skewness linked to the skewness of the market portfolio. They demonstrate that coskewness has power in explaining the cross-section of expected returns even after including factors based on size and book-to-market ratio. They also provide a relation between momentum effect and systematic skewness in their analysis.

1.1.3 Other Studies

As discussed above, there is an immense literature on the cross-section of expected returns. In this sense, many variables that have explanatory power for the cross-section of returns have been thoroughly studied so far. There are also other variables that attracted the attention of many researchers, such as idiosyncratic volatility, option-implied volatility, investor inattention, investor sentiment, asset growth, and lottery demand.

It is also worthwhile to mention some of the recent studies on this literature. Recently, there are important papers that study many anomalies at the same time and examine their significance. Some of those studies are conducted by McLean and Pontiff (2016); Harvey, Liu and Zhu (2016); Green, Hand and Zhang (2017); Hou, Xue and Zhang (2020); and Jacobs and Müller (2020).

McLean and Pontiff (2016) examine 97 variables which have been proven to have predictive power in peer-reviewed journals. Their main aim is to analyze out-of-sample and post-publication return predictability of these variables. They compare the return of each variable in three different periods, namely, the original study's sample period, the period after the original sample but before publication, and the post-publication period. They show that there is a huge decline in out-of-sample and post-publication return predictability. They suggest that academic research draws the attention of investors and they utilize academic publications to learn about mispricing. Similar to McLean and Pontiff (2016), Jacobs and Müller (2020) investigate 241 cross-sectional anomalies. However, in addition to the US market, they analyze these anomalies' pre- and post-publication predictability in 39 stock markets. They document that only the US exhibits a reliable decline in post-publication return predictability.

Harvey, Liu and Zhu (2016) takes a different perspective on the cross-section of expected returns and analyze whether usual statistical significance cutoffs in asset pricing tests are appropriate by covering at least 316 factors. They argue that t-statistics need to exceed 3.0 for a new factor to be considered as significant.

Green, Hand and Zhang (2017) simultaneously evaluate 94 characteristics of a firm to identify which ones provide independent information about US stock returns. They find that, in univariate regressions, only 12 characteristics are significant in the cross-section of non-microcap stocks. When they include all 94 characteristics in the regression for non-microcap stocks, they demonstrate that only 12 of them can provide independent information.

Hou, Xue and Zhang (2020) attempt to replicate most of the published anomalies in the literature by covering 452 variables. They control for microcap stocks by using NYSE breakpoints for portfolio sorts and value-weighted returns. They use the standard statistical significance cutoff of 1.96 for t-values. Surprisingly, they find that 65% of the anomalies cannot be replicated. The reason is that they control for microcaps which are overweighted by most of the original studies via equal-weighted returns and with NYSE-AMEX-NASDAQ breakpoints in portfolio sorts.

1.1.4 Conclusion

As stated above, there is a great number of studies that deal with the predictability of cross-section of expected returns in the asset pricing literature. After the debates on market beta's insufficiency to explain the predictability of the cross-section of stock returns, new variables have been introduced into the literature. Important empirical regularities have been reported by prominent papers in this field through detailed analyses. There are also many other variables that have importance in explaining the cross-section of expected returns. I try to briefly review some of the most significant studies that are relevant for cross-sectional predictability. While there are many studies that document the predictability of the cross-section of returns, there is no consensus on the source of predictability.

1.2 A Literature Review on the Time Series of Expected Returns

1.2.1 Introduction

There has been a significant amount of empirical research carried out on the time-series predictability of stock returns in finance literature. Many variables that have power to predict the time-series variation in aggregate stock returns have been introduced into the literature. The goal of this part is to provide a brief literature review on the determinants of the time-series predictability by presenting fundamental variables by covering important studies. Some of the most prominent variables examined in the time-series literature are the value-to-price ratios such as dividend-price ratio, earnings-price ratio, book-to-market ratio; dividend-earnings (payout) ratio; the level of earnings; the level of prices; macroeconomic variables such as consumption and wealth; inflation rates; historical returns and volatility. I will cover some of the notable papers which investigate these variables in chronological order in the next section.

1.2.2 Determinants of the Time-Series of Stock Returns

One of the earlier studies conducted in the literature of time-series predictability belongs to Fama and Schwert (1977). This paper examines the relation between expected and unexpected components of the inflation rate and the returns of various assets, including returns on value- and equal-weighted portfolio of NYSE stocks, returns on US treasury bills and government bonds. Their main aim is to see whether these assets can be used as a hedge against inflation by examining their relationship with the inflation rate. They conclude that common stock returns have a negative relation with the expected component of the inflation rate, which implies that they are not useful as hedges against inflation.

An important variable that is evaluated thoroughly in the time-series predictability literature is the dividend-price ratio (D/P), or dividend yield. This variable is one of the early variables proposed to have predictive power for aggregate stock returns and this finding paves the way for much more research in the literature. The study conducted by Campbell and Shiller (1988a) is among the first ones that examine the predictive power of D/P. They investigate the time variation in aggregate stock prices linked to dividends. First, they reveal that the log D/P has a clear relation with expected future growth in dividends under the rational expectation assumption. Moreover, they find that different measures of short-term discount rates cannot explain stock price movements. One of the main findings of the paper is that D/P predicts future returns.

Another important variable in the time-series predictability of stock returns is the earnings-to-price ratio (E/P), or earnings yield. Campbell and Shiller (1988b) investigate the predictive ability of earnings concerning the dividends and stock prices. They show that historical averages of real earnings help the prediction of the present values of future real dividends. They also reveal that E/P is an important predictor of aggregate stock returns and the predictability of returns enhances at longer horizons. An important contribution of Campbell and Shiller (1988a, 1988b) is that they developed the log-linear approximation of stock returns which provides a framework to examine predictive relations.

Another important study that examines the determinants of time-series of stock returns is run by Fama and French (1988a). This paper investigates the autocorrelation in stock returns at different horizons. Up to this study, tests of market efficiency generally focused on the autocorrelation of returns in short horizons, like daily and weekly stock returns. There is empirical evidence that the slowly-decaying component of stock prices causes negative autocorrelation in returns. This autocorrelation is weak in daily and weekly periods which are generally used by market efficiency tests. This paper also examines the behavior of autocorrelation in longer holding periods by constructing industry and decile portfolios. They find that the negative autocorrelation is larger when the holding period is more than a year which implies that the mean-reverting component of stock prices plays an important role in the stock return variation. The results of the paper show that, when three-to-five-year return variances are considered, price variation caused by mean reversion is responsible for a large part of the return variance. Thus, they suggest that the negative autocorrelation of returns becomes stronger as the holding period increases up to 3-5 years. Then, longer-horizon return autocorrelation becomes zero again, due to the domination of random-walk price components of stock prices. Besides, when firm size is considered, they find that returns are more predictable for small firms.

One of the notable studies that examine the impact of dividend yield and earnings yield is conducted by Fama and French (1988b). This paper employs D/P to forecast value-weighted and equal-weighted NYSE portfolio returns for holding periods from one month to four years. They demonstrate that the predictive power of D/P, measured by R^2, increases as the return horizon increases. When monthly and quarterly regressions of returns on D/P are considered, these regressions can only explain less than 5% of return variation. However, when a two-to-four-year return horizon is used, regressions can explain more than 25% of the variation in return. They suggest two explanations for this finding. The first explanation states that the variance of expected returns increases at a faster rate with the return horizon compared to the unexpected returns' variance. This confirms that expected returns have high autocorrelation. The second explanation is that the variance of residuals coming from the regression of returns on dividend yields grows at a slower rate in proportion to the return horizon. Furthermore, they find that shocks to expected returns are linked to shocks to current prices in opposite direction. Thus, while higher expected returns produce future price increases, this is offset by the immediate decrease in the current price, which brings roughly zero cumulative price effect. In addition to the relation between D/P and returns, they analyze the relation between value- and equal-weighted NYSE returns and E/P. They find that the results are similar to D/P results. However, they also note that the explanatory power of D/P is higher after 1940 since earnings have more variation, which is unrelated to the variation in expected returns, than dividends. So, they argue that E/P includes more noise in terms of forecasting power than D/P.

In a different paper, Fama and French (1989) examine the impact of business conditions on expected returns of stocks, along with the expected returns of bonds. They aim to find whether the same variables forecast returns on stocks and bonds and the change in stock and bond returns has a relation with business conditions. They consider three variables: The dividend yield; the default spread, calculated as the difference between the yield on Aaa bonds and the yield on a portfolio of corporate bonds; and the term spread, calculated as the difference between the one-month Treasury bill rate and the yield on Aaa bonds. They find that the dividend yield and the default spread are linked to long-term business cycles and produce similar variations in bond and stock returns. On the other hand, the term spread is related to short-term business episodes. They find that all three variables have predictive power for both stock and bond returns, which suggests that the variation in expected returns is common across different securities. Furthermore, they suggest that the variation in expected returns has a negative relation to long-term and short-term changes in business conditions. In other words, when economic conditions become better, which is called business-cycle peaks, expected returns are lower. Conversely, when economic conditions get worse, which is called business-cycle troughs, expected returns are higher.

Another significant study to evaluate the predictive ability of dividend yield and earnings yield is conducted by Lamont (1998). He suggests that the argument of Fama and French (1988b) about E/P being a noisier measure of expected returns than D/P due to the high variability of earnings is not true. Conversely, the higher variability of earnings includes important information about the short-term variability of expected returns. This paper simultaneously examines the impact of dividends and earnings through aggregate dividend payout ratio (dividends-to-earnings ratio) on expected returns. According to their analysis, the forecast power of aggregate dividend payout ratio is due to the separate forecast power of the level of dividends and the level of earnings. Dividends and future returns have positive relation. The reason behind this fact is that the current level of dividends can be considered as a measure of the value of future dividends which makes dividends contain information about future returns. On the other hand, there is a negative relation between earnings and expected returns. The reason behind this fact is that there is a clear link between business conditions and the level of earnings. Also, there is a negative relation between expected returns and business conditions. In other words, higher expected returns are required in recessions, whereas in booms, investors require lower returns. Due to these relations between business conditions and earnings, and business conditions and expected returns, the level of earnings has predictive power for future returns. Thus, both dividends and earnings have predictive power for future returns and include information about future returns different than the information that the level of stock prices has. Moreover, price has a negative relation with future returns because of mean reversion in stock prices. Earnings and dividends contain information about short-run variance in expected returns. However, when it comes to forecasting long-horizon returns, the only relevant variable is the level of the stock price. Furthermore, when they analyze the predictive power of E/P, they suggest that the reason of the low predictive power of E/P is not about earnings being a noisy measure. Since both current prices and current earnings have a negative relation with future returns, using earnings yield at forecasting wipes out any possible relationship. However, the dividend yield has significant explanatory power since prices and dividends have opposite relation with future returns.

Another popular variable that attracts the attention of many researchers in the field of time-series predictability is book-to-market ratio (B/M). Pontiff and Schall (1998) examine the B/M of the Dow Jones Industrial Average (DJIA) to see whether it can forecast market returns. Different than the previous study conducted by Kothari and Shanken (1997), in addition to B/M, they also include other variables that have shown a predictive ability for market returns in the previous literature such as dividend yield and interest yield spreads. They find that DIJA B/M has predictive power for market returns that is not captured by other variables. To put it differently, DIJA B/M stands out as a stronger predictor of market returns than previously reported variables. However, they also note that these results are specific to the period before 1960. Then, they investigate the predictive power of S&P B/M for S&P returns. They find that it has some predictive ability for the period after 1960 although it cannot be statistically justified. Besides, this prediction is much weaker than the DIJA B/M's forecast power in the pre-1960 sample. In other words, they state that there exists a structural difference between the pre- and post-1960 periods. There does not exist a significant relation after 1960. When they analyze the source of the relation between aggregate B/M and market return, they suggest that this is due to the relation between book value and future earnings in the sense that the book value can be used as a proxy for expected cash flows.

Some of the other variables reported to have forecast power for market returns are related to economic conditions, such as consumption and wealth. Lettau and Ludvigson (2001) take these macroeconomic variables into account and reveal that fluctuations in the aggregate consumption-wealth ratio strongly predict stock returns. When compared to other commonly used variables such as dividend yield and dividend payout ratio, this ratio has a better forecasting ability at short and intermediate time horizons. Furthermore, this variable stands out as the best univariate predictor among other commonly used predictors when periods up to one year are considered.

Another important paper that evaluates the predictive ability of financial ratios in the form of value-to-price ratios is conducted by Lewellen (2004). This paper analyzes the time-series ability of different ratios like D/P, B/M and E/P to forecast aggregate stock returns, focusing primarily on D/P since it has received the most attention of researchers. This study claims that the correction for small-sample biases used by previous papers has underestimated the forecasting ability of dividend yield. The paper provides a new test and reveals that dividend yield significantly forecasts market return during the period of 1946-2000. When B/M and E/P are analyzed, they have significant predictive power during a shorter sample between 1963 and 2000. Before running regressions and conducting analyses, Lewellen (2004) investigates the statistical properties of these financial ratios. He reveals that they share similar time-series properties which is important on tests of return predictability. For analyses, the paper focuses on short horizons by regressing monthly market returns on lagged D/P to avoid the issues related to overlapping returns. He postulates that small-sample bias correction conducted by previous studies dramatically understates the forecasting power of D/P.

Lettau and Ludvigson (2005) study the impact of expected dividend growth on the post-war US stock market. Despite the fact that D/P has been lately shown to be unable to predict stock market returns, changing forecasts of dividend growth plays an important role in US stock market. Furthermore, when they analyze the behavior of dividend forecasts during business cycles, they reveal that it covaries with the forecasts of excess stock returns. This positive covariation between expected returns and expected dividend growth wipes out the impact of D/P.

Lettau and Ludvigson (2005) state that the empirical evidence on the predictive power of D/P has attracted the attention of many researchers. However, there are also a considerable number of studies that provide evidence against the paradigm of D/P predictability that has been established in the literature. Some papers, such as Stambaugh (1999) and Goyal and Welch (2003), argue that there exists little evidence on the forecast power of D/P after careful statistical analysis are conducted. This paper provides an alternative take on this topic by studying a consumption-based present-value relation which is a function of future dividend growth. They conclude that the positive covariation between expected returns and expected dividend growth is the reason of the insignificant predictive power of D/P.

Ang and Bekaert (2007) provide an alternative view on the predictive inability of D/P. As stated in Ang and Bekaert (2007), under the rational model assumptions, price-dividend ratio, or the dividend yield, corresponds to the expected value of discounted cash flows by using time-varying discount rates. Hence, dividend yield variability can be regarded as the result of the variation of expected cash flow growth or expected future discount rates, or risk premia. Due to the empirical evidence that dividend yield has a weak predictive power for dividend growth, most of the variation in dividend yields is attributed to variation in expected returns. Ang and Bekaert (2007) reexamine this argument. They find that dividend yield cannot predict excess market returns in the univariate regression. On the other hand, together with the short rate, dividend yield forecasts excess market returns only at short horizons, in the bivariate regression specification. When analyzed at longer horizons, dividend yield shows no predictive ability in explaining excess returns. Hence, the predictability of dividend yield that has been proposed by many studies does not exist.

The short rate stands out as a strong predictor of returns at short horizons. Thus, they conclude that the most robust variable that has predictive power for future excess returns at short horizons is the short rate. The predictive power of the short rate has already been proposed by Fama and Schwert (1977). To strengthen this finding, they also conduct analysis on three other countries, namely the United Kingdom, France and

Germany. After all, according to their arguments, this finding implies that the predictability is fundamentally a short-run issue.

When the variation in dividend yield is concerned, discount rate and short rate variations seem to be important. They show that dividend yields are positively associated with future interest rates. Finally, they reveal that, in contrast to their poor predictive performance for future excess returns, dividend yield and earnings yield are good predictors for future cash flow growth rates.

Bali, Demirtas and Tehranian (2008) provide a different point of view on the predictability of aggregate stock returns by examining earnings at different levels. This paper thoroughly analyzes the predictive power of market-, industry-, and firm-level earnings. They reveal that the findings of Lamont (1998) on the predictive power of aggregate earnings and dividend payout ratio are sample-specific. In other words, his empirical results are not valid in different sample periods. They argue that, contrary to Lamont’s (1998) findings, there is no significant relation between aggregate earnings and future returns and dividend payout ratio and future returns. When they extend the sample of Lamont (1998), the significance of aggregate earnings and dividend payout ratio disappears. Bali, Demirtas and Tehranian (2008) also examine the predictive ability of earnings at the firm-level. They find that the earnings yield has the ability to explain the time-series variation in firm-level stock returns, which contrasts with the aggregate-level results. They argue that firm-level earnings have two components: Systematic component which can be explained by systematic earnings and unsystematic component which is orthogonal to aggregate earnings. When aggregated to the market level, the unsystematic component diversifies away. In other words, firm-level earnings are informative about future cash flows and the aggregation of firm-level earnings to construct market-level earnings diversify away the information contained in firm-level earnings about future stock returns. Hence, at the aggregate level, earnings cannot predict future returns. At the firm-level, the earnings yield has a significant explanatory power due to the opposite relation of prices and earnings with expected returns. So, they do not offset each other, and earnings yield can predict future returns at the firm-level.

In addition to the analysis at the firm-level and aggregate-level, this paper also examines the predictability at the industry-level by constructing 17 industry portfolios. They reveal that industry-level earnings cannot predict future returns because the aggregation of firm-level earnings to industry-level wipes out the information contained in the unsystematic portion of firm-level earnings about future cash flows. However, if more industry portfolios are used, the information about future cash flows is only partially diversified away. To test this argument, they employ 48 industry portfolios and the results indicate that earnings have a positive and significant relation with future returns. To sum up, there is a significant relation between earnings and expected returns at the firm-level and also, when the market is partitioned into 48 industry portfolios. However, there is no predictability at the aggregate level or when 17 industry portfolios are considered.

Moreover, when they analyze the source of the predictive power of earnings yield, they find that the mean reversion of stock prices and the correlation between the unsystematic component of earnings and future returns lead to significant relation between earnings yield and expected returns at the firm-level. As a robustness check, they also investigate the cross-sectional relation between future stock returns and earnings at the firm-level. The cross-sectional results indicate that firm-level earnings positively and significantly predict the cross-section of expected returns. These results are still robust after controlling for size, momentum, book-to-market ratio, and post-earnings announcement drift.

Another variable that is evaluated in terms of its forecast ability of expected aggregate returns is the historical average of returns. While Goyal and Welch (2007) propose that the historical average of stock excess returns is the best predictor of future excess stock returns compared to various predictor variables, Campbell and Thompson (2008) present empirical evidence against this argument. Campbell and Thompson (2008) reveal that many predictors have outperformed the historical average return in their out-of-sample performance after imposing some restrictions on predictive regressions. It is worthwhile to note that this paper shows that restricted regressions perform better than unrestricted regressions in terms of out-of-sample performance.

Welch and Goyal (2008) take all variables that have been proposed by the earlier academic research to have predictive power for stock returns into consideration and reevaluate their performance both in-sample and out-of-sample. The paper states that different studies employ different periods, analysis, and variables; so, there is a need for consolidation to evaluate the performance of different variables. In other words, this paper reexamines the empirical evidence for each proposed variable by using the same methods, same time-periods, and same estimation frequencies. Interestingly, the evidence in the paper reveals that most variables no longer have any significant explanatory power even in-sample. For most of the variables, any predictive ability is only valid during the period up to and especially in the period of the Oil Shock (1973-1975). Furthermore, most models show poor out-of-sample performance. According to their argument, all these findings make these models unstable or even spurious.

Bollerslev, Todorov and Xu (2015) take an alternative take on time-series predictability of market returns by examining the forecast power of the variance risk premium. The variance risk premium is the difference between the risk-neutral and actual expectations of the forward aggregate market variation. According to the evidence presented in the paper, the variance risk premium has a forecasting power for future market returns. They decompose the variance risk premium into two components, namely, normal price fluctuations and jump tail risk components. Thanks to this decomposition, they are able to find the source of the predictive power of the variance risk premium. The evidence shows that the two components show different dynamic features. When the two components are separately considered in the return predictability regressions, it is reported that jump tail risk component, which is regarded as a proxy for market fears, is responsible for most of the predictability for the aggregate market return.

1.2.3 Conclusion

The time-series predictability of aggregate stock returns has attracted the attention of many researchers. As explained in the previous section, there have been seminal studies carried out that deal with the predictability of time-series of expected returns in the asset pricing literature. Significant empirical regularities have been revealed by notable papers in this field through detailed analyses. There are also many other variables that are reported as important in explaining the time-series variation of aggregate returns. I try to briefly review some of the most significant studies that are relevant for time-series predictability.

2. DECOMPOSING VALUE GLOBALLY

2.1 Introduction

The value premium is one of the most scrutinized empirical regularities in financial research that focuses on the cross-section of equity returns. This effect refers to the widely documented anomaly that value stocks defined as equities with high measures of fundamental value such as book value of equity relative to their market value generate higher future returns compared to growth stocks defined as equities with low measures of fundamental value relative to their market value. There is consensus regarding the existence of the value premium both in the cross-section and time-series of equity returns. However, the sources of this anomaly remain an open question.[1]

There are two main explanations that have been offered for the value anomaly. The first is a risk-based explanation which argues that higher (lower) returns to value (growth) stocks are caused by the higher (lower) exposures of these securities to a priced risk factor. Fama and French (1992) argue that book-to-market ratio is a proxy for the relative distress effect that Chan and Chen (1991) postulate to explain the size anomaly. According to this argument, low market valuations relative to measures of fundamental value indicate that the market's expectations for a firm's prospects are unfavorable. Another way to interpret the distress effect is to perceive it as an involuntary leverage effect in disguise since low market valuations are associated with high market leverage. Consistent with the risk-based explanation, Fama and French (1995) and Chen and Zhang (1998) document that value firms have persistently low earnings, high earnings uncertainty and high leverage. The second explanation proposed for the value premium

[1] Price-to-fundamental ratios are also strong predictors in the time-series of aggregate market and industry returns. See Kothari and Shanken (1997) and Bali, Demirtas and Tehranian (2009).

is behavioral. Lakonishok, Shleifer and Vishny (1994) find that the returns to value strategies are due to mispricing caused by investors' forecasting errors with respect to the future earnings growth of stocks. Naïve investors tend to get overly optimistic (pessimistic) about stocks that have performed well (poorly) in the past and create excessive demand for (oversell) these shares causing them to be overpriced (underpriced). In other words, investors extrapolate the past too far into the future creating mispricing in equities. The predictive power of book-to-market ratio on equity returns is essentially an outcome of the correction of these pricing errors.[2]

Gerakos and Linnainmaa (2018, GL hereafter) provide an alternative take on this topic by arguing that there is a disconnect between the book-to-market ratio and the value premium. In other words, not all firms with high book-to-market ratios (value firms) earn value-like returns and not all firms with low book-to-market ratios (growth firms) earn growth-like returns. The authors explain this disconnect by showing that changes in book-to-market ratio are driven predominantly by changes in firm size in the US. In fact, their results reveal that the significantly positive relation between book-to-market ratio and future equity returns turns insignificant when lagged annual changes in firm size are controlled for in a regression framework. This finding supports the conjecture that the main driver of the value premium is higher (lower) returns associated with firms that have shrunk (grew) in market capitalization. The authors also decompose the book-to-market ratio into its size and orthogonal components (independent from changes in firm size) and compare the future returns of equity deciles formed based on the book-to-market ratio and these components. They show that the positive return spread between value and growth stocks completely emanates from the size component of the book-to-market ratio rather than the orthogonal component. Thus, they conclude that changes in firm size completely subsume the predictive power of book-to-market ratio on equity returns.

This study extends the analyses of GL (2018) to an international context that spans 23 developed markets beginning from 1990. In my baseline analyses, I group these countries into four regions, namely North America, Europe, Japan and Asia Pacific. After reproducing the main results of the original study, whose sample period begins in 1963, I run cross-sectional regressions of monthly equity returns on current and lagged book-to-market ratio, changes in firm size and various control variables in different regions. First, I find that the results of GL (2018) for US stocks continue to hold in the more recent

[2] For other studies that support this behavioral interpretation of the value premium, see La Porta (1996), La Porta, Lakonishok, Shleifer and Vishny (1997), Griffin and Lemon (2002) and Bali, Demirtas and Hovakimian (2010).

sample period. For US stocks, the positive slope on book-to-market ratio loses its significance when lagged changes in firm size are controlled for. In other words, the results of the original study are not specific to its sample period. Second, I find that these results do not hold for the rest of the world in the sense that the significantly positive relation between book-to-market ratio and future equity returns remains strong even after controlling for changes in firm size. I also repeat the portfolio analyses in the original study and find that it is only the US market where the size component of book-to-market ratio is responsible for the return spread between value and growth firms. For all other regions, the orthogonal component is either the main driver of the value premium or it is at least as strong as the size component. These results hold for both equal- and value-weighted portfolio returns although the value premium is not as significant in the recent sample period under value-weighting. I also repeat the regression and portfolio analyses for each individual market but fail to find evidence that historical changes in firm size are the primary source of the value premium. To summarize, I conclude that GL's assertion that changes in firm size drive the positive relation between book-to-market and future equity returns is valid only in the US setting. For the rest of the world, it is the component of book-to-market ratio which is orthogonal to changes in firm size that is responsible for the covariance with future equity returns.

The remainder of the paper is organized as follows. Section 2 describes the data and variables. Section 3 presents the methodology and results for the cross-sectional regression analysis. Section 4 presents the methodology and results for the portfolio analysis. Section 5 present results from country-level analyses. Section 6 concludes.

2.2 Data and Variables

2.2.1 Data

I follow Fama and French (2012, 2017) and group 23 developed countries into four regions to balance parsimony in the choice of regions and need for reasonable market integration within each region.[3] The four regions are: 1) North America, including the United States and Canada; 2) Europe, including Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom; 3) Japan; and 4) Asia Pacific, including Australia, Hong Kong, New Zealand and Singapore. I also present separate results for the United States (and Canada) to see how the results compare to those of GL (2018).

For the US, I obtain monthly equity data for returns, prices and volume of shares necessary to calculate market value of equity from the Center for Research in Security Prices (CRSP).[4] Balance sheet data come from Compustat. I include all stocks traded in NYSE, AMEX and Nasdaq and exclude ADRs, REITs and closed end funds from the sample. The risk-free rate used to calculate excess returns is the interest rate on one-month US T-bills and is available at the Federal Reserve database. Book value of common equity is defined as stockholders' equity plus deferred taxes and investment tax credit minus the value of preferred stock following Fama and French (1993).[5] Following GL (2018), I lag accounting data by at least six months for the numerator of the book-to-market ratio. For the denominator, I use the market value of equity at the end of the previous calendar year. The US sample contains about 1.72 million firm-month observations.

Outside the US, the primary data source for market and accounting information is Thomson Reuters Datastream. Daily equity returns are calculated using the daily total return index adjusted for stock splits and dividend payments. Monthly equity returns are calculated by compounding daily returns. I utilize returns denominated in US dollars; (i) to make the returns comparable across countries, (ii) to eliminate the effect of exchange rate risk on returns, and (iii) to reflect the effect of different inflation rates across countries through purchasing power parity.[6] I follow other international studies such as Bekaert, Harvey and Lundblad (2007) and Bekaert, Hodrick and Zhang (2009) to screen the data and omit some of the data errors in Datastream that have been reported in the prior

[3] I also repeat main analyses at the country-level in section 5.

[4] For companies that delist, if the delisting return is missing from CRSP and the delisting is performance-related, I apply a return of -30% for NYSE and Amex stocks and -55% for Nasdaq stocks.

[5] I use the redemption, liquidation or par value (in this order) depending on availability to estimate the value of preferred stock.

[6] My choice to utilize returns denominated in US dollars follows studies such as Ang et al. (2009), Eun et al. (2010), Hou, Karolyi and Kho (2011), Lee (2011), Fama and French (2012, 2017), Asness, Moskowitz and Pedersen (2013) and Asness and Frazzini (2013). However, I repeat main analyses using returns denominated in local currencies in the country-level analyses presented in section 5.

literature. I select stocks only from major exchanges defined as those in which the majority of equities in a given country are traded. Again, I only include common equities in the sample and exclude stocks with special features such as depository receipts, real estate investment trusts and preferred stocks. I retain all data for defunct stocks in the sample to avoid survivorship bias. Following Fama and French (2012), I only include firms with a minimum market value of equity of 1 million USD for each month when I run regression or portfolio tests.[7] I also drop any day from the sample as a non-trading day if more than 90% of stocks in a given exchange have zero returns on that day. To implement this last screen, I calculate the returns using the total return indices denominated in local currencies since returns denominated in US dollars may be non-zero solely due to changes in exchange rates. Again, I lag accounting data by at least six months for book value of equity and I utilize the market value of equity at the end of the previous calendar year. The sample period for all regions extends from 1990 to 2014. Canadian, European, Japanese and Asia Pacific equity samples contain about 0.31 million, 1.65 million, 0.73 million and 0.73 million firm-month observations, respectively. The number of stocks at the end of each year for each country is presented in Table I of the appendix.

2.2.2 Descriptive Statistics

Table 1 reports descriptive statistics for monthly equity returns for each region separately. I also report descriptive statistics for control variables. These variables are book-to-market ratio (B/M), firm size defined as logarithm of market value of equity and momentum returns (MOM) defined as the prior year return after skipping one month following Jegadeesh and Titman (1993).[8]

Panel A of Table 1 shows that the average monthly return to North American stocks is 79 basis points, however, US equities have higher mean returns compared to Canadian equities with values equal to 93 and 24 basis points, respectively. The median returns are much lower than the mean returns in both markets and the monthly return volatilities are

[7] To maintain consistency between the US and non-US samples, I also exclude firms with market value of equity less than 1 million USD from the US sample. The results are qualitatively the same if this screen is not utilized.

[8] I winsorize these control variables at the 1% level in both the US and non-US samples.

very high compared to the central tendency statistics. North American equity return distributions are positively skewed and leptokurtic with these patterns being more pronounced in the US compared to Canada. European and Japanese equities have negative mean monthly returns with values equal to -13 and -15 basis points, respectively.[9] In the Asia Pacific region, the average monthly return is 16 basis points. For these three regions, the returns are again highly volatile and median returns are lower compared to mean returns. Moreover, the return distributions in these three regions are mildly positively skewed, however, the magnitudes of the skewness and kurtosis statistics are lower compared to North America.

The average book-to-market ratio is 0.76 in North America and this statistic tends to be higher in Canada compared to the US with values of 0.93 and 0.73, respectively. Europe, Japan and Asia Pacific regions also exhibit higher book-to-market ratios compared to the US. In all regions, the distribution of the book-to-market ratio is positively skewed and highly leptokurtic with these deviations from normality being most acute for European stocks. The average firm size is largest in the US and Japan and smallest in the Asia Pacific region. Finally, the highest average momentum return belongs to the US with a value of 13 percent.

2.3 Cross-Sectional Regression Analysis

2.3.1 Methodology

Following Fama and French (2008), the logarithm of the book-to-market ratio can be decomposed as its value k years earlier plus the sum of the annual changes in the logarithmic book and market values of equity during these years:

$$BM_t = BM_{t-k} + \sum_{s=1}^{k} dbe_{t-s} - \sum_{s=1}^{k} dme_{t-s} \qquad (2.1)$$

[9] I should note that these negative values do not indicate that the aggregate equity markets of these countries have lost value over the sample period. To calculate these descriptive statistics, I equal-weight stock returns at the cross-sectional level and the time-series level, subsequently. If equities that have large negative returns tend to be smaller, the return to the aggregate market for these regions can be positive over the sample period.

where BM_t is the logarithm of the book-to-market ratio in year t, dbe_t is the annual logarithmic change in the book value of equity and dme_t is the annual logarithmic change in the market value of equity. Thus, a firm becomes a value firm (or attains a higher book-to-market ratio) either if its book value of equity increases more relative to its market value of equity or its market value of equity decreases more relative to its book value of equity or it was already a value firm and its book and market values of equity stay comparatively unchanged. In this section, I investigate whether the impact of book-to-market ratio on future equity returns emanates predominantly from changes in market value of equity rather than historical book-to-market ratio or changes in book value of equity. To do so, I regress one-month-ahead returns on the logarithm of book-to-market ratio today and five years ago and annual logarithmic changes in firm size in the past five years. Changes in firm size are December-to-December changes over each calendar year. I also control for the logarithm of the current firm size, one-month-lagged return and momentum return.[10] The regressions follow the methodology of Fama and Macbeth (1973) where reported coefficients are time-series averages from monthly regressions and the associated *t*-statistics are reported using the Newey-West (1987) procedure.

To make sure that the methodology captures the empirical regularities that GL (2018) reports, I first repeat the analyses in Table 2 of that study.[11] The results from this exercise are presented in Table II of the appendix. In the univariate specification, the average slope on the book-to-market ratio is significantly positive with a t-statistic of 4.88. The second column adds the five-year-lagged book-to-market ratio to the specification. The slope on the historical book-to-market ratio is significantly negative whereas the coefficient of current book-to-market ratio increases both in magnitude and statistical significance. The next five regressions augment the first specification with one-year logarithmic changes in firm size in a stepwise fashion. First, historical increases in firm size have a significantly negative relation with future equity returns. Second, and more importantly, the slope of current book-to-market ratio declines in magnitude and loses its statistical significance when annual changes in firm size are controlled for. The last specification reveals that current book-to-market ratio is also uninformative about

[10] I restrict the control variables to this set to make the results comparable with GL (2018). I suppress the coefficients and t-statistics associated with these control variables in the exposition in Table 2 to preserve space.

[11] For this exercise, I begin left-hand-side returns from July 1963 and follow the data procedures in the original study. Any discrepancies in the exact numbers can be attributed minor methodological differences that cannot be deciphered from the original study.

one-month-ahead returns in the presence of both the historical book-to-market ratio and annual changes in firm size. These findings indicate that I can closely reproduce the results of GL (2018) and confirm that book-to-market ratio's ability to forecast equity returns is driven by changes in firm size in the US.

2.3.2 Empirical Results

The results for the cross-sectional regressions in each region are reported across the six panels of Table 2. Panel A reports the findings for North America. The first specification shows that book-to-market ratio has an average slope of 0.41 with a t-statistic of 3.37 in the univariate specification. When five-year-lagged book-to-market ratio is added to the regression, the average slope of BM declines to 0.37 but it is still highly significant with a t-statistic of 3.12. The coefficient of historical book-to-market ratio is not significant at conventional levels. Regressions 3 to 7 augment the specification with annual logarithmic changes in the market value of equity during the last five years. The results indicate that the coefficient of BM first decreases to 0.32 and then gradually to 0.10. The t-statistic associated with the slope of BM is equal to only 0.89 when all lags of changes in firm size are controlled for. The coefficients of the annual changes in firm size are all negative and mostly statistically significant. The last two specifications show that neither the current nor the historical book-to-market ratio have any predictive power for future equity returns above and beyond that of changes in firm size.

I repeat this analysis for only US stocks in Panel B of Table 2. The findings are parallel to those in the North America region. Current book-to-market ratio has a significantly positive coefficient in the univariate specification with a value of 0.36 and t-statistic of 2.97. Historical book-to-market ratio cannot subsume this predictive power, however, adding successive past annual changes in firm size brings the average slope of BM as low as -0.01 with a t-statistic of -0.12. In other words, book-to-market ratio is able to predict equity returns only because it correlates with changes in firm size. The results for North America and the US in the sample corroborate the main message of GL (2018).

Next, I turn my attention to Canada. Panel C of Table 2 shows that the significantly positive relation between book-to-market ratio and one-month-ahead equity returns is borne out in the Canadian sample as well. For the first two specifications, the coefficient of BM is 0.28 with t-statistics of 3.34 and 2.47 in the absence and presence of historical book-to-market ratio, respectively. When I add dme_{t-1} to the univariate specification, I observe that the coefficient of BM increases both in magnitude and statistical significance with a value of 0.32 and t-statistic of 3.79. Although the coefficient of dme_{t-1} is significantly negative, successive annual changes in firm size generally do not have a significant relation with one-month-ahead returns. More importantly, the average slope of the current book-to-market ratio stays significantly positive with t-statistics between 3.73 and 3.87. The final column of Panel C indicates that controlling for both historical book-to-market ratio and changes in firm size does not subsume the significantly positive relation between BM and future equity returns. In other words, the predictive power of book-to-market ratio for stock returns is not driven by changes in firm size in Canada. These results are in contrast with those for the US. The fact that North American results fall in line with the results of GL is caused by the dominance of US data in the North American sample.

Panel D of Table 2 presents results for European equities. For this subsample, current book-to-market ratio has a significant predictive relation for one-month-ahead returns by itself with a coefficient of 0.19 (t-statistic = 3.85). Controlling for the historical book-to-market ratio decreases this coefficient in magnitude and statistical significance, however, it is still significantly positive with a t-statistic of 2.80. Past annual changes in firm size have statistically insignificant coefficients in regressions 3 to 7 except dme_{t-1} whose average slope is significantly negative. More importantly, current book-to-market ratio always has a significantly positive coefficient with t-statistics between 4.11 and 6.04. The full specification in the last column shows that the value and t-statistic associated with the average slope of BM are equal to 0.18 and 4.23, respectively. Similar patterns are observed for Japanese stocks in Panel E as well. The coefficient of current book-to-market ratio varies between 0.37 and 0.50 across all specifications with t-statistics between 4.11 and 9.20. For equities traded in the Asia Pacific region, Panel F shows that the predictive relation between BM and future equity returns in the univariate specification is strong even after five years of annual changes in firm size are controlled for as the t-statistics associated with the average slope of BM vary between 2.86 and 4.40. These findings collectively suggest that, the result that the relation between book-to-market ratio and future equity returns is driven by historical changes in firm size is not borne out in the international sample. On the contrary, book-to-market ratio remains a strong predictor of future stock returns even after one controls for past changes in firm size in cross-sectional regressions.

2.4 Portfolio Analysis

2.4.1 Methodology

In this section, I conduct an alternative test to understand the sources of the relation between book-to-market ratio and future equity returns by decomposing book-to-market ratio into its size and orthogonal components. To do so, I run annual cross-sectional regressions of book-to-market ratio on historical changes in firm size:

$$BM_{it} = a_t + \sum_{s=1}^{5} b_s dme_{i,t-s} + e_{it} \tag{2.2}$$

where BM_{it} is the logarithm of the book-to-market ratio for firm *i* in year *t* and dme_{it} is the annual logarithmic change in the market value of equity for firm *i* as defined earlier. The regression is estimated each year using end-of-June values. The second term on the right-hand side is denoted as BM^s and represents the size component of the book-to-market ratio. The third term on the right-hand side (the error term) is denoted BM^o and represents the orthogonal component which captures the cross-sectional variation in the book-to-market ratio that remains after stripping the variation driven by firm size. Based on this decomposition methodology, annual changes in firm size are relevant only to the extent that they explain the cross-sectional variation in the book-to-market ratio.

In the portfolio analyses for international stocks, I assign equities to deciles based on their book-to-market ratios and its two components. The sorts are carried out at the end of June of each year *t* and equal- or value-weighted portfolios are held from July of year *t* to June of year *t*+1. To determine the breakpoints for the portfolio assignments, I follow Fama and French (2012) and use breakpoints based on large stocks to avoid placing undue weight on tiny firms in the sample. Large stocks are defined as those stocks whose total market value of equity make up 90% of the aggregate market capitalization in each region. In other words, for each portfolio formation date, I calculate the sum of the market values of equity for the stocks in each region in descending order beginning with the largest stock and stop when this sum reaches 90% of the aggregate market value of equity. After I conduct the univariate sorts, one-month-ahead returns are calculated for each decile to test whether the zero-cost portfolio that takes a long position in stocks with the highest book-to-market ratio (or one of its components) and a short position in stocks with the lowest book-to-market ratio (or one of its components) generates a significant return.[12]

Table 3 presents average portfolio characteristics for equity deciles sorted on the book-to-market ratio. For each decile and region, the table reports the mean values for current and five-year-lagged book-to-market ratio, current and five-year lagged firm size and momentum return. There are some common patterns across the regions. For growth stocks defined as those with the lowest current book-to-market ratios, I observe that the average book-to-market ratio has declined over time. On the other hand, for value stocks defined as those with the highest current book-to-market ratios, I observe that the average book-to-market ratio has increased over time. For example, for North America, the stocks in the growth decile experienced a decrease in B/M from 0.38 to 0.09 whereas the stocks in the value decile experienced an increase in B/M from 1.09 to 1.72. However, I also see that the mechanical increase in current B/M from the growth to the value decile is preserved for the historical book-to-market ratio. In other words, there is some degree of persistence for this ratio. This pattern is observed across all panels of Table 3. Another common finding is that the average size of growth firms has increased over time whereas value firms either experienced a decrease in average size or the level of increase has not been as high as the growth firms. The only exception for this pattern is Japan where average firm size for the B/M deciles has been relatively stable over time. Finally, I observe that value firms have lower momentum returns compared to growth firms in the US, however, this pattern is reversed in other regions.

Next, I reproduce the portfolio results presented in Table 5 of GL (2018) using their sample period to ensure that I am able to follow their methodology and to juxtapose the

[12] I also examine whether the excess return differences between the extreme deciles can be explained by the international asset pricing model of Fama and French (2017) which incorporates the market, size, value, investment and profitability factors. GL (2018) use the three-factor model of Fama and French (1993) to calculate alphas for their US sample. I also recalculate the abnormal returns for the sample using the international version of this three-factor model and the interpretation of the results does not change. For each region, I use the region-specific asset pricing factors provided in Kenneth R. French's data library. This data library does not include standalone pricing factors for Canada. To calculate abnormal returns for Canadian equities, I use the pricing factors for North America for the reported results since these factors are publicly available. I also calculate Canada-specific pricing factors following the methodology of Fama and French (2017) and the results are robust to the utilization of these self-generated factors.

results from the international sample with those of the original study. For this exercise, I form ten portfolios based on book-to-market ratio and its two components by using NYSE breakpoints. Panel A of Table III of the appendix presents the excess returns for the value-weighted decile portfolios and for a strategy that is long the top decile and short the bottom decile. The results show that BM and its size component create similar patterns for the decile returns. The zero-cost strategy that buys (sells) equities with the highest (lowest) book-to-market ratio generates a return of 53 basis points with a t-statistic of 2.79. The same strategy produces a return of 66 basis points with a t-statistic of 2.91 when the sorting variable is BM^s. However, the orthogonal component of book-to-market ratio does not generate any significant spread in excess returns. In other words, in the US, the value premium is driven by the portion of book-to-market ratio that can be explained by historical changes in firm size. Panel B of Table III shows that the three-factor alpha associated with the zero-cost strategy based on BM^s is zero whereas the alpha of the strategy based on BM^o is significantly negative. These results are very closely in line with those of the original study.

2.4.2 Equal-Weighted Portfolio Returns

Table 4 presents equal-weighted returns to deciles formed based on book-to-market ratio and its size and orthogonal components and to the zero-cost strategy long in the top and short in the bottom deciles for the different regions. Panel A presents results for North America. The returns to the book-to-market ratio deciles increase almost uniformly from 34 basis points to 135 basis points and the return difference between the extreme deciles is statistically significant with a t-statistic of 3.13. This spread is driven by the size component of book-to-market ratio as the findings indicate that the return to the zero-cost strategy associated with BM^S is equal to 1.35% with a t-statistic of 4.48. In contrast, the return spread generated by the orthogonal component is only 15 basis points with a t-statistic of 0.60. In other words, the portfolio findings in GL (2018) are also borne out for the North American sample used in this study in the sense that the portion of book-to-market ratio explained by historical changes in firm size accounts for the value premium. In Panel B, I observe that these patterns are also apparent for US stocks in the recent sample. The zero-cost strategy based on BM and BM^s are equal to 1.12% and 1.26% with t-statistics of 3.42 and 4.11, respectively, whereas the return spread associated with BM^o is statistically insignificant.[13] However, results presented in Panel C of Table 4 for Canadian stocks reveal that the positive relation between book-to-market ratio and future equity returns is not just limited to the size component. Zero-cost strategies based on BM, BM^s and BM^o generate returns of 74, 67 and 68 basis points with t-statistics equal to 3.25, 2.63 and 3.37, respectively. In other words, the orthogonal component of book-to-market ratio which cannot be explained by historical changes in firm size also contributes to the value premium in Canada. Thus, similar to the findings from the cross-sectional regressions of section 3.2, North American results are driven by the dominance of US data in this sample.

Next, I investigate whether these results extend to regions outside North America. Panel D of Table 4 presents results for European equities. The value premium is also existent for equal-weighted portfolio returns in Europe with book-to-market ratio generating a return spread of 78 basis points with a t-statistic of 3.98 between the extreme deciles. However, unlike North America, the size component of book-to-market ratio is not associated with a significant return to the zero-cost strategy. The return difference between the extreme BM^s deciles is 30 basis points with a t-statistic of 1.54. In contrast, the returns to the portfolios formed based on BM^o almost uniformly increase from the lowest to the highest decile. The orthogonal component of book-to-market ratio generates a return of 60 basis points to the zero-cost strategy with a t-statistic of 5.41. Thus, the findings for US stocks is reversed in the European sample. Moreover, a similar reversal is also observed for Japanese stocks in Panel E. The return spreads between the extreme deciles generated by BM, BM^s and BM^o are 105, 5 and 81 basis points with t-statistics of 5.51, 0.20 and 6.49, respectively. In other words, the component of book-to-market ratio that is explained by past changes in firm size does not account for the value premium in Europe and Japan. Finally, Panel F of Table 4 presents results for the Asia Pacific region and shows that both the size and orthogonal components of book-to-market ratio contribute to the value premium. These two components generate return spreads of 70 and 71 basis points with t-statistics of 2.93 and 3.72, respectively. These results

[13] As explained in section 4.1, the book-to-market ratio breakpoints in the analyses are determined using only big stocks based on the definition in Fama and French (2012). I apply this choice also to the US stocks in the international sample to ensure comparability with the other regions. The breakpoints that GL (2018) use for their US sample is based on NYSE stocks, therefore, I repeat the analysis in Panel B of Table 4 using NYSE breakpoints. The results are presented in Panel A of Table IV of the appendix. Findings indicate that the return spreads associated with book-to-market ratio and its size component are again significantly positive whereas the orthogonal component generates no return spread. Similar patterns are also observed for the five-factor alphas.

collectively suggest that value premium is not specific to variation in book-to-market ratio that is driven by size changes in regions outside the US.[14]

Figure 2.1 summarizes these results in a graphical framework. The figure presents cumulative returns to an equal-weighted zero-cost portfolio based on the book-to-market ratio and its size and orthogonal components for each region. The monthly return to the zero-cost portfolio is the difference in monthly excess returns between the extreme BM, BM^s or BM^o deciles. An investor who holds this portfolio invests \$1 at the beginning of the sample period and gains the monthly returns to the zero-cost strategy. Panel A of Figure 2.1 reiterates the findings of Panel A of Table 4. The value premium is driven by the size component of book-to-market ratio in North America, and in fact, the average return spread generated by BM^s is higher in magnitude compared to that generated by BM. As a result, the investment in the size-based zero-cost strategy grows to more than 21 dollars whereas the investment in the BM-based strategy grows to 6.5 dollars. The orthogonal strategy adds only 25 cents on top of the initial dollar invested. This pattern is mostly driven by US equities as observed in Panel B. In the US, the strategy based on BM^s brings 17.4 dollars whereas the strategy based on BM brings only 8.5 dollars. On the other hand, for Canada, the zero-cost strategy performs the best for the book-to-market ratio itself. The size-based and orthogonal strategies display very similar cumulative returns equal to 4.7 dollars which are lower than the cumulative return of the BM-based strategy which is equal to 6.3 dollars. In Europe and Japan, the size-based strategy lags behind the strategies based on BM and BM^o consistent with the results from Table 4. Finally, in the Asia Pacific region, all three zero-cost strategies exhibit similar performances. The final value of one dollar invested in the strategies varies in a narrow range between 4.7 and 5 dollars in this region. These findings reiterate that the returns to a value-based strategy are not driven by the size component of book-to-market ratio in regions outside the US.

[14] Table V of the appendix presents five-factor alphas associated with the returns for the equal-weighted portfolios and zero-cost strategies examined in Table 4. Generally, the factor-based returns associated with the extreme BM, BM^s and BM^o deciles are close enough not to nullify the patterns observed for the excess returns. In North America and the US, adjusting for the pricing factors still leaves a significantly positive alpha for the zero-cost strategies based on BM and its size component. However, for Canadian equities, I observe that not only the size component but also the orthogonal component of book-to-market ratio is associated with a significantly positive alpha. In Europe and Japan, the abnormal returns are significantly positive for both BM and its orthogonal component whereas they are not significantly different from zero for the size component. In the Asia Pacific region, zero-cost strategies associated with BM and both components generate significantly positive alphas.

2.4.3 Value-Weighted Portfolio Returns

In this section, I apply portfolio analysis to value-weighted returns associated with deciles sorted on book-to-market ratio and its two components. Table 5 presents results for the excess returns associated with these deciles and the zero-cost strategies for each region. In Panel A of Table 5, for North America, I find that there is a tendency for the book-to-market decile returns to increase from stocks with the lowest to highest BM values and the return difference between the extreme BM deciles is equal to 44 basis points. Although this magnitude is economically meaningful, it is statistically insignificant with a t-statistic of 1.11. When I investigate whether this insignificance is driven by one or both of the book-to-market ratio components, I find that neither BM^s nor BM^o can produce a statistically significant return spread between the extreme deciles. The returns to the zero-cost strategies associated with these components are 57 and -15 basis points with t-statistics of 1.24 and -0.73, respectively. In other words, although the return spread created by the book-to-market ratio is driven by the size component in North America, the statistical significance associated with the value premium diminishes in the sample period used in this study for value-weighted portfolio returns. Fama and French (2012) find that there are value premiums in average stock returns in all regions. They do not present results for portfolios sorted on solely book-to-market ratio, but they construct 5x5 size-BM portfolios and show that average returns increase with book-to-market in all size quintiles. However, they do not comment on the statistical significance of these patterns. Moreover, their results suggest that the magnitude of the value premium decreases with firm size. This is consistent with this study's finding that the value effect is significant for equal-weighted portfolio returns in Table 4, but not for value-weighted portfolio returns in Table 5.[15]

The finding that the value effect does not manifest itself significantly in North America also applies to the two countries that make up this region. Panel B of Table 5 shows that, although the returns increase from the bottom BM decile to the top BM decile in the US, the return difference between the extreme portfolios is 46 basis points with a t-statistic of 1.14. The size component generates a higher and economically important return spread of 63 basis points but this value is also statistically insignificant with a t-

[15] To ensure that the methodology is consistent with that of Fama and French (2012), I repeat the analysis in Panel A of Table 2 of their study for their sample period and closely reproduce their results.

statistic of 1.36. The orthogonal component has a dampening effect on the value premium since the long minus short return based on BM^o is -23 basis points which is statistically indistinguishable from zero.[16] To sum up, the value premium is weaker and statistically insignificant for US stocks in the sample period used in this study for value-weighted returns. Thus, the question of whether changes in firm size can account for the value effect is a less relevant one.[17] Panel C shows that neither the book-to-market ratio nor its size and orthogonal components can generate significant returns to a zero-cost strategy for Canadian equities. The return spreads in this panel vary between 1 and 5 basis points with t-statistics between 0.03 and 0.17.

Panels D and F of Table 5 reveal similar patterns for equities traded in Europe and Asia Pacific. For these regions, the return pattern across the value-weighted book-to-market ratio deciles is relatively flat and I again observe no significant value premium. Similar to North America, BM and BM^s produce positive returns to the zero-cost strategy whereas BM^o produces negative return spreads between extreme deciles for these two regions. However, all of these values are statistically insignificant. An exception is observed for the Japan in Panel E of Table 5. The return difference between the extreme BM deciles is 48 basis points with a t-statistic of 2.11. In other words, the value effect seems to be alive for value-weighted portfolios constructed in the Japanese market. In contrast to the results from the US sample and confirming the findings for equal-weighted decile returns in Table 4, the relation between the book-to-market ratio and future returns is driven by the orthogonal component rather than the component based on changes in firm size. BM^s and BM^o generate return spreads of 10 and 35 basis points with t-statistics of 0.31 and 2.03 for the Japanese sample, respectively. This result is not surprising because Fama and French (2012) report that the value effect is stronger for small stocks in all regions except Japan. The strength of the value premium in the largest size quintile in Japan as reported by Fama and French (2012) renders the value-weighted returns to the zero-cost strategy that I construct statistically significant. Asness, Moskowitz and

[16] To make the findings more comparable with those of GL (2018) in the US for the recent sample period, I again use NYSE breakpoints to construct the value-weighted book-to-market deciles. The results presented in Panel B of Table IV of the appendix indicate that the returns to the zero-cost strategy based on BM and its size component are 60 and 73 basis points. Although these values are not economically small, they are insignificant. The orthogonal component generates a negative return spread. Five-factor alphas associated with these returns paint a similar picture. These findings reiterate this study's claim that the value effect has gotten weaker in the US during the recent sample period.

[17] Asness, Moskowitz and Pedersen (2013) also investigate the existence of a value premium in a US sample that begins in 1972. The annualized value-weighted return difference between the high and low book-to-market ratio terciles for their sample is 3.7% with a t-statistic of 1.83 which is also not significant at the 5% level.

Pedersen (2013) also report that the value strategy exhibits its strongest performance in Japan.[18]

2.5 Country-Level Analysis

The analysis up to this point groups the countries into four regions and conducts all regression and portfolio tests at the regional level. An alternative approach is taking all analyses to the country-level and investigating whether the results uncovered in GL (2018) extend to markets outside the US. For this purpose, I repeat the cross-sectional regression analysis in Table 2 and portfolio analysis in Table 4 for each individual market separately. Since I focus on each country separately, there is no rationale to measure stocks returns in US dollars. Thus, I utilize returns denominated in local currencies obtained from Datastream in this section. Moreover, since the equity returns are not denominated in US dollars, the interest rate on one-month US T-bills is no longer an appropriate proxy for risk-free rates. Thus, I utilize local measures of risk-free rates when I calculate excess returns.[19]

Panel A of Table 6 presents results from cross-sectional regressions for each country. First, I report results from specification (1) in Table 2 where the independent variables are the logarithm of book-to-market ratio today (BM), the logarithm of the current firm size, one-month-lagged return and momentum return. Next, I also report results from specification (7) in which annual logarithmic changes in firm size in the past five years are added to the set of independent variables. To conserve space, I only report

[18] I present the five-factor alphas associated with the value-weighted decile and zero-cost strategy returns in Table VI of the appendix. In Table VI, I observe that accounting for the pricing factors causes a larger reduction in alphas for value-weighted portfolios compared to equal-weighted. For example, the alphas for the zero-cost strategy based on BM are essentially zero in both North America and the US. I attribute this to the fact that the asset pricing factors of Fama and French (2017) are also calculated based on the returns of various value-weighted portfolios. Hence, they are better able to capture the returns of value-weighted portfolios compared to equal-weighted portfolios. The alphas for the return spreads between extreme BM, BM^s and BM^o deciles are all statistically insignificant in North America, the US, Canada and Asia Pacific. The pricing model renders the alphas to the zero-cost strategy based on BM and its orthogonal component insignificant in Japan. In Europe, the alphas to the zero-cost strategy based on BM and its orthogonal component are significantly negative.

[19] Interest rate data for one-month or three-month T-bills are seldomly available in markets outside the US. Therefore, I consider two alternative interest rate series when interest rates on local T-bills are not available: three-month overnight indexed swap (OIS) and one-month or three-month interbank rate (IBR). The drawback of OIS is that it is only available since 2000. The drawback for IBR is that it does not behave similar to T-bill rates since 2007 due to additional default risk incorporated into the series after the credit crisis. Thus, I use IBR to measure the risk-free rate before OIS data is available in a country. If both rates are available, I use the lower rate as a proxy for the risk-free rate.

the coefficients and t-statistics for BM. My goal is testing whether controlling for historical changes in firm size has an impact on the relation between BM and future equity returns. Results from specification (1) indicate that the coefficient of current log book-to-market ratio is positive for all 22 countries outside the US. Moreover, the coefficient of BM is significantly positive in 13 countries. These results indicate that there is considerable evidence for the existence of a value premium in the sample used in this study. More importantly, for these 13 markets in which BM has significant predictive power for future equity returns, the slope coefficient of BM continues to be significantly positive for most of the cases when historical changes in firm size are controlled for in specification (7). The only exceptions are Austria, Belgium and Germany for which the coefficient of BM is still positive but statistically insignificant in the presence of changes in firm size in the specification. These findings shed doubt on the generalizability of the results of GL (2018) to markets outside the US.

Panel B of Table 6 presents one-month-ahead equal-weighted return differences between extreme equity quintiles sorted on the book-to-market ratio and its size and orthogonal components for each country. The size (BM^s) and orthogonal (BM^o) components of BM are calculated as described in section 4.1. I focus on equal-weighted returns since evidence for the value premium is stronger for this weighting scheme and I utilize quintiles rather than deciles to make sure that the portfolios are well-populated at all times.[20] I find that the one-month-ahead return difference between extreme quintiles sorted on the book-to-market ratio itself is significantly positive in 12 markets. More importantly, out of these 12 markets, New Zealand is the sole exception where BM^s has a significantly positive relation with one-month-ahead returns whereas the zero-cost strategy based on BM^o generates insignificant returns. For almost all other markets, either only the orthogonal component of book-to-market ratio generates significantly positive return spreads between extreme quintiles, or both components are associated with significant returns to the zero-cost strategy. These results once again indicate that if the value premium is going to be attributed to a certain component of the book-to-market ratio, it should be the orthogonal component rather than the size component for markets outside the US.

[20] I repeat this analysis using terciles rather than quintiles in Austria, Finland, Greece, Ireland, New Zealand and Portugal since the number of stocks is low for these markets in the earlier years of the sample. Results are qualitatively robust to this choice.

2.6 Conclusion

This study investigates the sources of the predictive power of book-to-market ratio on equity returns in an international sample that covers 23 developed countries. Gerakos and Linnainmaa (2018) argue that, in the US setting, book-to-market ratio and value premium do not coincide since some firms with high book-to-market ratios do not capture the higher returns associated with the value premium and vice versa. They show that this disconnect is driven by the fact that changes in firm size account for a large portion of variations in book-to-market ratios and the significantly positive relation between book-to-market ratio and future equity returns ceases to exist once changes in firm size are controlled for in regression or portfolio analyses. Thus, it is the negative relation between changes in market capitalization and future equity returns which drives the value premium.

I find that these results are also observed for US stocks in the sample which covers a more recent time period. However, changes in firm size do not subsume the predictive power that book-to-market ratio has for equity returns in regions outside the US. Cross-sectional regressions that control for the impact of historical changes in firm size reveal that the positive relation between book-to-market ratio and future equity returns is still robust. Moreover, the orthogonal component of book-to-market ratio that cannot be explained by changes in firm size generate significantly higher return spreads in portfolio sorts compared to the size component of book-to-market ratio. I repeat the regression and portfolio analyses also at the country-level and reiterate the finding that it is not the changes in firm size which is the main driver of the relation between book-to-market ratio and future stock returns.

GL (2018) rely on a decomposition similar to that in Cohen, Polk and Vuolteenaho (2003) to show that a firm's book-to-market today equals its book-to-market k years prior and the changes in the market and book values of equity during this period. It is an empirical exercise to see which one of these components is the main driver of the value premium. GL (2018) find that the answer to this question in the US is historical changes in market value of equity whereas this paper's results indicate that this finding does not extend to other countries. I would not go as far as to argue that the results in GL (2018) are due to luck or data snooping. Instead, I conjecture that changes in firm size are responsible for more of the cross-sectional variation in book-to-market ratios in the US compared to other markets. However, pinpointing potential institutional differences between the US and the international sample that could drive this result is outside the scope of this study.

2.7 Tables

Table 2.1 Descriptive statistics

This table presents descriptive statistics for monthly equity returns and various firm-specific variables. B/M is the ratio of the book value of equity to the market value of equity. Size is the logarithm of market value of equity in millions of dollars. MOM is the cumulative return of a stock during the prior year after skipping one month. Each panel presents the mean, standard deviation, 25th percentile, median, 75th percentile, minimum, maximum, skewness, and kurtosis statistics for each variable. Statistics are computed as the time-series averages of monthly cross-sectional means. The sample period is from 1990 to 2014. Panels A to F report statistics for North America, United States, Canada, Europe, Japan and Asia Pacific, respectively.

Panel A. North America

	Mean	St Dev	Min	25%	Median	75%	Max	Skewness	Kurtosis
Return	0.79	13.85	-40.00	-6.72	0.04	7.12	58.32	0.66	5.89
B/M	0.76	0.67	0.06	0.31	0.57	0.98	3.33	2.01	8.10
Size	5.08	2.02	0.52	3.60	4.95	6.43	10.28	0.27	2.70
MOM	11.87	52.68	-83.82	-20.19	4.42	31.75	275.65	1.64	8.46

Panel B. United States

	Mean	St Dev	Min	25%	Median	75%	Max	Skewness	Kurtosis
Return	0.93	14.22	-40.73	-6.73	0.12	7.35	60.85	0.71	6.15
B/M	0.73	0.60	0.06	0.30	0.57	0.96	2.98	1.75	6.93
Size	5.30	1.97	0.79	3.85	5.17	6.61	10.42	0.30	2.70
MOM	13.05	53.42	-83.54	-19.17	5.06	32.62	284.80	1.73	8.97

Panel C. Canada

	Mean	St Dev	Min	25%	Median	75%	Max	Skewness	Kurtosis
Return	0.24	11.91	-33.36	-6.37	-0.24	5.99	44.17	0.41	4.54
B/M	0.93	1.03	0.09	0.41	0.65	1.04	6.25	3.51	18.16
Size	4.09	1.95	0.28	2.67	3.92	5.37	8.95	0.35	2.71
MOM	7.18	48.03	-82.28	-23.36	1.63	27.93	219.69	1.17	6.07

Panel D. Europe

	Mean	St Dev	Min	25%	Median	75%	Max	Skewness	Kurtosis
Return	-0.13	8.01	-27.27	-4.57	-0.35	4.06	28.91	0.23	4.65
B/M	1.00	1.29	0.07	0.36	0.65	1.10	8.33	4.12	24.34
Size	4.60	2.12	0.43	3.07	4.40	5.99	10.09	0.37	2.70
MOM	2.33	31.91	-77.50	-17.98	0.12	19.26	135.34	0.72	4.78

Panel E. Japan

	Mean	St Dev	Min	25%	Median	75%	Max	Skewness	Kurtosis
Return	-0.15	7.90	-23.61	-5.23	-0.48	4.47	30.05	0.32	3.91
B/M	1.06	0.72	0.14	0.57	0.90	1.36	4.27	2.22	17.27
Size	5.59	1.57	2.80	4.43	5.40	6.58	9.71	0.52	2.80
MOM	-0.26	28.03	-67.77	-18.42	-2.78	14.90	123.60	0.71	4.72

Panel F. Asia Pacific

	Mean	St Dev	Min	25%	Median	75%	Max	Skewness	Kurtosis
Return	0.16	11.54	-33.98	-6.45	-0.45	5.84	45.34	0.51	4.80
B/M	1.08	0.90	0.09	0.48	0.82	1.36	4.76	2.07	8.56
Size	3.95	1.92	0.31	2.57	3.80	5.15	9.14	0.40	2.81
MOM	6.76	45.96	-82.11	-23.41	0.77	28.30	229.71	1.24	6.44

Table 2.2 Cross-sectional regressions

This table reports average regression slopes and t-statistics from cross-sectional regressions to predict monthly equity returns. The independent variables are BM (log book-to-market ratio today), BM_{t-5} (log book-to-market ratio five years ago), dme_{t-k} (annual log changes in the market value of equity calculated over each calendar year), firm size, one-month-lagged return and momentum return defined as the prior one-year return skipping one month. The regressions utilize the ordinary least squares methodology. Reported coefficients are time-series averages from monthly Fama-MacBeth (1973) regressions and the associated t-statistics are reported using the Newey-West (1987) procedure. Average R-squared statistics for each regression are presented in the last row of each panel. Panels A to F report results for North America, United States, Canada, Europe, Japan and Asia Pacific, respectively. The sample period is from 1990 to 2014.

Panel A. North America

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Average regression slopes				
BM	0.41	0.37	0.32	0.17	0.14	0.12	0.10	0.03
BM_{t-5}		-0.14						0.08
dme_{t-1}			-0.67	-0.77	-0.70	-0.73	-0.71	-0.70
dme_{t-2}				-0.57	-0.54	-0.52	-0.51	-0.58
dme_{t-3}					-0.39	-0.36	-0.34	-0.35
dme_{t-4}						-0.15	-0.15	-0.19
dme_{t-5}							-0.36	-0.39
				t-statistics				
BM	3.37	3.12	2.64	1.33	1.15	1.05	0.89	0.26
BM_{t-5}		-1.69						1.08
dme_{t-1}			-3.40	-3.51	-3.51	-3.58	-3.27	-3.06
dme_{t-2}				-4.07	-3.96	-3.98	-3.76	-4.04
dme_{t-3}					-3.20	-2.99	-2.79	-2.87
dme_{t-4}						-1.71	-1.64	-2.01
dme_{t-5}							-3.93	-3.88
R^2	3.0%	3.5%	3.4%	3.8%	4.2%	4.4%	4.7%	4.9%

Panel B. United States

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Average regression slopes				
BM	0.36	0.34	0.24	0.07	0.03	0.01	-0.01	-0.08
BM_{t-5}		-0.16						0.09
dme_{t-1}			-0.69	-0.86	-0.80	-0.82	-0.79	-0.81
dme_{t-2}				-0.60	-0.58	-0.58	-0.57	-0.66
dme_{t-3}					-0.35	-0.35	-0.35	-0.37
dme_{t-4}						-0.12	-0.14	-0.16
dme_{t-5}							-0.37	-0.41
				t-statistics				
BM	2.97	2.79	1.94	0.49	0.22	0.06	-0.12	-0.72
BM_{t-5}		-1.85						1.38
dme_{t-1}			-2.79	-3.07	-3.00	-2.94	-2.61	-2.95
dme_{t-2}				-3.69	-3.62	-3.61	-3.45	-3.79
dme_{t-3}					-2.82	-2.78	-2.73	-2.92
dme_{t-4}						-1.60	-1.70	-1.81
dme_{t-5}							-3.85	-4.21
R^2	3.1%	3.5%	3.4%	3.8%	4.1%	4.3%	4.7%	4.8%

Panel C. Canada

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Average regression slopes				
BM	0.28	0.28	0.32	0.29	0.29	0.28	0.29	0.25
BM_{t-5}		-0.01						0.04
dme_{t-1}			-0.40	-0.33	-0.34	-0.36	-0.38	-0.15
dme_{t-2}				-0.15	-0.14	-0.10	-0.09	-0.09
dme_{t-3}					-0.11	-0.16	-0.04	0.00
dme_{t-4}						0.08	0.01	-0.09
dme_{t-5}							-0.20	-0.29
				t-statistics				
BM	3.34	2.47	3.79	3.87	3.77	3.74	3.73	2.30
BM_{t-5}		-0.15						0.39
dme_{t-1}			-3.04	-2.55	-2.50	-2.51	-2.55	-0.73
dme_{t-2}				-1.18	-1.06	-0.80	-0.67	-0.56
dme_{t-3}					-0.83	-1.24	-0.37	-0.01
dme_{t-4}						0.61	0.07	-0.62
dme_{t-5}							-2.51	-2.18
R^2	5.1%	7.2%	6.0%	6.8%	7.6%	8.1%	8.6%	11.7%

Panel D. Europe

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Average regression slopes				
BM	0.19	0.14	0.20	0.20	0.21	0.21	0.20	0.18
BM_{t-5}		0.06						0.03
dme_{t-1}			-0.24	-0.22	-0.24	-0.27	-0.25	-0.18
dme_{t-2}				-0.02	0.00	0.02	0.05	0.04
dme_{t-3}					0.01	0.04	0.08	0.11
dme_{t-4}						0.03	0.06	0.06
dme_{t-5}							-0.06	-0.09
				t-statistics				
BM	3.85	2.80	4.11	4.72	5.44	6.04	5.60	4.23
BM_{t-5}		1.59						1.00
dme_{t-1}			-2.78	-2.39	-2.48	-2.72	-2.38	-1.75
dme_{t-2}				-0.26	-0.05	0.21	0.59	0.49
dme_{t-3}					0.19	0.48	1.11	1.34
dme_{t-4}						0.57	1.05	1.11
dme_{t-5}							-0.89	-1.30
R^2	5.1%	5.2%	5.5%	5.8%	6.2%	6.4%	6.7%	6.7%

Panel E. Japan

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Average regression slopes				
BM	0.44	0.37	0.47	0.49	0.50	0.50	0.47	0.49
BM_{t-5}		0.11						-0.01
dme_{t-1}			-0.73	-0.72	-0.68	-0.70	-0.75	-0.67
dme_{t-2}				0.05	0.12	0.09	0.07	0.14
dme_{t-3}					0.14	0.17	0.20	0.25
dme_{t-4}						0.11	0.16	0.24
dme_{t-5}							0.11	0.12
				t-statistics				
BM	6.72	4.11	7.22	8.27	9.03	9.20	8.80	7.67
BM_{t-5}		1.40						-0.22
dme_{t-1}			-3.57	-3.41	-3.17	-3.11	-3.39	-2.68
dme_{t-2}				0.39	0.85	0.63	0.46	0.83
dme_{t-3}					1.10	1.23	1.48	1.68
dme_{t-4}						0.92	1.26	1.79
dme_{t-5}							0.89	0.93
R^2	5.9%	6.0%	6.8%	7.2%	7.5%	7.8%	8.0%	8.4%

Panel F. Asia Pacific

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Average regression slopes				
BM	0.23	0.20	0.32	0.26	0.24	0.25	0.22	0.20
BM_{t-5}		-0.10						-0.08
dme_{t-1}			-0.74	-0.74	-0.64	-0.64	-0.70	-0.61
dme_{t-2}				-0.29	-0.31	-0.34	-0.45	-0.30
dme_{t-3}					-0.19	-0.20	-0.24	-0.17
dme_{t-4}						-0.03	-0.07	0.06
dme_{t-5}							-0.23	-0.18
				t-statistics				
BM	3.18	1.65	4.40	3.35	3.16	3.22	2.86	1.80
BM_{t-5}		-1.09						-0.88
dme_{t-1}			-5.05	-5.09	-4.75	-4.50	-4.76	-3.72
dme_{t-2}				-2.14	-2.39	-2.72	-3.14	-2.34
dme_{t-3}					-1.62	-1.73	-2.01	-1.32
dme_{t-4}						-0.28	-0.59	0.34
dme_{t-5}							-2.13	-1.23
R^2	4.8%	6.3%	5.7%	6.4%	6.9%	7.3%	7.9%	9.6%

Table 2.3 Average characteristics of firms sorted by book-to-market ratio

This table presents average portfolio characteristics for equity deciles sorted on the book-to-market ratio. At the end of each June, portfolio breakpoints are determined based on large stocks which are defined as those stocks whose total market value of equity make up 90% of the aggregate market capitalization in each region. Portfolio 1 (10) is the portfolio of stocks with the lowest (highest) values of book-to-market ratio. For each decile, the table reports the mean values for current book-to-market ratio, five-year-lagged book-to-market ratio, current firm size defined as market value of equity, five-year lagged firm size and momentum return defined as the prior year return after skipping one month. Panels A to F report results for North America, United States, Canada, Europe, Japan and Asia Pacific, respectively. The sample period is from 1990 to 2014.

Panel A. North America

	B/M	B/M(-5)	Size	Size(-5)	MOM
1 (Low)	0.09	0.38	3,837.0	2,920.4	30.24
2	0.18	0.43	4,470.2	4,066.3	25.71
3	0.25	0.50	4,134.5	3,953.1	19.58
4	0.32	0.52	3,588.3	3,247.0	17.33
5	0.39	0.61	2,958.5	2,762.3	14.45
6	0.47	0.63	2,548.2	2,386.1	12.29
7	0.57	0.68	2,336.0	2,231.0	10.17
8	0.69	0.74	1,616.8	1,579.9	7.55
9	0.86	0.84	1,272.2	1,218.3	5.42
10 (High)	1.72	1.09	696.2	861.1	-0.22

Panel B. United States

	B/M	B/M(-5)	Size	Size(-5)	MOM
1 (Low)	0.09	0.36	4,163.4	3,377.2	33.49
2	0.18	0.40	5,303.3	5,027.3	28.38
3	0.24	0.45	4,351.5	4,337.7	23.36
4	0.31	0.50	4,149.6	3,820.4	19.86
5	0.38	0.55	3,382.5	3,513.6	16.10
6	0.46	0.61	2,687.6	2,524.7	13.44
7	0.56	0.66	2,661.2	2,615.5	11.19
8	0.68	0.72	1,750.2	1,787.8	8.04
9	0.86	0.80	1,396.0	1,354.1	5.45
10 (High)	1.67	1.10	853.0	1,080.8	-1.40

Panel C. Canada

	B/M	B/M(-5)	Size	Size(-5)	MOM
1 (Low)	0.17	0.56	818.5	418.6	0.60
2	0.30	0.55	1,303.2	718.4	5.15
3	0.39	0.60	1,506.3	928.4	9.54
4	0.46	0.73	1,795.2	1,154.8	5.86
5	0.53	0.76	1,790.6	1,265.9	8.16
6	0.60	0.76	1,504.1	1,043.1	7.01
7	0.68	0.83	1,262.2	948.7	8.31
8	0.78	0.89	999.5	788.8	7.64
9	0.93	0.95	607.8	452.5	9.05
10 (High)	2.07	1.31	243.0	209.1	8.82

Panel D. Europe

	B/M	B/M(-5)	Size	Size(-5)	MOM
1 (Low)	0.12	0.42	1,754.9	1,605.5	-2.60
2	0.23	0.43	2,168.7	1,905.8	1.27
3	0.32	0.48	2,126.3	2,002.4	2.23
4	0.39	0.54	2,239.4	2,019.7	3.19
5	0.47	0.61	1,888.6	1,561.8	4.16
6	0.56	0.67	2,077.7	1,708.0	3.73
7	0.66	0.73	1,631.7	1,415.3	3.49
8	0.79	0.81	1,473.1	1,370.2	5.03
9	0.99	0.91	1,083.0	1,030.5	5.32
10 (High)	2.31	1.40	502.8	562.9	4.81

Panel E. Japan

	B/M	B/M(-5)	Size	Size(-5)	MOM
1 (Low)	0.21	0.40	1,809.8	1,836.2	-9.44
2	0.37	0.49	2,272.7	2,249.2	-5.22
3	0.47	0.56	2,336.0	2,302.1	-2.52
4	0.56	0.60	2,238.4	2,260.2	-1.70
5	0.64	0.65	2,097.0	2,174.4	-1.30
6	0.72	0.71	1,561.8	1,600.7	-0.15
7	0.82	0.75	1,310.9	1,377.4	-0.03
8	0.93	0.82	1,035.2	1,078.6	0.69
9	1.10	0.93	813.0	812.5	2.46
10 (High)	1.75	1.26	499.0	488.7	2.63

Panel F. Asia Pacific

	B/M	B/M(-5)	Size	Size(-5)	MOM
1 (Low)	0.16	0.64	898.1	458.4	0.95
2	0.30	0.63	1,131.6	700.0	5.20
3	0.41	0.69	928.1	629.7	5.35
4	0.51	0.75	903.8	612.5	5.04
5	0.61	0.80	791.0	627.9	7.23
6	0.73	0.85	748.7	626.5	8.64
7	0.87	0.96	625.8	502.3	9.03
8	1.06	1.06	608.4	468.6	9.47
9	1.35	1.16	444.3	346.0	10.41
10 (High)	2.62	1.73	252.5	193.2	10.33

Table 2.4 Equal-weighted returns to portfolios sorted on BM, BM^s and BM^o

This table presents return comparisons between equity deciles sorted on the book-to-market ratio and its size and orthogonal components. At the end of each June, logarithmic book-to-market ratio (BM) is regressed on past annual logarithmic changes in firm size. The portion of BM that is explained by changes in firm size is denoted as the size component (BM^s) and the error term is denoted as the orthogonal component (BM^o). Portfolio 1 (10) is the portfolio of stocks with the lowest (highest) values of BM, BM^s or BM^o. Decile breakpoints are determined based on large stocks which are defined as those stocks whose total market value of equity make up 90% of the aggregate market capitalization in each region. The table reports the one-month-ahead equal-weighted excess returns for each decile. The last two rows of each panel show the differences in returns between deciles 10 and 1 and the Newey-West (1987) adjusted t-statistics associated with these differences. Panels A to F report results for North America, United States, Canada, Europe, Japan and Asia Pacific, respectively. The sample period is from 1990 to 2014.

	Panel A. North America			Panel B. United States		
	BM	BM^s	BM^0	BM	BM^s	BM^0
1 (Low)	0.34	-0.11	0.91	0.42	0.28	1.17
2	0.39	0.56	1.01	0.56	0.73	1.11
3	0.58	0.68	0.86	0.67	0.82	1.15
4	0.56	0.77	0.85	0.62	0.86	1.12
5	0.74	0.82	0.90	0.87	0.98	0.96
6	0.87	0.80	0.94	0.93	0.84	1.06
7	0.83	0.95	0.79	1.01	1.04	0.99
8	0.89	0.90	0.95	0.99	1.02	1.06
9	0.96	0.99	0.93	1.05	1.05	1.09
10 (High)	1.35	1.24	1.06	1.54	1.54	1.21
10-1	1.01	1.35	0.15	1.12	1.26	0.04
t-stat	(3.13)	(4.48)	(0.60)	(3.42)	(4.11)	(0.13)

	Panel C. Canada			Panel D. Europe		
	BM	BM^s	BM^0	BM	BM^s	BM^0
1 (Low)	-0.42	-0.60	-0.41	-0.83	-0.50	-0.52
2	-0.06	-0.10	0.12	-0.47	-0.05	-0.20
3	0.32	0.27	0.04	-0.34	0.13	-0.12
4	-0.08	0.32	0.24	-0.29	0.15	-0.15
5	0.35	0.42	0.43	-0.23	0.17	0.03
6	0.30	0.38	0.50	-0.12	0.19	0.02
7	0.21	0.53	0.50	-0.09	0.22	0.06
8	0.55	0.77	0.35	-0.08	0.13	0.09
9	0.41	0.39	0.38	0.01	0.12	0.07
10 (High)	0.31	0.07	0.27	-0.05	-0.20	0.07
10-1	0.74	0.67	0.68	0.78	0.30	0.60
t-stat	(3.25)	(2.63)	(3.37)	(3.98)	(1.54)	(5.41)

Panel E. Japan

	BM	BM^s	BM^0
1 (Low)	-1.19	-0.63	-1.03
2	-0.48	-0.39	-0.60
3	-0.49	-0.33	-0.40
4	-0.31	-0.29	-0.44
5	-0.23	-0.11	-0.34
6	-0.20	-0.16	-0.24
7	-0.19	-0.15	-0.31
8	-0.16	-0.21	-0.23
9	-0.10	-0.31	-0.20
10 (High)	-0.14	-0.58	-0.22
10-1	1.05	0.05	0.81
t-stat	(5.51)	(0.20)	(6.49)

Panel F. Asia Pacific

	BM	BM^s	BM^0
1 (Low)	-0.31	-0.85	-0.56
2	-0.23	-0.31	-0.20
3	-0.01	-0.03	-0.04
4	0.01	0.24	-0.04
5	0.12	0.45	-0.02
6	0.28	0.31	0.17
7	0.26	0.40	0.04
8	0.54	0.31	0.29
9	0.47	0.34	0.30
10 (High)	0.32	-0.15	0.15
10-1	0.62	0.70	0.71
t-stat	(2.88)	(2.93)	(3.72)

Table 2.5 Value-weighted returns to portfolios sorted on BM, BM^s and BM^o

This table presents return comparisons between equity deciles sorted on the book-to-market ratio and its size and orthogonal components. At the end of each June, logarithmic book-to-market ratio (BM) is regressed on past annual logarithmic changes in firm size. The portion of BM that is explained by changes in firm size is denoted as the size component (BM^s) and the error term is denoted as the orthogonal component (BM^o). Portfolio 1 (10) is the portfolio of stocks with the lowest (highest) values of BM, BM^s or BM^o. Decile breakpoints are determined based on large stocks which are defined as those stocks whose total market value of equity make up 90% of the aggregate market capitalization in each region. The table reports the one-month-ahead value-weighted excess returns for each decile. The last two rows of each panel show the differences in returns between deciles 10 and 1 and the Newey-West (1987) adjusted t-statistics associated with these differences. Panels A to F report results for North America, United States, Canada, Europe, Japan and Asia Pacific, respectively. The sample period is from 1990 to 2014.

	Panel A. North America			Panel B. United States		
	BM	BM^s	BM^0	BM	BM^s	BM^0
1 (Low)	0.41	0.39	0.74	0.42	0.40	0.79
2	0.62	0.89	0.76	0.60	0.77	0.72
3	0.68	0.84	0.94	0.74	0.72	0.95
4	0.62	0.73	0.56	0.60	0.84	0.59
5	0.72	0.76	0.88	0.71	0.92	0.83
6	0.62	0.75	0.67	0.54	0.71	0.50
7	0.74	0.85	0.67	0.78	0.79	0.74
8	0.70	0.60	0.74	0.72	0.54	0.67
9	0.63	0.99	0.63	0.60	0.93	0.64
10 (High)	0.85	0.96	0.59	0.88	1.03	0.56
10-1	0.44	0.57	-0.15	0.46	0.63	-0.23
t-stat	(1.11)	(1.24)	(-0.73)	(1.14)	(1.36)	(-1.02)

	Panel C. Canada			Panel D. Europe		
	BM	BM^s	BM^0	BM	BM^s	BM^0
1 (Low)	0.48	0.42	0.49	0.37	0.30	0.65
2	0.65	0.72	0.92	0.29	0.43	0.46
3	0.78	0.99	1.16	0.33	0.57	0.39
4	0.62	0.89	0.77	0.35	0.59	0.32
5	0.58	0.92	1.07	0.32	0.50	0.48
6	0.79	0.97	0.86	0.60	0.58	0.60
7	0.66	0.79	1.02	0.44	0.59	0.66
8	0.79	1.12	0.81	0.51	0.47	0.66
9	0.78	0.80	0.84	0.54	0.64	0.54
10 (High)	0.48	0.44	0.54	0.53	0.50	0.53
10-1	0.01	0.01	0.05	0.16	0.20	-0.12
t-stat	(0.03)	(0.03)	(0.17)	(0.71)	(0.86)	(-0.51)

	Panel E. Japan			Panel F. Asia Pacific		
	BM	BM^s	BM^0	BM	BM^s	BM^0
1 (Low)	-0.46	-0.31	-0.42	0.46	0.08	0.50
2	-0.05	-0.09	-0.09	0.82	0.47	0.74
3	-0.16	0.00	-0.02	0.83	0.44	0.57
4	0.16	0.08	-0.03	0.61	0.91	0.72
5	0.06	0.06	0.13	0.72	0.77	0.80
6	0.21	0.00	0.17	0.75	0.53	0.84
7	-0.04	0.05	0.06	0.61	0.56	0.19
8	0.13	0.07	0.20	0.82	0.38	0.56
9	0.04	-0.04	-0.04	0.67	0.67	0.72
10 (High)	0.02	-0.21	-0.06	0.62	0.25	0.25
10-1	0.48	0.10	0.35	0.16	0.18	-0.25
t-stat	(2.11)	(0.31)	(2.03)	(0.57)	(0.66)	(-0.94)

Table 2.6 Country-level analysis

This table reports results from regression and portfolio analyses for each country in the sample used in this study. Panel A presents average monthly OLS regression slopes and Newey-West (1987) adjusted t-statistics (in parentheses) for BM (log book-to-market ratio today) from specifications (1) and (7) presented in Table 2. Panel B presents one-month-ahead equal-weighted return differences between extreme equity quintiles sorted on the book-to-market ratio and its size and orthogonal components. At the end of each June, logarithmic book-to-market ratio (BM) is regressed on past annual logarithmic changes in firm size. The portion of BM that is explained by changes in firm size is denoted as the size component (BM^s) and the error term is denoted as the orthogonal component (BM^o). Newey-West (1987) adjusted t-statistics associated with the return differences are presented in parentheses. The sample period is from 1990 to 2014 for each country.

Panel A. Cross-sectional regressions

	(1)	(7)
Australia	0.34	0.46
	(4.21)	(4.90)
Austria	0.21	0.09
	(2.62)	(0.71)
Belgium	0.18	0.14
	(2.77)	(1.86)
Canada	0.34	0.32
	(3.90)	(4.00)
Denmark	0.23	0.19
	(2.47)	(1.96)
Finland	0.12	0.03
	(0.92)	(0.20)
France	0.24	0.31
	(3.03)	(4.33)
Germany	0.18	0.08
	(2.03)	(1.36)
Greece	0.17	0.13
	(1.22)	(0.89)
Hong Kong	0.27	0.27
	(2.86)	(3.00)
Ireland	0.19	0.33
	(1.02)	(1.51)
Italy	0.21	0.25
	(2.61)	(3.33)
Japan	0.47	0.52
	(7.20)	(9.67)
Netherlands	0.15	0.14
	(1.92)	(1.67)
New Zealand	0.30	-0.04
	(1.61)	(-0.24)
Norway	0.08	0.51
	(0.62)	(2.99)
Portugal	0.13	0.20
	(0.91)	(1.23)
Singapore	0.24	0.31
	(2.61)	(2.86)
Spain	0.06	0.02
	(0.82)	(0.19)
Sweden	0.33	0.31
	(2.54)	(2.30)
Switzerland	0.12	0.09
	(1.95)	(1.46)
United Kingdom	0.18	0.19
	(3.08)	(3.22)

Panel B. Returns to zero-cost strategies

	BM	BM^s	BM^0
Australia	0.71	0.74	0.71
	(3.81)	(3.45)	(4.32)
Austria	0.28	0.18	0.17
	(1.59)	(0.79)	(1.02)
Belgium	0.50	0.19	0.29
	(3.34)	(1.27)	(1.95)
Canada	0.65	0.56	0.48
	(3.39)	(2.52)	(3.26)
Denmark	0.45	0.14	0.14
	(1.66)	(0.51)	(0.48)
Finland	0.23	0.21	-0.09
	(0.60)	(0.86)	(-0.37)
France	0.61	0.21	0.30
	(2.83)	(1.02)	(2.14)
Germany	0.71	-0.33	0.56
	(2.96)	(-1.94)	(3.99)
Greece	0.75	0.39	0.42
	(2.09)	(0.96)	(1.38)
Hong Kong	0.60	0.41	0.53
	(2.45)	(1.78)	(2.34)
Ireland	-0.20	-1.34	0.33
	(-0.42)	(-1.78)	(0.87)
Italy	0.22	-0.40	0.36
	(1.20)	(-2.25)	(2.22)
Japan	0.75	0.03	0.67
	(4.65)	(0.15)	(6.45)
Netherlands	0.18	0.07	-0.23
	(0.70)	(0.26)	(-1.07)
New Zealand	0.63	0.65	-0.04
	(2.59)	(3.09)	(-0.15)
Norway	0.41	-0.08	0.59
	(1.49)	(-0.25)	(2.38)
Portugal	0.03	0.30	0.18
	(0.09)	(0.89)	(0.53)
Singapore	0.57	0.36	0.74
	(2.71)	(1.02)	(3.66)
Spain	-0.22	-0.12	-0.24
	(-1.12)	(-0.43)	(-1.70)
Sweden	0.97	0.20	0.36
	(2.56)	(0.70)	(1.58)
Switzerland	0.09	-0.04	0.07
	(0.44)	(-0.16)	(0.47)
United Kingdom	0.40	0.28	0.31
	(2.39)	(1.98)	(2.11)

Table 2.7 Appendix Tables

Table I Sample size for each country through time

This table presents the number of sample stocks for each country at the end of each calendar year. The sample period is from 1990 to 2014.

Year	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Greece	Hong Kong	Ireland	Italy
1990	400	83	142	786	161	53	674	381	81	264	59	233
1991	396	88	141	799	188	49	648	424	95	314	46	238
1992	422	97	127	812	182	58	633	386	101	363	43	234
1993	528	103	130	942	199	56	648	407	114	422	43	222
1994	582	99	140	982	177	83	678	398	155	458	39	211
1995	613	104	139	991	190	81	647	402	172	461	37	194
1996	881	87	143	1,055	187	94	708	465	186	503	35	193
1997	888	95	152	1,114	189	106	717	496	197	546	42	199
1998	862	91	162	1,109	183	117	767	690	213	568	39	211
1999	984	89	171	1,121	191	135	799	1,078	241	606	46	236
2000	1,060	93	170	1,109	192	141	858	1,379	291	656	48	264
2001	1,010	88	163	951	154	133	865	1,385	298	723	40	262
2002	1,005	70	156	964	142	131	801	1,231	300	745	35	261
2003	1,081	85	154	1,033	161	125	760	1,217	300	809	36	242
2004	1,208	79	153	1,085	157	120	730	1,189	296	816	35	238
2005	1,296	80	153	1,180	154	126	740	1,285	286	839	35	248
2006	1,438	81	166	1,212	176	128	789	1,495	275	890	38	264
2007	1,595	89	171	1,201	192	126	816	1,679	264	966	43	281
2008	1,357	80	160	1,112	187	120	748	1,588	255	962	41	271
2009	1,466	81	158	1,069	179	117	728	1,428	246	1,027	36	261
2010	1,498	82	148	1,065	178	113	690	1,433	219	1,099	32	260
2011	1,436	69	140	883	169	114	676	1,280	207	1,113	29	250
2012	1,389	66	136	1,030	152	113	638	1,215	191	1,163	29	243
2013	1,329	69	130	1,026	152	114	630	1,135	175	1,257	29	247
2014	1,256	72	124	956	138	113	612	1,035	151	1,258	28	235

Year	Japan	Netherlands	New Zealand	Norway	Portugal	Singapore	Spain	Sweden	Switzerland	UK	US
1990	1,938	184	47	86	127	137	140	201	198	1,200	4,934
1991	1,818	183	61	81	125	144	143	187	196	1,137	5,075
1992	1,857	181	77	80	113	162	142	153	184	1,112	5,315
1993	2,119	172	95	91	116	188	137	152	208	1,261	5,862
1994	2,220	173	101	111	113	209	138	180	182	1,203	6,202
1995	2,301	169	93	125	99	226	131	183	193	1,286	6,295
1996	2,366	172	90	141	100	243	144	201	201	1,474	6,789
1997	2,414	183	90	167	92	268	152	252	209	1,485	6,796
1998	2,440	204	92	172	91	291	167	292	220	1,357	6,409
1999	2,491	211	92	182	85	332	163	339	230	1,360	6,091
2000	2,542	192	100	171	72	383	155	355	252	1,383	5,879
2001	2,580	167	96	159	66	381	165	337	249	1,287	5,234
2002	2,589	151	87	158	56	387	153	316	246	1,197	4,829
2003	2,596	140	99	146	52	442	145	303	242	1,272	4,507
2004	2,654	134	122	160	50	514	137	318	237	1,349	4,460
2005	2,688	130	115	196	50	516	139	340	244	1,514	4,381
2006	2,748	130	122	196	47	596	148	372	248	1,551	4,323
2007	2,756	128	117	226	43	636	145	416	251	1,568	4,204
2008	2,699	112	95	212	46	553	139	407	248	1,327	3,973
2009	2,634	107	92	196	42	600	135	389	246	1,199	3,774
2010	2,577	102	90	199	39	595	139	381	242	1,187	3,631
2011	2,558	101	90	201	38	589	133	371	241	1,115	3,513
2012	2,558	97	95	186	36	646	126	343	232	1,069	3,396
2013	2,555	91	103	186	39	631	130	356	229	1,161	3,391
2014	2,528	89	100	175	40	606	113	333	230	1,095	3,506

Table II Cross-sectional regressions as in GL (2018)

This table reports average regression slopes and t-statistics from cross-sectional regressions to predict monthly equity returns for the US sample described in Gerakos and Linnainmaa (2018) beginning in 1963. The independent variables are BM (log book-to-market ratio today), BM_{t-5} (log book-to-market ratio five years ago), dme_{t-k} (annual log changes in the market value of equity calculated over each calendar year), firm size, one-month-lagged return (STR) and momentum return (MOM) defined as the prior one-year return skipping one month. The regressions utilize the ordinary least squares methodology. Reported coefficients are time-series averages from monthly Fama-MacBeth (1973) regressions. t-statistics associated with the coefficients and average R-squared statistics for each regression are also presented.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Average regression slopes				
BM	0.30	0.37	0.27	0.17	0.11	0.09	0.06	0.02
BM_{t-5}		-0.15						0.06
dme_{t-1}			-0.32	-0.37	-0.45	-0.47	-0.49	-0.53
dme_{t-2}				-0.50	-0.53	-0.55	-0.59	-0.62
dme_{t-3}					-0.33	-0.34	-0.38	-0.41
dme_{t-4}						-0.25	-0.26	-0.29
dme_{t-5}							-0.35	-0.37
ME	-0.10	-0.11	-0.10	-0.09	-0.09	-0.08	-0.08	-0.08
STR	-6.26	-6.31	-6.06	-6.20	-6.31	-6.36	-6.45	-6.49
MOM	0.43	0.48	0.77	0.72	0.70	0.67	0.65	0.64
				t-statistics				
BM	4.88	5.47	4.33	2.8	1.84	1.53	1.08	0.34
BM_{t-5}		-2.99						1.42
dme_{t-1}			-2.19	-2.50	-2.94	-3.08	-3.25	-3.64
dme_{t-2}				-5.15	-5.40	-5.61	-5.96	-6.30
dme_{t-3}					-4.14	-4.21	-4.70	-4.92
dme_{t-4}						-3.69	-3.87	-4.21
dme_{t-5}							-5.50	-5.67
ME	-2.71	-2.95	-2.73	-2.51	-2.55	-2.52	-2.38	-2.30
STR	-15.31	-15.74	-15.37	-15.97	-16.38	-16.61	-16.89	-17.07
MOM	2.68	3.18	5.00	4.71	4.64	4.53	4.41	4.34
R^2	4.3%	4.7%	4.7%	5.1%	5.5%	5.7%	5.9%	6.1%

Table III Returns and alphas to portfolios sorted on BM, BM^s and BM^o as in GL (2018)

This table presents return comparisons between equity deciles sorted on the book-to-market ratio and its size and orthogonal components for the US sample described in Gerakos and Linnainmaa (2018) beginning in 1963. At the end of each June, logarithmic book-to-market ratio (BM) is regressed on past annual logarithmic changes in firm size. The portion of BM that is explained by changes in firm size is denoted as the size component (BM^s) and the error term is denoted as the orthogonal component (BM^o). Portfolio 1 (10) is the portfolio of stocks with the lowest (highest) values of BM, BM^s or BM^o. Decile breakpoints are determined based on NYSE stocks. Panels A and B report the one-month-ahead value-weighted excess returns and alphas for each decile, respectively. Alphas are calculated after adjusting for the market, size and value factors of Fama and French (1993). The last rows in each panel show the differences of monthly excess returns or alphas between deciles 10 and 1. t-statistics associated with the returns and alphas are also presented.

Panel A. Excess returns

	Estimates			t-statistics		
	BM	BM^s	BM^0	BM	BM^s	BM^0
1 (Low)	0.39	0.32	0.50	2.07	1.34	2.86
2	0.58	0.49	0.51	3.16	2.52	2.58
3	0.53	0.45	0.54	2.86	2.42	2.84
4	0.52	0.57	0.44	2.66	3.31	2.20
5	0.56	0.55	0.60	3.10	3.22	2.95
6	0.62	0.60	0.46	3.35	3.49	2.49
7	0.61	0.69	0.58	3.38	3.96	3.1
8	0.62	0.73	0.47	3.33	3.96	2.53
9	0.74	0.84	0.62	3.76	4.10	3.28
10 (High)	0.93	0.98	0.45	3.92	3.6	2.00
10-1	0.53	0.66	-0.06	2.79	2.91	-0.38

Panel B. Three-factor alphas

	Estimates			t-statistics		
	BM	BM^s	BM^0	BM	BM^s	BM^0
1 (Low)	0.11	-0.07	0.17	1.59	-0.79	2.30
2	0.17	0.06	0.04	2.19	0.66	0.50
3	0.03	0.00	0.01	0.36	-0.05	0.19
4	-0.04	0.10	-0.18	-0.37	1.30	-2.20
5	0.04	0.03	0.00	0.44	0.40	-0.05
6	0.02	0.01	-0.12	0.21	0.17	-1.40
7	-0.05	0.06	-0.04	-0.57	0.76	-0.52
8	-0.10	0.04	-0.18	-1.21	0.42	-2.04
9	-0.04	0.05	-0.12	-0.44	0.54	-1.47
10 (High)	-0.02	-0.07	-0.31	-0.15	-0.51	-2.80
10-1	-0.13	0.00	-0.48	-1.05	0.00	-3.43

Table IV Equal-weighted and value-weighted returns and alphas to portfolios sorted on BM, BM^s and BM^o in the U.S. using NYSE breakpoints (after 1990)

This table presents return comparisons between equity deciles sorted on the book-to-market ratio and its size and orthogonal components for US stocks in the international sample. At the end of each June, logarithmic book-to-market ratio (BM) is regressed on past annual logarithmic changes in firm size. The portion of BM that is explained by changes in firm size is denoted as the size component (BM^s) and the error term is denoted as the orthogonal component (BM^o). Portfolio 1 (10) is the portfolio of stocks with the lowest (highest) values of BM, BM^s or BM^o. Decile breakpoints are determined based on NYSE stocks. Panel A (B) reports the one-month-ahead equal-weighted (value-weighted) excess returns and alphas for each decile, respectively. Alphas are calculated after adjusting for the market, size, value, investment and profitability factors of Fama and French (2015). The last two rows of each panel show the differences in returns and alphas between deciles 10 and 1 and the Newey-West (1987) adjusted t-statistics associated with these differences.

Panel A. Equal-weighting

	Excess returns			Alphas		
	BM	BM^s	BM^0	BM	BM^s	BM^0
1 (Low)	0.51	0.48	1.13	0.09	-0.26	0.43
2	0.75	0.90	1.13	0.11	0.07	0.35
3	0.91	0.92	1.06	0.19	0.05	0.24
4	0.89	1.00	1.04	0.08	0.16	0.20
5	1.08	1.01	1.03	0.29	0.19	0.14
6	1.09	1.00	0.96	0.32	0.14	0.13
7	1.04	1.09	1.11	0.27	0.28	0.24
8	1.06	1.10	0.95	0.29	0.26	0.07
9	1.35	1.32	1.33	0.62	0.51	0.55
10 (High)	1.75	1.92	1.18	1.00	1.17	0.47
10-1	1.24	1.44	0.05	0.90	1.43	0.04
t-stat	(3.95)	(3.96)	(0.19)	(4.27)	(4.28)	(0.17)

Panel B. Value-weighting

	Excess returns			Alphas		
	BM	BM^s	BM^0	BM	BM^s	BM^0
1 (Low)	0.57	0.69	0.75	-0.01	0.04	0.05
2	0.75	0.84	0.72	0.01	-0.06	0.06
3	0.76	0.81	0.87	-0.06	-0.09	0.12
4	0.67	0.82	0.58	-0.21	0.01	-0.25
5	0.67	0.84	0.84	-0.08	-0.07	-0.05
6	0.79	0.80	0.60	-0.06	-0.09	-0.20
7	0.80	0.87	0.66	-0.13	-0.01	-0.12
8	0.63	0.82	0.62	-0.24	-0.16	-0.16
9	0.77	1.02	0.81	-0.13	0.13	-0.03
10 (High)	1.17	1.42	0.41	0.20	0.37	-0.23
10-1	0.60	0.73	-0.34	0.21	0.33	-0.28
t-stat	(1.77)	(1.63)	(-1.37)	(1.16)	(1.32)	(-1.13)

Table V Alphas for equal-weighted returns to portfolios sorted on BM, BM^s and BM^o

This table presents abnormal return comparisons between equity deciles sorted on the book-to-market ratio and its size and orthogonal components. At the end of each June, logarithmic book-to-market ratio (BM) is regressed on past annual logarithmic changes in firm size. The portion of BM that is explained by changes in firm size is denoted as the size component (BM^s) and the error term is denoted as the orthogonal component (BM^o). Portfolio 1 (10) is the portfolio of stocks with the lowest (highest) values of BM, BM^s or BM^o. Decile breakpoints are determined based on large stocks which are defined as those stocks whose total market value of equity make up 90% of the aggregate market capitalization in each region. The table reports alphas associated with the one-month-ahead equal-weighted excess returns for each decile. The last two rows of each panel show the differences in alphas between deciles 10 and 1 and the Newey-West (1987) adjusted t-statistics associated with these differences. Alphas are calculated after adjusting for the market, size, value, investment and profitability factors of Fama and French (2017). Panels A to F report results for North America, United States, Canada, Europe, Japan and Asia Pacific, respectively. The sample period is from 1990 to 2014.

	Panel A. North America			Panel B. United States		
	BM	BM^s	BM^0	BM	BM^s	BM^0
1 (Low)	0.07	-0.69	0.22	0.19	-0.34	0.48
2	-0.04	-0.08	0.30	0.16	0.04	0.43
3	0.03	-0.03	0.10	0.16	0.09	0.39
4	0.09	0.11	0.12	0.13	0.14	0.31
5	0.14	0.08	0.11	0.27	0.21	0.16
6	0.17	0.04	0.15	0.22	0.04	0.20
7	0.16	0.23	0.00	0.31	0.23	0.14
8	0.20	0.14	0.19	0.27	0.18	0.21
9	0.26	0.26	0.19	0.29	0.23	0.25
10 (High)	0.70	0.56	0.37	0.82	0.72	0.48
10-1	0.64	1.25	0.15	0.63	1.06	0.00
t-stat	(3.52)	(5.08)	(0.78)	(3.09)	(4.09)	(0.01)

	Panel C. Canada			Panel D. Europe		
	BM	BM^s	BM^0	BM	BM^s	BM^0
1 (Low)	-0.92	-1.22	-1.08	-0.88	-0.82	-0.91
2	-0.68	-0.76	-0.57	-0.69	-0.53	-0.67
3	-0.31	-0.32	-0.67	-0.64	-0.40	-0.68
4	-0.80	-0.33	-0.47	-0.65	-0.40	-0.72
5	-0.30	-0.32	-0.24	-0.66	-0.41	-0.61
6	-0.44	-0.29	-0.27	-0.58	-0.44	-0.60
7	-0.43	-0.11	-0.25	-0.60	-0.38	-0.53
8	-0.08	0.19	-0.25	-0.63	-0.48	-0.53
9	-0.24	-0.21	-0.39	-0.50	-0.52	-0.53
10 (High)	-0.27	-0.42	-0.44	-0.58	-0.75	-0.51
10-1	0.65	0.80	0.64	0.30	0.06	0.41
t-stat	(3.56)	(2.98)	(3.05)	(2.21)	(0.37)	(3.98)

	Panel E. Japan			Panel F. Asia Pacific		
	BM	BM^s	BM^0	BM	BM^s	BM^0
1 (Low)	-1.16	-0.66	-1.04	-0.76	-1.16	-1.03
2	-0.50	-0.44	-0.61	-0.84	-0.85	-0.66
3	-0.55	-0.40	-0.45	-0.68	-0.64	-0.63
4	-0.39	-0.35	-0.48	-0.65	-0.38	-0.75
5	-0.32	-0.19	-0.39	-0.52	-0.19	-0.69
6	-0.30	-0.23	-0.30	-0.50	-0.29	-0.39
7	-0.32	-0.19	-0.40	-0.51	-0.14	-0.54
8	-0.29	-0.27	-0.33	-0.26	-0.25	-0.36
9	-0.24	-0.37	-0.28	-0.33	-0.13	-0.32
10 (High)	-0.31	-0.66	-0.33	-0.26	-0.45	-0.33
10-1	0.85	0.01	0.71	0.50	0.71	0.70
t-stat	(6.99)	(0.04)	(6.52)	(2.44)	(3.62)	(4.23)

Table VI Alphas for value-weighted returns to portfolios sorted on BM, BM^s and BM^o

This table presents abnormal return comparisons between equity deciles sorted on the book-to-market ratio and its size and orthogonal components. At the end of each June, logarithmic book-to-market ratio (BM) is regressed on past annual logarithmic changes in firm size. The portion of BM that is explained by changes in firm size is denoted as the size component (BM^s) and the error term is denoted as the orthogonal component (BM^o). Portfolio 1 (10) is the portfolio of stocks with the lowest (highest) values of BM, BM^s or BM^o. Decile breakpoints are determined based on large stocks which are defined as those stocks whose total market value of equity make up 90% of the aggregate market capitalization in each region. The table reports alphas associated with the one-month-ahead value-weighted excess returns for each decile. The last two rows of each panel show the differences in alphas between deciles 10 and 1 and the Newey-West (1987) adjusted t-statistics associated with these differences. Alphas are calculated after adjusting for the market, size, value, investment and profitability factors of Fama and French (2017). Panels A to F report results for North America, United States, Canada, Europe, Japan and Asia Pacific, respectively. The sample period is from 1990 to 2014.

	Panel A. North America		
	BM	BM^s	BM^0
1 (Low)	-0.04	-0.20	-0.18
2	-0.08	0.19	0.07
3	0.02	-0.01	0.13
4	-0.01	-0.01	-0.03
5	-0.02	-0.17	0.02
6	-0.13	-0.08	-0.14
7	-0.02	0.04	0.01
8	-0.06	-0.22	-0.06
9	-0.14	0.04	-0.05
10 (High)	-0.04	0.01	-0.15
10-1	0.00	0.21	0.03
t-stat	(-0.01)	(0.99)	(0.20)

Panel B. United States		
BM	BM^s	BM^0
-0.01	-0.14	-0.04
-0.01	0.19	0.06
0.04	-0.04	0.24
-0.02	0.05	0.01
-0.08	0.14	0.18
-0.25	-0.11	-0.38
0.02	-0.03	-0.12
-0.11	-0.29	-0.10
-0.23	0.00	-0.11
-0.02	0.05	-0.14
-0.01	0.19	-0.10
(-0.07)	(0.94)	(-0.50)

	Panel C. Canada		
	BM	BM^s	BM^0
1 (Low)	-0.15	-0.37	-0.38
2	-0.06	-0.27	-0.01
3	-0.01	0.19	0.26
4	-0.30	0.02	0.01
5	-0.12	0.00	0.26
6	0.14	0.23	-0.06
7	-0.06	-0.11	0.26
8	-0.07	0.31	-0.16
9	-0.10	-0.15	-0.26
10 (High)	-0.39	-0.29	-0.34
10-1	-0.24	0.08	0.04
t-stat	(-0.97)	(0.18)	(0.14)

Panel D. Europe		
BM	BM^s	BM^0
0.34	-0.19	0.36
-0.03	-0.10	0.00
-0.11	-0.02	-0.25
-0.14	-0.12	-0.23
-0.25	-0.04	-0.20
0.01	-0.20	-0.15
-0.20	-0.02	-0.03
-0.16	-0.06	-0.07
-0.09	-0.10	-0.16
-0.09	-0.29	-0.08
-0.43	-0.10	-0.45
(-2.44)	(-0.36)	(-2.86)

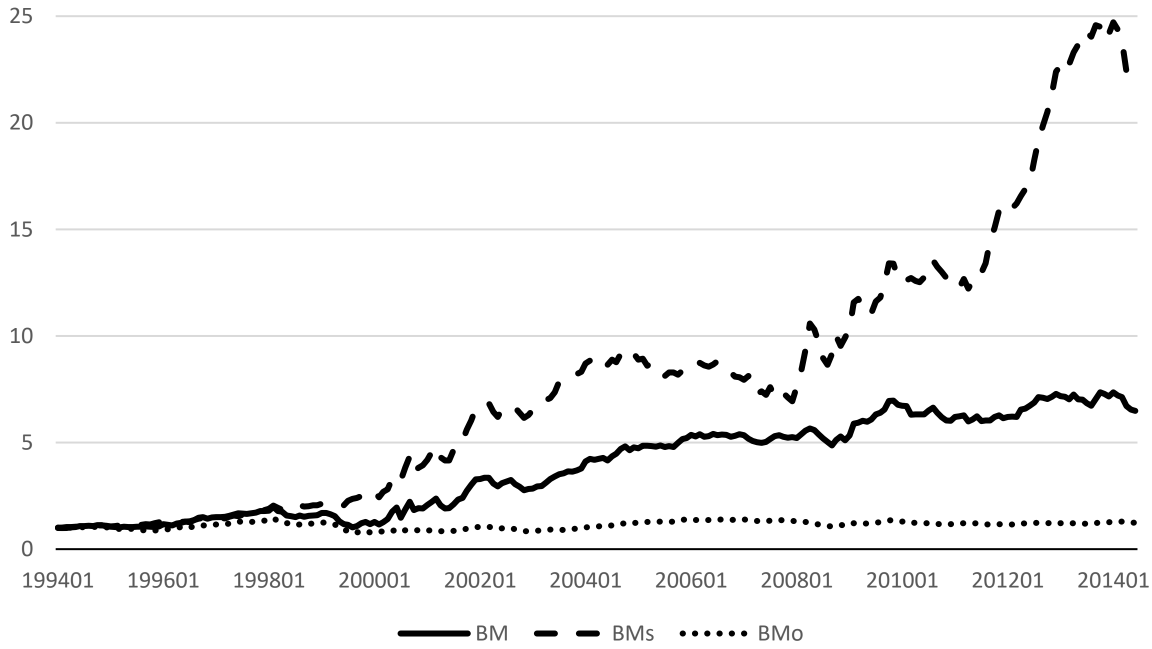
	Panel E. Japan		
	BM	BM^s	BM^0
1 (Low)	-0.35	-0.31	-0.30
2	0.02	-0.10	0.00
3	-0.16	-0.04	0.01
4	0.08	0.11	-0.03
5	-0.01	0.01	0.16
6	0.18	-0.02	0.16
7	-0.10	0.06	0.01
8	0.01	0.11	0.10
9	-0.09	-0.02	-0.10
10 (High)	-0.16	-0.22	-0.13
10-1	0.18	0.09	0.17
t-stat	(1.26)	(0.42)	(1.13)

	Panel F. Asia Pacific		
	BM	BM^s	BM^0
1 (Low)	-0.05	-0.20	-0.06
2	0.19	-0.23	0.16
3	0.11	-0.16	0.07
4	-0.22	0.21	0.02
5	0.08	0.10	0.03
6	-0.07	-0.14	-0.08
7	-0.29	-0.36	-0.52
8	-0.02	-0.25	-0.21
9	-0.16	0.01	0.02
10 (High)	-0.03	-0.09	-0.09
10-1	0.02	0.11	-0.03
t-stat	(0.08)	(0.34)	(-0.13)

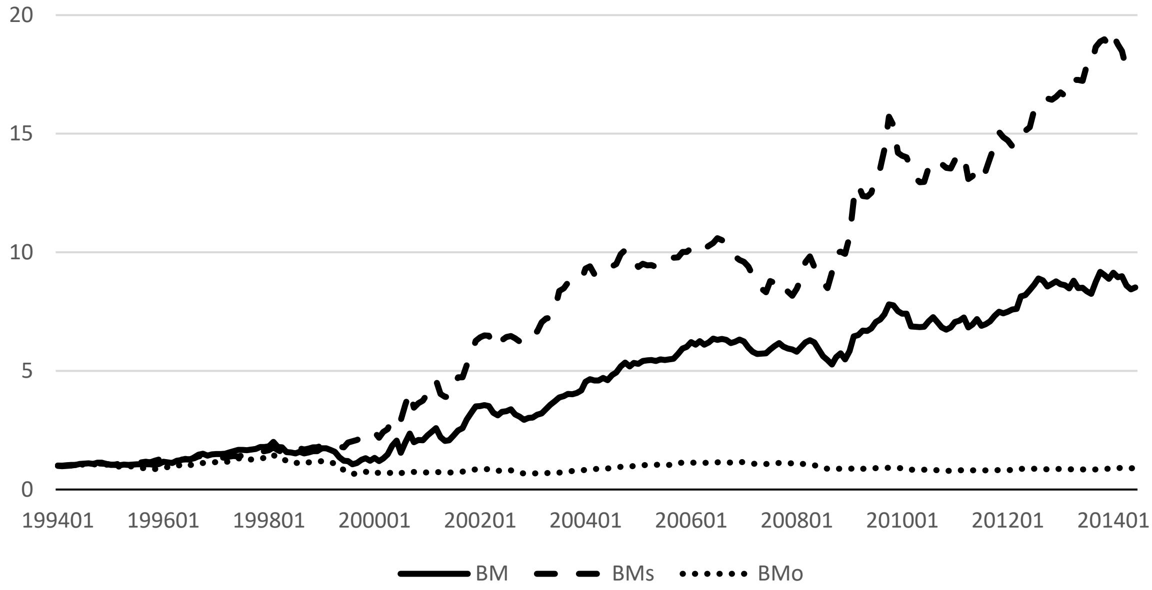
Figure 2.1 Cumulative returns to equal-weighted zero-cost strategies based on BM, BM^s and BM^o

This figure presents cumulative returns to an equal-weighted zero-cost strategy based on the book-to-market ratio and its size and orthogonal components. At the end of each June, logarithmic book-to-market ratio (BM) is regressed on past annual logarithmic changes in firm size. The portion of BM that is explained by changes in firm size is denoted as the size component (BM^s) and the error term is denoted as the orthogonal component (BM^o). Stocks are assigned to deciles based on BM, BM^s or BM^o each June. The return to the zero-cost strategy is the difference in monthly excess returns between portfolios 10 and 1. Portfolio 1 (10) is the portfolio of stocks with the lowest (highest) values of BM, BM^s or BM^o. The strategies are associated with a $1 investment at the beginning of the sample period. Panels A to F report results for North America, United States, Canada, Europe, Japan and Asia Pacific, respectively. The sample period is from 1990 to 2014.

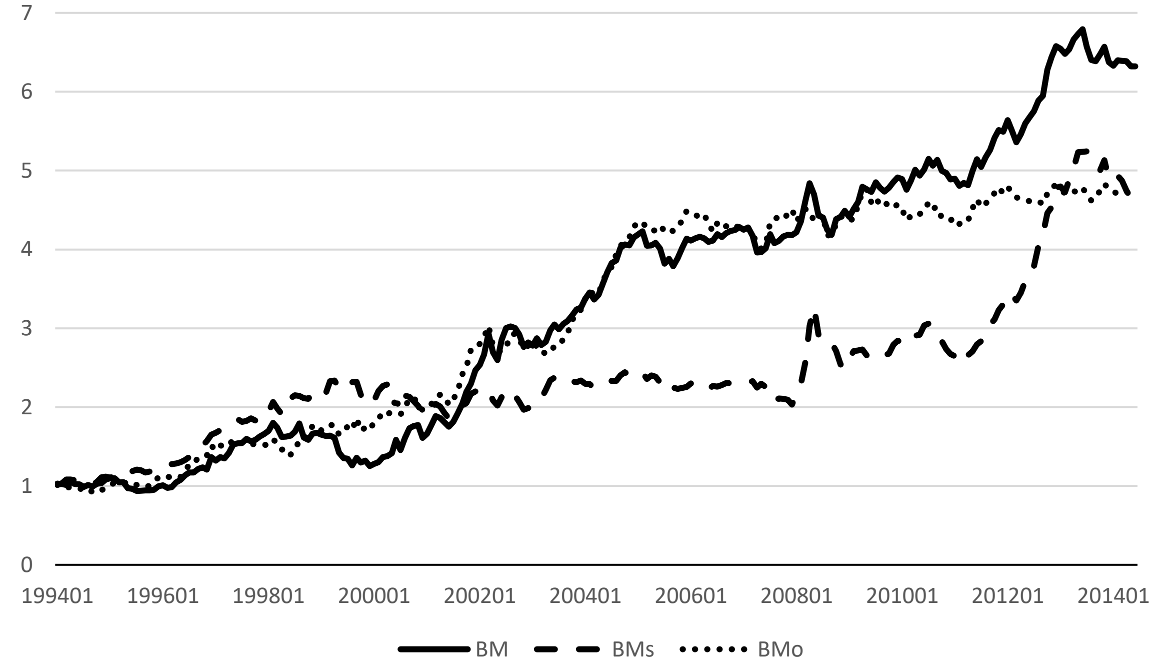
Panel A. North America



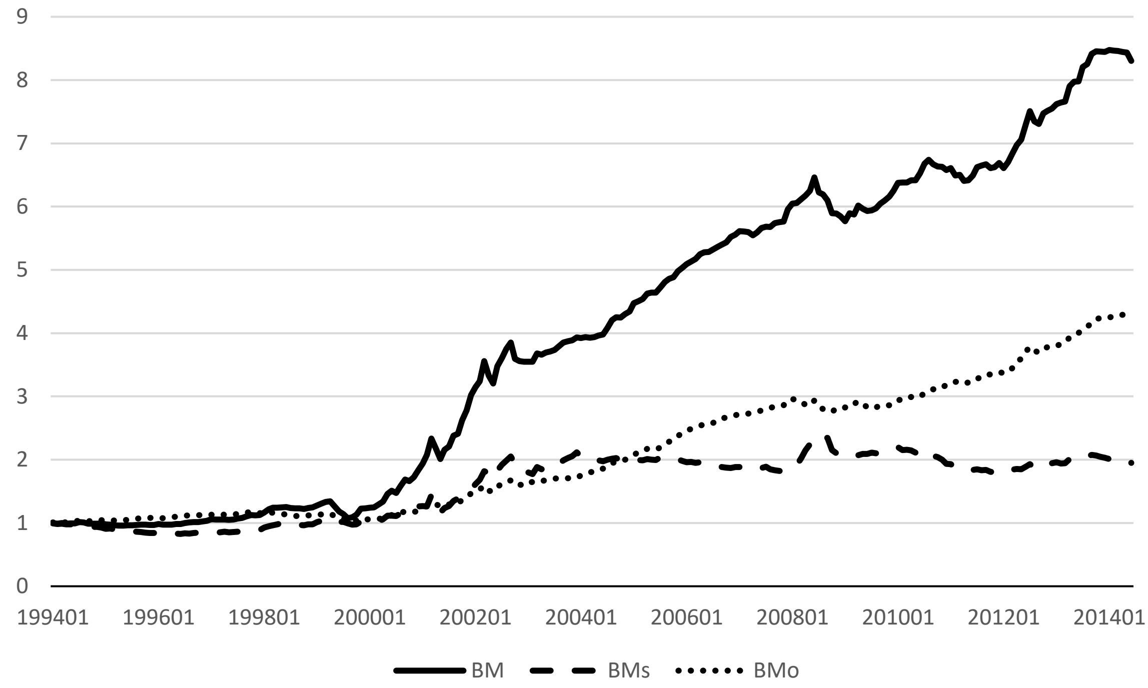
Panel B. United States



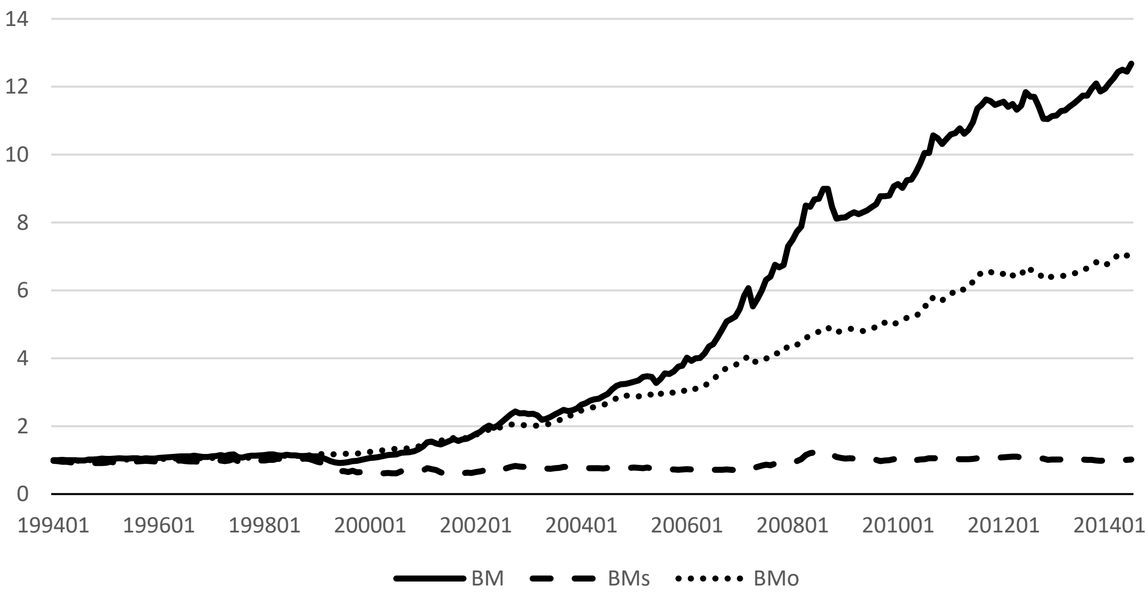
Panel C. Canada



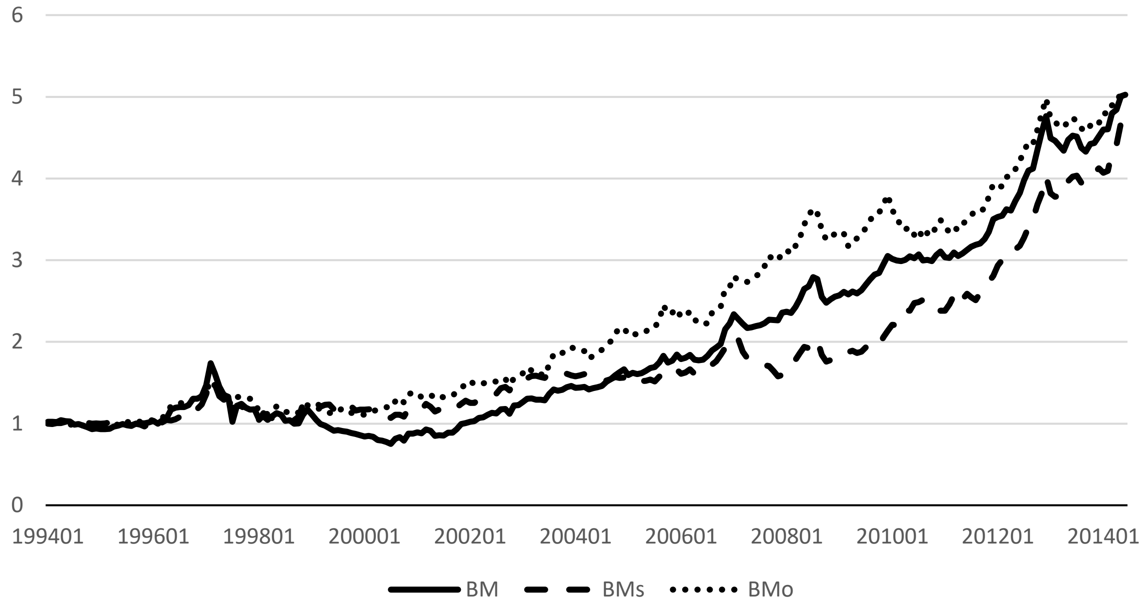
Panel D. Europe



Panel E. Japan



Panel F. Asia Pacific



3. AVERAGE SKEWNESS IN GLOBAL EQUITY MARKETS

3.1 Introduction

The role of skewness in asset pricing is a vibrant topic of discussion. Early studies such as Arditti (1967, 1971), Scott and Horvath (1980) and Kimball (1990) suggest that investors demand higher (lower) returns from investments whose return distributions are negatively (positively) skewed. This preference for skewness can impact security prices. Most of this early work focuses only on coskewness which is the component of an asset's skewness which can be explained by aggregate skewness. The assumption behind this focus is that fully diversified investors will take skewness into account in their investment decisions only as far as it poses a systematic risk and idiosyncratic skewness will be diversified away. Kraus and Litzenberger (1976) incorporate preference for skewness into the standard CAPM framework and studies such as Harvey and Siddique (2000) and Dittmar (2002) provide empirical evidence for the role of coskewness in equity pricing.

On the other hand, subsequent work has also documented the ability of various measures of idiosyncratic skewness to explain the cross-section of equity returns whether interpreted as a measure of downside risk or lottery preference (e.g., Kumar, 2009; Boyer et al., 2010; Bali et al., 2011; Bali and Murray, 2013; Conrad et al., 2013; Boyer and Vorkink, 2014; Conrad et al., 2014; Amaya et al., 2015). The common theme that runs through these studies is that investors under-diversify their portfolios due to their preference for individual stock skewness (Mitton and Vorkink, 2007).[21] Several theoretical studies present models that hinge on alternative utility functions and/or behavioral biases and provide a justification for this type of under-diversification (e.g.,

[21] There are also some earlier theoretical studies which demonstrate a relation between skewness preference and portfolio under-diversification. (e.g., Kane, 1982; Simkowitz and Beedles, 1978; Conine and Tamarkin, 1981).

Brunnermeier and Parker, 2005; Brunnermeier et al., 2007, Barberis and Huang, 2008; Bordalo et al., 2012).

Jondeau et al. (2019) carry these ideas from the cross-section to the time-series of aggregate returns. They present a model which suggests that if investors have a preference for both systematic and individual stock skewness, idiosyncratic moments do not vanish in the expression for expected market returns due to under-diversification. In other words, the stochastic discount factor should also incorporate idiosyncratic higher-order moment risk. This framework suggests a role for average skewness across stocks to predict aggregate returns and the authors test this hypothesis in the US data. Monthly skewness values for individual equities are calculated as the third moment of the distribution of demeaned and standardized daily excess stock returns. Next, these monthly skewness values are averaged using either market capitalization or equal weights and two measures of average skewness are calculated. The authors also construct two analogous measures of average variance by averaging monthly variance values across stocks. Moreover, market variance and market skewness are calculated using daily excess market returns. Results from univariate regressions indicate that both value- and equal-weighted skewness is a powerful predictor of future market returns. Multivariate regressions that control for lagged market return, market variance and market skewness show that average skewness has incremental predictive power and captures independent information about future aggregate returns. The results are robust after measuring average skewness and average variance in alternative ways, controlling for various macroeconomic and financial variables, utilizing different specifications and performing out-of-sample tests.

This paper investigates the predictive power of average skewness for future market returns in 23 developed countries including the US. The sample period of this study begins in January 1990 and ends in September 2019. To make sure that the empirical implementation of this study is accurate, I first replicate the methodology of Jondeau et al. (2019) who present their findings for two samples. The full sample covers the period between 1963 and 2016 and a subsample extends from 1990 to 2016. I validate the variable construction procedure by comparing the summary statistics and correlation structures for the US data used by this study and the data used by Jondeau et al. (2019) during the overlapping sample period between 1990 and 2016. I also validate the significantly negative relation between average skewness and future aggregate returns during this period in the data. However, when I estimate the predictive regressions using the extended sample that ends in 2019, the relation becomes either insignificant or marginally significant at best. In other words, adding less than 3 years of monthly data to the subsample used by Jondeau et al. (2019) erases the predictive power of average skewness in the US.

Next, I estimate univariate and multivariate regressions of future market returns on various measures of both average and market skewness and variance in non-US markets. Finding a negatively significant coefficient associated with the average skewness measures turns out to be an exception rather than the norm. Even these very rare instances are not robust across different specifications. The results of this study strongly indicate that there is no significant relation between average skewness and future aggregate returns in global equity markets. In additional analysis, I measure the variables using returns denominated in US dollars, control for some business cycle and market liquidity variables and use various different methods to construct the average skewness and average variance measures. I conclude that the lack of a predictive relation between average skewness and market returns is pervasive.

The remainder of the paper is organized as follows. Section 2 describes the data and variables. Section 3 presents the main empirical results. Section 4 presents a battery of robustness tests. Section 5 concludes.

3.2 Data and Variables

3.2.1 Data

In the analysis conducted by this paper, I focus on 23 developed countries that Fama and French (2012, 2017) also examine. These countries can be grouped into four regions 1) North America, including the United States and Canada; 2) Europe, including Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom; 3) Japan; and 4) Asia-Pacific, including Australia, Hong Kong, New Zealand and Singapore. The analysis are performed at the country-level rather than regional-level. The sample period for all countries is from January 1990 to September 2019.

For the US, I obtain daily equity returns from the Center for Research in Security Prices (CRSP).[22] These returns are corrected for dividend payments and corporate actions. I include all common stocks traded in NYSE, AMEX and Nasdaq and exclude ADRs, REITs and closed end funds from the sample. I use all stocks that have at least ten valid return observations in a month. I also exclude the stocks that fall into the highest 0.1% percentile based on their Amihud's (2002) illiquidity ratio each month and stocks whose prices are less than $1. The aggregate market return is the return on the value-weighted CRSP index including dividends. The risk-free rate used to calculate excess stock returns is the interest rate on one-month US T-bills. Both the risk-free rate and market excess returns are directly obtained from Kenneth French's website.[23]

Outside the US, the primary data source for market information is Thomson Reuters Datastream. Daily equity returns are calculated using the daily total return index (RI) adjusted for stock splits and dividend payments. I use Datastream's value-weighted total market index item *TOTMK* as the market index for each country. I utilize returns denominated in local currencies in the main analysis.[24] I follow other international studies such as Bekaert, Harvey and Lundblad (2007), Bekaert, Hodrick and Zhang (2009) and Lee (2011) to screen the data and omit some of the data errors in Datastream that have been reported in the prior literature. I select stocks only from major exchanges defined as those in which the majority of equities in a given country are traded. Again, I only include common equities in the sample and exclude stocks with special features such as depository receipts, real estate investment trusts and preferred stocks. I retain all data for defunct stocks in the sample to avoid survivorship bias. Due to the presence of some unrealistically extreme returns in Datastream, I set the highest and lowest 0.5% of daily returns in each country to be missing. The daily returns for both days t and t-1 are set to missing if the product of the gross returns in these two days is less than or equal to 1.5, and at least one of the two returns is 200% or greater. The daily return is also set to missing if either the total return index for the previous day or that of the current day is

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[22] I treat returns equal to -66, -77, -88 and -99, prices equal to zero and negative trading volumes as missing values.

[23] The set of screens used for US data is directly taken from Jondeau et al. (2019) to make the results of this study comparable to theirs. However, in additional tests, I also apply the set of screens used for non-US markets to the US data as well and I discuss the findings when relevant.

[24] Some international studies use returns denominated in US dollars to make returns comparable across countries, to eliminate the effect of exchange rate risk on returns and to reflect the effect of different inflation rates across countries through purchasing power parity. This approach is more suitable when countries are being grouped together in the analysis. Since I run the tests for each country independently, I use returns denominated in local currencies. However, I also repeat the main tests for returns denominated in US dollars and discuss them.

less than 0.01. I also drop any day from the sample as a non-trading day if more than 90% of stocks in a given exchange have zero returns on that day. As in the US sample, I retain all stocks that have at least ten valid return observations in a month. I also want to impose an illiquidity screen to the international data; however, calculating an illiquidity ratio for each stock would result in losing a substantial part of the sample due to the relative scarcity of trading volume data in Datastream. Thus, I truncate the sample at the left tail in each country-month at the 10% level both in terms of market value of equity and price.[25] For non-US data, equity returns are denominated local currencies and the interest rate on one-month US T-bills is no longer an appropriate proxy for risk-free rates. Thus, I utilize local measures of risk-free rates when I calculate excess returns.[26]

3.2.2 Variables

I follow Jondeau et al. (2019) in the variable definitions. The monthly variance of stock *i* in month *t* can be defined as

$$V_{i,t} = \sum_{d=1}^{D_t}(r_{i,d} - \bar{r}_{i,t})^2 + 2\sum_{d=2}^{D_t}(r_{i,d} - \bar{r}_{i,t})(r_{i,d-1} - \bar{r}_{i,t}) \qquad (3.1)$$

where $r_{i,d}$ is the daily excess return of stock *i* on day *d* and $\bar{r}_{i,t}$ is the average daily excess return of stock *i* in month *t*. The second term on the right-hand side adjusts for the first-order serial correlation in daily equity returns as in French et al. (1987). Daily excess stock returns are centered by subtracting the average daily excess stock return in each month. Following Jondeau et al. (2019), I exclude the last two trading days of each calendar month when I calculate $\bar{r}_{i,t}$ due to the correlation between daily returns at the

[25] This screen has no qualitative effect on the results; however, I use it to make the screening procedure for the non-US data more comparable to that for US data.

[26] Interest rate data for one-month or three-month T-bills are seldomly available in markets outside the US. Therefore, I follow Schmidt et al. (2019) and consider two alternative interest rate series when interest rates on local T-bills are not available: three-month overnight indexed swap (OIS) and one-month or three-month interbank rate (IBR). The drawback of OIS is that it is only available since 2000. The drawback for IBR is that it does not behave similar to T-bill rates since 2007 due to additional default risk incorporated into the series after the credit crisis. Thus, I use IBR to measure the risk-free rate before OIS data is available in a country. If both rates are available, I use the lower rate as a proxy for the risk-free rate.

turn of the month as identified by Lakonishok and Smidt (1988).[27] I calculate monthly value-weighted average variance (V_{vw}) by weighing each individual monthly variance by total market capitalization and I calculate monthly equal-weighted average variance (V_{ew}) by applying equal weights.

To calculate average skewness which is the main variable of interest in this study, I define the standardized skewness of stock *i* in month *t* as

$$Sk_{i,t} = \sum_{d=1}^{D_t} \tilde{r}_{i,d}^3 \tag{3.2}$$

where $\tilde{r}_{i,d} = (r_{i,d} - \bar{r}_{i,t})/\sigma_{i,t}$ with $\sigma_{i,t}^2 = \sum_{d=1}^{D_t}(r_{i,d} - \bar{r}_{i,t})^2$. This standardized skewness measure enables one to compare skewness measures across firms with different variances.[28] I calculate monthly value-weighted average skewness (Sk_{vw}) by weighing each individual monthly skewness by total market capitalization and I calculate monthly equal-weighted average skewness (Sk_{ew}) by applying equal weights.

I also follow Jondeau et al. (2019) to calculate monthly market variance (V_m) and market skewness (Sk_m) measures. Market variance is calculated as the average of the squared daily demeaned market excess returns in each month and market skewness is calculated as the average of the cubed daily demeaned market excess returns standardized by standard deviation in each month.[29]

3.2.3 Descriptive Statistics

Table 1 presents summary statistics for market return, market variance and market skewness in addition to two sets of measures for average variance and average skewness

[27] The results are qualitatively robust if I omit the term that adjusts for serial correlation when I calculate the monthly variance for each stock or if I use all trading days in a calendar month when I calculate average daily excess stock returns for demeaning.

[28] Adding the term that adjusts for serial correlation to the variance measure that is used to standardize the skewness measure does not change the results qualitatively.

[29] The choices regarding adjusting for serial correlation in daily returns to calculate monthly variance, the variance measure used to standardize skewness and excluding the last two trading days in a month to calculate average market returns for demeaning do not have a qualitative impact on the results associated with the market skewness and variance measures.

for all countries in the sample. I should note that the summary statistics are not directly comparable across countries since the returns used to generate these measures are denominated in local currencies. First, I discuss the summary statistics associated with the US market. In line with the theoretical model proposed by Albuquerque (2012), I find that there are periods in the sample of this study in which skewness has different signs at the market and firm levels. Market skewness has a negative mean equal to -0.052 whereas value-weighted (equal-weighted) average skewness has a mean of 0.025 (0.045). A similar pattern is also observable for the median values. Moreover, I find that market skewness has a much wider range compared to the average skewness metrics. Equal-weighted versions of the average skewness and variance statistics have larger central tendency statistics compared to the value-weighted versions indicating that smaller firms, on average, tend to have larger variance and skewness statistics. The median market return of 12 basis points is higher than the mean market return of 7 basis points which is a manifestation of negative skewness in equity returns. All of these patterns are consistent with those encountered in Jondeau et al. (2019).[30]

I also present descriptive statistics for another version of the US sample where the screening procedure applied to the international data are used. This procedure has no effect on the variables calculated from market returns (r_m, V_m and Sk_m) but they may have an impact on the average variance and skewness metrics. I observe that the summary statistics associated with the value-weighted versions of average variance and skewness (V_{vw} and Sk_{vw}) are virtually identical between the two screening methods. The summary statistics associated with the equal-weighted versions of average variance and skewness (V_{ew} and Sk_{ew}) are also very close with only minor deviations at the extremes of the distributions. This finding validates the integrity of the cleaning procedures that I use for international data.

Next, I examine whether the patterns associated with US data are also observed for other countries. First, as in the US, I find that both measures of average skewness have positive means in all markets. However, unlike the US, the mean of market skewness is negative in only 10 out of 22 non-US markets. I also observe that market skewness lies in a relatively wider range compared to the average skewness measures without

[30] The sample of this study covers the period between 1990 and 2019 whereas the sample utilized in Jondeau et al. (2019) is from 1963 to 2016. However, the monthly time-series of the variables used Jondeau et al. (2019) are provided online, thus, I am able to compare the summary statistics for the common sample period (between 1990 and 2016). I find that for the seven variables tabulated in Table 1, the summary statistics are virtually identical. This provides confirmation for the variable construction methodology of this study.

exception. Second, although the differences are small, I find that V_{vw} (Sk_{vw}) has a higher mean value compared to V_{ew} (Sk_{ew}) in only 5 (5) non-US markets indicating that larger variance and skewness statistics associated with smaller firms is a widespread phenomenon. Third, similar to the US, the median market return is greater than the average market return in 18 non-US markets.

In Table I of the appendix, I present the correlation matrix between one-month ahead market returns (fr_m), current market returns and various measures of variance and skewness for all countries. I again begin by discussing the results for US. Average variance is negatively correlated with contemporaneous market returns (-0.24 for V_{vw} and -0.05 for V_{ew}) and the correlation between average variance and one-month-ahead market returns is also negative (-0.12 for V_{vw} and -0.02 for V_{ew}). However, the sign of the correlation coefficient between average skewness measures and market returns depends on whether contemporaneous or intertemporal correlation is being estimated. Average skewness and one-month-ahead market returns are negatively correlated (-0.08 for Sk_{vw} and -0.06 for Sk_{ew}) whereas the contemporaneous correlation between average skewness and market returns is positive (0.14 for Sk_{vw} and 0.25 for Sk_{ew}). I also observe that the correlation between market variance and average variance is relatively high (0.79 for V_{vw} and 0.68 for V_{ew}). The correlation between market skewness and average skewness is also not low (0.57 for Sk_{vw} and 0.42 for Sk_{ew}) but there is room for market skewness and average skewness to convey independent information about future market returns. The correlation between equal- and value-weighted variance (skewness) is equal to 0.86 (0.79). These patterns are again consistent with those encountered in Jondeau et al. (2019).[31]

Next, I focus on the correlation matrices for the non-US markets. Although there are some exceptions, I continue to observe negative correlations between average variance and both contemporaneous and one-month ahead returns in the international data. Moreover, the positive contemporaneous correlation between average skewness and market returns is intact across the board. The major difference between US and non-US markets has to do with the correlation between average skewness and one-month-ahead market returns. In 19 out of 22 non-US markets (except France, Netherland and the UK),

[31] I again check the accuracy of the methodology of this study by using two procedures. First, I clean the US data using the screens I use for international data. Table I of the appendix shows that the correlation structure is very similar regardless of the set of screens being used. Second, I compare the correlation matrices calculated for the period between 1990 and 2016 using the data set of this study and the data set used by Jondeau et al. (2019). I again find that the two correlation matrices are very similar. The difference between the individual correlation coefficients is never greater than 0.05 in absolute value between the two data sets.

at least one of the correlation coefficients between Sk_{vw} or Sk_{ew} and future market returns is positive. In 10 of these 19 markets, both correlation coefficients are non-negative. Another notable finding is that market variance and average variance are still highly correlated in international markets. The lowest correlation between V_m and V_{vw} (V_{ew}) is encountered in New Zealand and equal to 0.58 (0.41). The correlation between market skewness and average skewness is lower in non-US data compared to the US. The correlation between Sk_m and Sk_{vw} ranges between 0.06 for Canada and 0.64 for Germany and Hong Kong. The correlation between Sk_m and Sk_{ew} ranges between 0.00 for Canada and 0.34 for Italy. Finally, there is substantial positive correlation between the equal- and value-weighted versions of the average higher order moments. The correlation between V_{vw} and V_{ew} ranges between 0.67 for Greece and 0.94 for Japan, whereas the correlation between Sk_{vw} and Sk_{ew} ranges between 0.34 for Belgium and 0.77 for Canada.

3.3 Empirical Results

3.3.1 Univariate Regressions

Table 2 presents results from one-month-ahead univariate predictive regressions of market excess returns on market variance, market skewness, two measures of average variance and two measures of average skewness for all countries in the sample. For every univariate regression, I report the slope coefficient of the independent variable, the constant term and the associated t-statistics adjusted for autocorrelation and heteroskedasticity using the Newey-West (1987) procedure. The sample period is between January 1990 and September 2019.

The regression estimates for US are presented in the last two rows of Table 2. First, I find that there is a significantly negative relation between market variance (V_m) and future market returns at the 10% level (t-stat = -1.79) whereas no such relation exists between market skewness (Sk_m) and future market returns. Second, value-weighted average variance (V_{vw}) has a significantly negative relation with one-month-ahead market returns (t-stat = -2.13) whereas equal-weighted average variance (V_{ew}) has no such predictive relation. These results are all consistent with Table 2 Panel B of Jondeau et al.

(2019) which presents results for the sample period between January 1990 and December 2016. However, in the sample, I find that neither Sk_{vw} nor Sk_{ew} can predict future market returns with t-statistics of -1.60 and -1.16, respectively. In Jondeau et al. (2019), the coefficient of the former variable is equal to -0.1168 and significantly negative at the 5% level whereas the latter variable has a negative coefficient which is equal to -0.1432 and marginally significant. To reconcile these contradictory results, I estimate these regressions using the data set used in this study for the sample period examined in Jondeau et al. (2019). I find that the coefficient of Sk_{vw} is equal to -0.1116 (t-stat = -2.05) and the coefficient of Sk_{ew} is equal to -0.1155 (t-stat = -1.46) for this shorter sample. Jondeau et al. (2019) especially promote value-weighted average skewness as "the variable with the lowest p-value" in their discussion; however, adding less than three years of monthly data to the sample is enough to render this variable insignificant.[32]

Next, I focus on non-US markets and investigate whether average skewness is a robust predictor of market returns in international data. The answer to this question is a resounding no. For Sk_{vw}, the only statistically significant coefficient at the 5% level belongs to Ireland with a t-statistic of 2.30 and this coefficient is positive with a value of 0.0926. The only negative coefficient that is significant at the 10% level belongs to Netherlands with a value of -0.0811 (t-statistic = -1.77). For Sk_{ew}, I observe two slope coefficients that are significant at the 5% level (for Canada and Sweden) and two other slope coefficient that are significant at the 10% level (for Ireland and Singapore). However, all of these coefficients are positive. In other words, there is no trace of a significantly negative predictive relation between average skewness and market returns in the international data which was already foreshadowed by the correlation matrices in Table I of the appendix.[33]

I also discuss the coefficients of the other variables for non-US markets. I begin with three variance metrics. For 17 out of 22 international markets, the coefficient of

[32] I also estimate these univariate regressions for the alternative US sample for which international screens are applied. For both sample periods, V_m has a marginally significant negative relation and V_{vw} has a significantly negative relation with one-month-ahead market returns whereas Sk_m and V_{ew} have no predictive power. In the longer sample period that ends in 2019, Sk_{vw} (Sk_{ew}) has a coefficient of -0.0804 (-0.0844) with a t-statistic of -1.60 (-1.29). In the shorter sample period that ends in 2016, Sk_{vw} (Sk_{ew}) has a coefficient of -0.1115 (-0.1135) with a t-statistic of -2.05 (-1.59). These results reiterate the points in the discussion above.

[33] I do not report adjusted R^2 statistics in the tables to conserve space; however, these statistics are low for the time-series regressions for market returns as expected. The highest (lowest) adjusted R^2 statistic for the specifications that use Sk_{vw} as the independent variable is equal to 1.23% for Ireland (-0.28% for Sweden). The highest (lowest) adjusted R^2 statistic for the specifications that use Sk_{ew} as the independent variable is equal to 1.58% for Sweden (-0.28% for Australia and New Zealand).

market variance (V_m) has a negative sign; however, only three of these coefficients are significant at the 5 % level (for Austria, Denmark and Greece) and two of these coefficients are significant the 10% level (for Canada and Ireland). For the average variance measures, 15 (16) non-US markets exhibit negative slope coefficients associated with V_{vw} (V_{ew}). However, for V_{vw}, these coefficients are significantly different from zero in only Australia, New Zealand and Norway. For V_{ew}, the only country that displays a significant predictive relation with market returns is Norway. Finally, I look at whether market skewness can predict aggregate returns outside the US. Similar to the average skewness measures, there is no significant relation between Sk_m and one-month-ahead market returns. The only significant coefficient belongs to Ireland and its sign is positive.

3.3.2 Univariate Regressions with Returns in US Dollars

In the main analysis, I use returns denominated in local currencies since the tests are conducted for each country independently. However, in this section, I estimate the one-month-ahead univariate predictive regressions of section 3.1 by using returns denominated in US dollars. In other words, I calculate the dependent variable and all independent variables using returns denominated in US dollars. The results are presented in Table 3 for all non-US markets.

Evidence for a negative predictive relation between average skewness and aggregate returns is also non-existent when returns are denominated in US dollars. Only two countries exhibit significantly negative coefficients for Sk_{vw}, namely Netherlands (t-stat = -2.18) and Sweden (t-stat = 1.68). For Sk_{ew}, the only slope coefficient that is significantly different from zero at %10 level belongs to Singapore (t-stat = 1.75) and its sign is positive. Similar results apply for market skewness. For Sk_m, Australia and Japan display significantly positive coefficients with t-statistics of 1.88 and 2.09, respectively. The only significantly negative slope coefficient belongs to Netherlands (t-stat = -2.26).

For the three variance measures used in the analysis, V_m, V_{vw} and V_{ew} carry negative coefficients in 17, 17 and 18 markets, respectively. However, these negative coefficients lack statistical significance at the 5% level except in Greece for market variance (t-stat = -2.95) and in New Zealand for value-weighted average variance (t-stat = -2.05). These results collectively suggest that a robust predictive relation between various variance and skewness measures and one-month-ahead aggregate returns is fleeting in international markets whether returns are denominated in local currencies or US dollars.

3.3.3 Multivariate Regressions

In this section, I estimate one-month-ahead multivariate predictive regressions of market returns on two separate combinations of the variables described in Table 1. The first specification includes lagged market return, market variance and skewness, and value-weighted versions of the average variance and skewness metrics in the set of independent variables. The second specification replaces the value-weighted versions of the average variance and skewness metrics with the equal-weighted versions. These specifications correspond to those in columns (6) and (7) in Table 3 of Jondeau et al. (2019), respectively.[34]

Table 4 presents the results for these multivariate regressions. For the US, I find that neither value-weighted nor equal-weighted average skewness can predict one-month-ahead aggregate returns. The coefficient of Sk_{vw} has a t-statistic of -1.14 in the first specification whereas the coefficient of Sk_{ew} has a t-statistic of -1.30 in the second specification. These results contradict those in Table 3 Panel B of Jondeau et al. (2019). The findings in that panel suggest that, in the sample period between 1990 and 2016, Sk_{vw} has a coefficient of -0.1254 and Sk_{ew} has a coefficient of -0.1593 which are marginally significant. To reconcile these findings, I re-estimate the specifications for this shorter sample period using the data utilized in this study and find that Sk_{vw} has a coefficient of -0.1286 (t-stat = -1.82) and Sk_{ew} has a coefficient of -0.1798 (t-stat = -1.90). In other words, similar to the univariate setting, adding less than 3 years of monthly data causes the average skewness measures to lose their predictive power in the US.

For the non-US markets, I still find no significantly negative intertemporal relation between average skewness and aggregate returns. For Sk_{vw} (Sk_{ew}), only Netherlands (Portugal) displays a significantly negative coefficient with a t-statistic of -1.78 (-2.31). In other words, the central finding of Jondeau et al. (2019) does not extend to countries

[34] These specifications also correspond to the "baseline regressions" (4) and (5) described on page 34 of Jondeau et al. (2019) with an additional control for lagged market return. I actually estimate all specifications presented in Table 3 of Jondeau et al. (2019) for each country. The findings do not change the takeaways of this study regarding the lack of an intertemporal relation between average skewness and market returns in the international sample and the comparability of the US results of this study to those of Jondeau et al. (2019).

outside the US. Market skewness does not fare any better with only one significantly negative coefficient which belongs to New Zealand (t-stat = -1.82) in the first specification.

The three variance measures have no predictive power for US market returns except V_m in the second specification (t-stat = -2.16). The general lack of a significant relation between market variance or average variance and future market returns extends to other countries as well. V_m has a negative coefficient which significant at least at the 10% level in only three countries (Austria, Finland, Ireland) in the first specification and only one country (Denmark) in the second specification. For average variance, the rare case of statistical significance is encountered with a negative sign in Norway (for both V_{vw} and V_{ew}) and with a positive sign in Finland (for only V_{vw}). These findings corroborate the conclusions of this study regarding the non-existence of a robust intertemporal relation between various variance and skewness measures and aggregate equity returns. Finally, I observe that there is a significantly positive intertemporal relation between market returns and their one-month-ahead values in 10 (9) non-US markets in the first (second) specification at least at the 10% level.[35]

3.3.4 Controlling for Business Cycle and Market Liquidity

Jondeau et al. (2019) argue that the predictive power of average skewness for aggregate equity returns may be due to the possibility that it serves a proxy for other fundamental factors. Although I am not able to find a significant intertemporal relation between average skewness and market returns even in the univariate setting, I follow Jondeau et al. (2019) and add some variables that proxy for the business cycle and market liquidity to the specifications in the international sample. Specifically, I control for the dividend yield (DY) associated with the value-weighted market index provided by Datastream, the relative interest rate (RREL) calculated as the difference between a short-term interest rate (as explained in footnote 5) and its 12-month backward moving average, and a market illiquidity measure ($ILLIQ^E$). To calculate $ILLIQ^E$, I first calculate the daily

[35] For the first specification that includes value-weighted variance and skewness, the highest (lowest) adjusted R^2 statistic is 6.31% for Finland (-0.68% for Germany). For the second specification that includes equal-weighted variance and skewness, the highest (lowest) adjusted R^2 statistic is 5.52% for Ireland (-0.27% for Germany).

ratio of absolute return to dollar trading volume for every stock that has the required data. The illiquidity ratio for a stock in a given month is calculated as the average of these daily ratios. Aggregate illiquidity (ILLIQ) is the average of these monthly illiquidity ratios across stocks. The expected component of the aggregate illiquidity measure $ILLIQ^E$ is calculated as the fitted value from a regression of ILLIQ on its one-month-lagged value. The results for two specifications that include either Sk_{vw} or Sk_{ew} among the independent variables are presented in Table 5.

For the US, there is a significantly negative intertemporal relation between Sk_{vw} and market returns (t-stat = -1.88), however, a similar observation cannot be made for Sk_{ew} (t-stat = -1.01). I also estimate these regressions for a shortened sample that ends in 2016. For this sample, the coefficient of Sk_{vw} is equal to -0.1372 with a t-statistic of -2.59 whereas the coefficient of Sk_{ew} is equal to -0.1350 with a t-statistic of -1.79. In other words, extending the sample until 2019 reduces the statistical significance associated with Sk_{vw} and renders the coefficient of Sk_{ew} insignificant. I can only compare the Sk_{vw} results with Table 4 Panel B of Jondeau et al. (2019) since that panel omits the findings for Sk_{ew}. The closest specification that I can compare the results is specification (4) although I cannot control for default and term premia due to data unavailability. Jondeau et al. (2019) report a coefficient of -0.1326 for Sk_{vw} which is significant at the 5% level similar to the findings of this paper. For the other control variables, only RREL exhibits predictive power for aggregate returns with a positive sign.

For the non-US markets, evidence for an intertemporal relation between average skewness and market returns is once again rare. Out of 22 countries, only four exhibit significantly negative slope coefficients for Sk_{vw} at least at the 10% level, namely Austria, Finland, France and Netherlands. The count stays the same (France, Netherlands, Norway and Portugal) when Sk_{vw} is replaced by Sk_{ew} in the specification. For the other control variables, the only notable observation is that RREL has a significant coefficient in both specifications in 8 countries, but the sign of this coefficient is negative.

3.4 Robustness Tests

In this section, I run several robustness tests by modifying the variable construction methodology of this study following the tests presented in section B of the technical appendix of Jondeau et al. (2019). I limit the discussion to the findings related to the average skewness measures in order not to make the same points repeatedly.

First, I modify the demeaning procedure applied to daily stock returns to calculate monthly measures of average variance and skewness. Specifically, I replace the term $\bar{r}_{i,t}$ in equations (1) and (2) with the term $\bar{r}_{m,t}$ which is equal to the average daily market excess return in month *t*. In other words, a stock's daily excess returns are centered around the average daily market excess return rather than its own daily average excess return. Table II of the appendix presents results for the specifications that add market return, market variance and market skewness to value- or equal-weighted versions of average variance and skewness as control variables (analogous to specification VI of Table A1 in Jondeau et al. (2019)). For the US, Sk_{vw} has a coefficient of -0.0937 with an insignificant t-statistic of -1.58 whereas Sk_{ew} has a coefficient of -0.1179 with a marginally significant t-statistic of -1.68. When I estimate these regressions for the sample period between 1990 and 2016 using the data utilized in this study, I find that both coefficients turn significant. The coefficient of Sk_{vw} (Sk_{ew}) is equal to -0.1316 (-0.1667) with a t-statistic of -2.10 (-2.18). These results are comparable to those in Jondeau et al. (2019) who report a significantly negative coefficient of -0.1258 for Sk_{vw}. More importantly, changing the demeaning methodology does not impact the prior conclusions for non-US markets. Sk_{vw} is associated with a significantly negative coefficient in only three countries (Finland, the Netherlands and Sweden) whereas Sk_{ew} is associated with a significantly negative coefficient in only two countries (Finland and Portugal).

Second, I modify the average variance measures used in the regressions. Specifically, in Tables III and IV of the appendix, I include the square root of average variance and the logarithmic transformation of average variance in the specifications rather than the average variance itself, respectively. I again control for market return, market variance and market skewness along with average skewness and transformed versions of average variance. The specification in Tables III and IV of the appendix are analogous to specifications VIII and IX of Table A4 in Jondeau et al. (2019), respectively.

Table III shows that, when square root of average variance is controlled for in the US, both Sk_{vw} and Sk_{ew} have insignificant coefficients with t-statistics of -1.19 and -1.14, respectively. When these regressions are estimated for a shorter sample that ends in 2016, the coefficient of Sk_{vw} (Sk_{ew}) becomes -0.1305 (-0.1656) with a t-statistic of -1.83 (-1.67). These results are comparable to those in Jondeau et al. (2019) who report a coefficient -0.1279 for Sk_{vw} which is significant at the 10% level. Table IV shows that, when the logarithm of average variance is controlled for in the US, both Sk_{vw} and Sk_{ew} have insignificant coefficients with t-statistics of -1.23 and -1.01, respectively. When these regressions are estimated for a shorter sample than ends in 2016, the coefficient of Sk_{vw} (Sk_{ew}) becomes -0.1315 (-0.1500) with a t-statistic of -1.83 (-1.51). These results are comparable to those in Jondeau et al. (2019) who report a coefficient -0.1291 for Sk_{vw} which is again significant at the 10% level. Last but not least, I focus on non-US markets. The findings show that the inability of average skewness to predict one-month-ahead aggregate returns in global equity markets is blatantly clear. In both tables, the only country that displays a significantly negative slope coefficient at least at the 10% level for Sk_{vw} (Sk_{ew}) is Netherlands (Portugal).

Third, to reduce the effects of outliers in the cross-sectional distribution of monthly variance and skewness for individual stocks, I define V_{md} and Sk_{md} as the median values of the stock variances and skewnesses in a given month, respectively. In the regressions, I replace the equal- and value-weighted average variance and skewness measures with these median measures. I continue to control for market return, market variance and market skewness analogous to specification V in Table A5 of Jondeau et al. (2019). The results are presented in Table V of the appendix. I find that Sk_{md} has an insignificant coefficient (t-stat = -1.15) in the US. However, it becomes significant with a value of -0.1887 and a t-statistic of -1.85 when the sample period is shortened to 2016. This finding is comparable to that in Jondeau et al. (2019) who report a coefficient of -0.1721 for Sk_{md} which is significant at the 10% level. Outside the US, none of the countries I analyze present evidence for a significant intertemporal relation between median skewness and aggregate equity returns.

3.5 Conclusion

The relation between skewness and financial asset returns has been examined from multiple angles in the financial economics literature. Jondeau et al. (2019) contribute to this field by documenting that average skewness, defined as the value- or equal-weighted average of monthly skewness values across stocks, is a powerful predictor of future market returns in the US. I examine this relation in 22 developed countries outside the US and also investigate an extended sample period for the US. After confirming both the validity of the results presented by Jondeau et al. (2019) for the sample period between 1990 and 2016 and the accuracy of the empirical implementation of this study, I show that extending this sample period until 2019 renders the intertemporal relation between average skewness and aggregate equity returns either insignificant or at best marginally significant for the US. Moreover, univariate and multivariate regressions show that there is no robust relation between average skewness and future market returns in non-US markets. The already rare incidence of statistical significance in a particular market is scattered and inconsistent across different specification choices. The inability of average skewness to predict market returns is independent of the currency used to measure stock returns, controlling for business cycle and market liquidity, alternative ways of demeaning daily stock returns, controlling for the square root or logarithm of average variance, and using median values rather than value- or equal-weighted averages to calculate monthly skewness.

3.6 Tables

Table 3.1 Summary statistics

This table provides summary statistics for market excess returns (r_m), market variance (V_m), market skewness (Sk_m), value-weighted average variance (V_{vw}), equal-weighted average variance (V_{ew}), value-weighted average skewness (Sk_{vw}) and equal-weighted average skewness (Sk_{ew}) for various countries. All variables are measured at a monthly frequency. Market excess return is the return of the value-weighted market portfolio minus the risk-free rate. Market variance is the average of the squared daily demeaned market excess returns within each month. Market skewness is the average of the cubed daily demeaned market excess returns standardized by standard deviation within each month. Value-weighted average variance is calculated as the market capitalization-weighted average of individual stock variances where individual stock variance is equal to the squared daily demeaned stock returns adjusted for autocorrelation within each month. Equal-weighted average variance is calculated as the average of individual stock variances within each month. Value-weighted average skewness is calculated as the market capitalization-weighted average of individual stock skewnesses where individual stock skewness is equal to the cubed daily demeaned stock returns standardized by standard deviation within each month. Equal-weighted average skewness is calculated as the average of individual stock skewnesses within each month. The table presents the mean, minimum, median, maximum and standard deviation statistics for each variable. The sample period is from January 1990 to September 2019.

	Australia					Austria					Belgium				
	Mean	Min	Med	Max	SD	Mean	Min	Med	Max	SD	Mean	Min	Med	Max	SD
r_m	0.004	-0.131	0.009	0.079	0.037	0.004	-0.274	0.007	0.139	0.051	0.006	-0.253	0.010	0.134	0.046
V_mx100	0.008	0.001	0.005	0.134	0.011	0.010	0.001	0.005	0.248	0.019	0.010	0.001	0.006	0.155	0.015
Sk_m	-0.051	-2.949	-0.006	1.769	0.557	-0.052	-2.346	-0.091	2.981	0.624	-0.014	-2.822	-0.013	2.881	0.640
V_{vw}	0.008	0.003	0.007	0.071	0.006	0.007	0.001	0.005	0.049	0.005	0.006	0.001	0.004	0.038	0.005
V_{ew}	0.025	0.011	0.024	0.081	0.008	0.006	0.002	0.005	0.035	0.003	0.005	0.001	0.004	0.023	0.002
Sk_{vw}	0.023	-0.134	0.027	0.126	0.035	0.033	-0.216	0.030	0.298	0.060	0.023	-0.249	0.027	0.219	0.066
Sk_{ew}	0.043	-0.103	0.047	0.158	0.034	0.037	-0.130	0.039	0.226	0.056	0.028	-0.174	0.032	0.149	0.046

	Canada					Denmark					Finland				
	Mean	Min	Med	Max	SD	Mean	Min	Med	Max	SD	Mean	Min	Med	Max	SD
r_m	0.005	-0.194	0.008	0.111	0.038	0.007	-0.190	-0.022	0.188	0.050	0.009	-0.283	0.008	0.294	0.077
V_mx100	0.008	0.001	0.004	0.213	0.016	0.011	0.001	0.006	0.252	0.017	0.027	0.002	0.013	0.218	0.035
Sk_m	-0.152	-2.426	-0.147	1.704	0.557	-0.054	-2.770	0.019	1.876	0.641	0.006	-2.680	0.005	2.799	0.654
V_{vw}	0.062	0.032	0.058	0.214	0.022	0.007	0.002	0.005	0.048	0.005	0.009	0.001	0.007	0.052	0.007
V_{ew}	0.083	0.046	0.079	0.200	0.022	0.006	0.002	0.005	0.037	0.003	0.008	0.003	0.007	0.034	0.004
Sk_{vw}	0.085	-0.017	0.085	0.154	0.026	0.033	-0.200	0.038	0.188	0.055	0.031	-0.196	0.029	0.294	0.062
Sk_{ew}	0.074	-0.029	0.079	0.182	0.034	0.034	-0.236	0.039	0.235	0.066	0.039	-0.221	0.042	0.283	0.050

	France					Germany					Greece				
	Mean	Min	Med	Max	SD	Mean	Min	Med	Max	SD	Mean	Min	Med	Max	SD
r_m	0.006	-0.166	0.010	0.140	0.050	0.004	-0.215	0.007	0.165	0.052	0.001	-0.295	0.003	0.580	0.098
V_mx100	0.013	0.001	0.008	0.204	0.018	0.013	0.000	0.007	0.293	0.020	0.032	0.003	0.018	0.380	0.043
Sk_m	0.024	-2.576	0.039	2.506	0.562	-0.071	-3.303	-0.071	3.003	0.601	0.118	-2.016	0.071	2.828	0.688
V_{vw}	0.008	0.002	0.006	0.061	0.007	0.008	0.001	0.005	0.098	0.008	0.017	0.002	0.013	0.078	0.013
V_{ew}	0.009	0.004	0.008	0.032	0.004	0.013	0.003	0.011	0.056	0.008	0.019	0.006	0.016	0.100	0.013
Sk_{vw}	0.034	-0.186	0.034	0.258	0.046	0.029	-0.316	0.030	0.231	0.053	0.044	-0.205	0.047	0.303	0.070
Sk_{ew}	0.045	-0.069	0.045	0.179	0.037	0.039	-0.163	0.042	0.138	0.037	0.039	-0.247	0.036	0.230	0.058

	Hong Kong					Ireland					Italy				
	Mean	Min	Med	Max	SD	Mean	Min	Med	Max	SD	Mean	Min	Med	Max	SD
r_m	0.009	-0.300	0.013	0.285	0.070	0.005	-0.207	0.007	0.222	0.056	0.003	-0.156	0.001	0.232	0.061
V_mx100	0.020	0.001	0.011	0.319	0.031	0.014	0.001	0.007	0.224	0.021	0.017	0.001	0.011	0.217	0.020
Sk_m	0.006	-2.007	0.000	2.395	0.623	-0.034	-3.179	-0.010	3.219	0.650	0.000	-2.374	-0.010	2.150	0.567
V_{vw}	0.012	0.003	0.009	0.081	0.009	0.011	-0.001	0.007	0.103	0.012	0.007	0.002	0.006	0.032	0.005
V_{ew}	0.016	0.005	0.014	0.055	0.008	0.011	0.002	0.009	0.067	0.008	0.007	0.003	0.006	0.026	0.004
Sk_{vw}	0.049	-0.252	0.055	0.207	0.052	0.033	-0.254	0.035	0.251	0.074	0.046	-0.218	0.046	0.251	0.056
Sk_{ew}	0.060	-0.133	0.067	0.150	0.043	0.024	-0.265	0.032	0.263	0.082	0.058	-0.144	0.058	0.155	0.036

	Japan					Netherlands					New Zealand				
	Mean	Min	Med	Max	SD	Mean	Min	Med	Max	SD	Mean	Min	Med	Max	SD
r_m	0.001	-0.210	0.002	0.188	0.055	0.006	-0.237	0.011	0.128	0.049	0.004	-0.151	0.009	0.133	0.040
V_mx100	0.016	0.001	0.010	0.330	0.022	0.012	0.001	0.006	0.224	0.020	0.006	0.000	0.003	0.117	0.009
Sk_m	0.045	-1.998	0.057	2.083	0.595	-0.038	-1.910	-0.002	1.882	0.548	-0.018	-2.252	0.009	2.517	0.628
V_{vw}	0.009	0.003	0.007	0.070	0.007	0.007	0.001	0.004	0.051	0.006	0.005	0.002	0.004	0.029	0.003
V_{ew}	0.010	0.005	0.009	0.053	0.005	0.007	0.002	0.006	0.041	0.004	0.008	0.003	0.007	0.020	0.003
Sk_{vw}	0.039	-0.094	0.042	0.178	0.041	0.026	-0.239	0.026	0.215	0.063	0.035	-0.136	0.033	0.259	0.056
Sk_{ew}	0.036	-0.108	0.039	0.132	0.040	0.044	-0.143	0.045	0.147	0.043	0.041	-0.089	0.043	0.204	0.047

	Norway					Portugal					Singapore				
	Mean	Min	Med	Max	SD	Mean	Min	Med	Max	SD	Mean	Min	Med	Max	SD
r_m	0.006	-0.242	0.011	0.234	0.060	0.004	-0.205	0.004	0.162	0.052	0.005	-0.234	0.008	0.237	0.056
V_mx100	0.017	0.002	0.009	0.308	0.027	0.010	0.000	0.006	0.178	0.015	0.010	0.001	0.005	0.160	0.015
Sk_m	0.039	-2.372	0.005	3.691	0.592	0.009	-2.486	-0.009	2.740	0.650	0.032	-2.419	0.012	3.135	0.644
V_{vw}	0.010	0.002	0.007	0.087	0.008	0.007	0.001	0.005	0.067	0.006	0.009	0.002	0.006	0.072	0.009
V_{ew}	0.012	0.005	0.011	0.052	0.005	0.007	0.002	0.007	0.034	0.004	0.014	0.003	0.012	0.073	0.009
Sk_{vw}	0.038	-0.163	0.039	0.206	0.052	0.041	-0.158	0.039	0.342	0.073	0.046	-0.110	0.045	0.272	0.050
Sk_{ew}	0.044	-0.157	0.050	0.162	0.051	0.045	-0.138	0.049	0.208	0.056	0.055	-0.148	0.052	0.220	0.048

	Spain					Sweden					Switzerland				
	Mean	Min	Med	Max	SD	Mean	Min	Med	Max	SD	Mean	Min	Med	Max	SD
r_m	0.005	-0.196	0.009	0.166	0.056	0.008	-0.218	0.009	0.286	0.062	0.007	-0.182	0.013	0.129	0.042
V_mx100	0.014	0.001	0.009	0.187	0.018	0.018	0.002	0.010	0.175	0.022	0.010	0.001	0.005	0.180	0.015
Sk_m	0.004	-2.327	0.002	2.259	0.599	0.067	-1.850	0.066	2.072	0.606	-0.063	-2.800	-0.042	1.886	0.534
V_{vw}	0.006	0.001	0.005	0.033	0.004	0.009	0.002	0.007	0.081	0.008	0.005	0.001	0.004	0.041	0.005
V_{ew}	0.006	0.002	0.006	0.024	0.003	0.015	0.004	0.013	0.071	0.008	0.005	0.002	0.004	0.025	0.003
Sk_{vw}	0.034	-0.289	0.036	0.265	0.067	0.040	-0.211	0.039	0.286	0.055	0.022	-0.246	0.026	0.222	0.062
Sk_{ew}	0.044	-0.154	0.048	0.170	0.050	0.056	-0.216	0.063	0.163	0.043	0.032	-0.121	0.037	0.149	0.043

	UK					US					US (International Screening)				
	Mean	Min	Med	Max	SD	Mean	Min	Med	Max	SD	Mean	Min	Med	Max	SD
r_m	0.004	-0.139	0.008	0.110	0.040	0.007	-0.172	0.012	0.114	0.042	0.007	-0.172	0.012	0.114	0.042
V_mx100	0.010	0.001	0.005	0.198	0.016	0.012	0.001	0.006	0.232	0.020	0.012	0.001	0.006	0.232	0.020
Sk_m	0.001	-1.758	-0.004	2.503	0.559	-0.052	-2.844	-0.020	2.585	0.603	-0.052	-2.844	-0.020	2.585	0.603
V_{vw}	0.007	0.002	0.005	0.054	0.006	0.010	0.002	0.007	0.090	0.009	0.009	0.002	0.007	0.089	0.009
V_{ew}	0.009	0.003	0.009	0.031	0.004	0.027	0.010	0.022	0.195	0.018	0.023	0.008	0.018	0.135	0.015
Sk_{vw}	0.031	-0.162	0.033	0.176	0.039	0.025	-0.228	0.030	0.159	0.044	0.025	-0.229	0.030	0.159	0.044
Sk_{ew}	0.023	-0.224	0.028	0.238	0.069	0.045	-0.080	0.048	0.128	0.029	0.043	-0.094	0.045	0.132	0.031

Table 3.2 Univariate regressions

This table reports results from the one-month ahead univariate predictive regressions of market excess returns on market variance (V_m), market skewness (Sk_m), value-weighted average variance (V_{vw}), equal-weighted average variance (V_{ew}), value-weighted average skewness (Sk_{vw}) and equal-weighted average skewness (Sk_{ew}) for various countries. t-statistics are adjusted for autocorrelation and heteroskedasticity using the Newey-West (1987) procedure. The dependent and independent variables are defined in Table 1. The returns used to calculate the variables are in local currencies. The sample period is from January 1990 to September 2019.

	V_m	Constant	Sk_m	Constant	V_{vw}	Constant	Sk_{vw}	Constant	V_{ew}	Constant	Sk_{ew}	Constant
Australia	-31.4276	0.0069	0.0031	0.0046	-0.8725	0.0113	-0.0554	0.0057	-0.4965	0.0166	0.0091	0.0040
	(-1.27)	(3.13)	(0.82)	(2.11)	(-1.6822)	(3.14)	(-1.10)	(2.87)	(-1.09)	(1.59)	(0.16)	(1.23)
Austria	-44.6055	0.0082	0.0010	0.0037	-1.0297	0.0105	-0.0300	0.0046	-1.9587	0.0146	0.0333	0.0024
	(-2.30)	(2.82)	(0.21)	(1.03)	(-1.1711)	(2.11)	(-0.77)	(1.27)	(-1.65)	(2.61)	(0.59)	(0.52)
Belgium	-45.3039	0.0101	-0.0012	0.0056	-0.5910	0.0089	0.0171	0.0052	-0.6705	0.0089	0.0757	0.0035
	(-1.16)	(2.71)	(-0.36)	(1.79)	(-0.7602)	(2.32)	(0.54)	(1.69)	(-0.47)	(1.40)	(1.57)	(1.03)
Canada	-26.8290	0.0076	-0.0009	0.0053	-0.1055	0.0120	0.0814	-0.0015	-0.0545	0.0100	0.1151	-0.0031
	(-1.80)	(3.82)	(-0.20)	(2.17)	(-0.8440)	(1.73)	(1.29)	(-0.24)	(-0.48)	(1.14)	(2.17)	(-0.63)
Denmark	-34.9381	0.0103	-0.0008	0.0065	-1.0690	0.0138	0.0067	0.0064	-0.7938	0.0115	0.0595	0.0046
	(-2.54)	(3.19)	(-0.17)	(2.00)	(-1.2938)	(2.56)	(0.14)	(1.71)	(-0.57)	(1.39)	(1.49)	(1.24)
Finland	-8.8924	0.0108	-0.0052	0.0085	0.6403	0.0025	-0.0484	0.0100	-0.1502	0.0097	0.0499	0.0065
	(-0.67)	(2.09)	(-1.07)	(1.74)	(0.8225)	(0.37)	(-0.85)	(2.04)	(-0.12)	(1.04)	(0.62)	(1.10)
France	-4.6743	0.0065	-0.0048	0.0060	0.0927	0.0051	-0.0778	0.0085	0.1947	0.0041	-0.0433	0.0078
	(-0.21)	(1.89)	(-1.15)	(2.04)	(0.1834)	(1.24)	(-1.38)	(2.74)	(0.27)	(0.66)	(-0.62)	(1.74)
Germany	-11.1056	0.0058	-0.0013	0.0044	-0.3162	0.0069	-0.0229	0.0051	-0.5672	0.0116	0.0220	0.0036
	(-0.59)	(1.86)	(-0.29)	(1.41)	(-0.7874)	(1.91)	(-0.44)	(1.70)	(-1.30)	(2.33)	(0.32)	(0.97)
Greece	-21.3514	0.0081	0.0005	0.0011	-0.2443	0.0053	0.0700	-0.0019	-0.2465	0.0059	0.0808	-0.0020
	(-2.02)	(1.38)	(0.06)	(0.19)	(-0.4896)	(0.68)	(0.88)	(-0.30)	(-0.73)	(0.75)	(1.11)	(-0.33)
Hong Kong	-2.8865	0.0096	0.0020	0.0090	-0.2668	0.0121	0.0907	0.0045	-0.6228	0.0192	0.0436	0.0064
	(-0.23)	(2.24)	(0.31)	(2.33)	(-0.4892)	(1.83)	(1.32)	(1.04)	(-1.10)	(2.26)	(0.55)	(1.05)
Ireland	-47.9429	0.0110	0.0138	0.0050	-0.3530	0.0085	0.0926	0.0014	-0.6057	0.0110	0.0710	0.0028
	(-1.92)	(2.89)	(3.18)	(1.35)	(-0.6499)	(1.56)	(2.30)	(0.39)	(-0.80)	(1.50)	(1.87)	(0.71)

	V_m	Constant	Sk_m	Constant	V_{vw}	Constant	Sk_{vw}	Constant	V_{ew}	Constant	Sk_{ew}	Constant
Italy	13.5953	0.0006	-0.0026	0.0028	0.8083	-0.0032	0.0324	0.0013	1.2985	-0.0068	0.1017	-0.0031
	(0.62)	(0.12)	(-0.43)	(0.80)	(1.17)	(-0.55)	(0.46)	(0.31)	(1.38)	(-0.93)	(1.09)	(-0.47)
Japan	-7.5597	0.0020	0.0028	0.0006	-0.3490	0.0040	-0.0200	0.0015	-0.4390	0.0053	-0.0024	0.0008
	(-0.83)	(0.52)	(0.65)	(0.19)	(-0.81)	(0.78)	(-0.28)	(0.47)	(-0.70)	(0.73)	(-0.03)	(0.21)
Netherlands	-17.1150	0.0080	-0.0064	0.0057	-0.3446	0.0082	-0.0811	0.0080	-0.1103	0.0067	-0.0402	0.0077
	(-0.75)	(2.64)	(-1.41)	(1.80)	(-0.61)	(2.20)	(-1.77)	(2.56)	(-0.13)	(1.22)	(-0.65)	(1.78)
New Zealand	-41.6309	0.0064	-0.0053	0.0038	-1.2730	0.0106	0.0181	0.0033	-0.8210	0.0105	-0.0014	0.0040
	(-1.45)	(3.16)	(-1.65)	(1.72)	(-1.70)	(3.24)	(0.44)	(1.26)	(-0.96)	(1.74)	(-0.03)	(1.10)
Norway	-18.6104	0.0092	-0.0048	0.0062	-0.8530	0.0142	0.0035	0.0059	-1.2874	0.0215	0.0421	0.0042
	(-1.37)	(2.59)	(-1.11)	(1.78)	(-2.10)	(3.22)	(0.07)	(1.35)	(-2.04)	(2.87)	(0.61)	(0.80)
Portugal	-20.5634	0.0062	0.0055	0.0041	-0.5198	0.0076	0.0423	0.0024	-0.5081	0.0078	-0.0496	0.0064
	(-1.31)	(1.62)	(1.14)	(1.17)	(-1.43)	(1.74)	(1.02)	(0.66)	(-0.73)	(1.13)	(-0.93)	(1.58)
Singapore	14.5400	0.0035	-0.0003	0.0050	0.2771	0.0025	0.1278	-0.0009	0.4318	-0.0013	0.1470	-0.0031
	(0.44)	(0.90)	(-0.05)	(1.46)	(0.52)	(0.57)	(1.45)	(-0.23)	(0.81)	(-0.18)	(1.67)	(-0.60)
Spain	11.9161	0.0038	-0.0046	0.0055	0.7871	0.0007	-0.0258	0.0064	1.3340	-0.0026	0.0292	0.0042
	(0.56)	(0.95)	(-0.88)	(1.76)	(1.07)	(0.13)	(-0.59)	(2.03)	(1.05)	(-0.34)	(0.49)	(1.04)
Sweden	5.2837	0.0067	-0.0001	0.0077	0.3158	0.0047	-0.0060	0.0080	0.2089	0.0045	0.1954	-0.0033
	(0.31)	(1.58)	(-0.02)	(2.02)	(0.72)	(1.05)	(-0.10)	(1.79)	(0.44)	(0.64)	(2.69)	(-0.58)
Switzerland	-13.2485	0.0080	-0.0050	0.0064	-0.2604	0.0080	-0.0115	0.0070	-0.6080	0.0097	0.0366	0.0055
	(-0.61)	(2.89)	(-1.06)	(2.41)	(-0.45)	(2.31)	(-0.29)	(2.78)	(-0.61)	(1.99)	(0.79)	(2.01)
UK	2.3908	0.0041	-0.0046	0.0043	0.0009	0.0043	-0.0511	0.0059	0.0953	0.0034	-0.0246	0.0049
	(0.13)	(1.90)	(-1.30)	(1.99)	(0.00)	(1.49)	(-0.94)	(2.36)	(0.15)	(0.62)	(-0.85)	(1.92)
US	-25.7323	0.0099	-0.0024	0.0068	-0.5646	0.0123	-0.0805	0.0090	-0.0476	0.0082	-0.0839	0.0107
	(-1.79)	(5.03)	(-0.65)	(2.93)	(-2.13)	(5.23)	(-1.60)	(3.35)	(-0.23)	(1.70)	(-1.16)	(2.76)

Table 3.3 Univariate regressions with returns in US dollars

This table reports results from the one-month ahead univariate predictive regressions of market excess returns on market variance (V_m), market skewness (Sk_m), value-weighted average variance (V_{vw}), equal-weighted average variance (V_{ew}), value-weighted average skewness (Sk_{vw}) and equal-weighted average skewness (Sk_{ew}) for various countries. t-statistics are adjusted for autocorrelation and heteroskedasticity using the Newey-West (1987) procedure. The dependent and independent variables are defined in Table 1. The returns used to calculate the variables are in US dollars. The sample period is from January 1990 to September 2019.

	V_m	Constant	Sk_m	Constant	V_{vw}	Constant	Sk_{vw}	Constant	V_{ew}	Constant	Sk_{ew}	Constant
Australia	-9.9438	0.0086	0.0096	0.0074	-0.5348	0.0119	0.0128	0.0067	-0.3212	0.0151	0.0498	0.0050
	(-0.68)	(3.17)	(1.88)	(2.23)	(-0.85)	(2.60)	(0.20)	(2.25)	(-0.50)	(1.04)	(0.63)	(1.22)
Austria	-22.0776	0.0070	0.0042	0.0036	-0.9137	0.0104	-0.0231	0.0042	-1.8012	0.0151	0.0028	0.0035
	(-1.20)	(2.14)	(0.71)	(0.93)	(-1.04)	(1.86)	(-0.48)	(1.08)	(-1.29)	(1.87)	(0.04)	(0.75)
Belgium	-31.5433	0.0096	-0.0072	0.0056	-0.4530	0.0080	-0.0591	0.0070	-1.0042	0.0109	0.0706	0.0035
	(-1.01)	(2.68)	(-1.44)	(1.70)	(-0.47)	(1.80)	(-1.32)	(1.87)	(-0.64)	(1.51)	(0.76)	(0.75)
Canada	-15.9542	0.0082	-0.0001	0.0062	-0.1777	0.0173	0.1068	-0.0029	-0.1080	0.0152	0.1520	-0.0053
	(-1.14)	(3.24)	(-0.02)	(1.99)	(-1.16)	(2.04)	(0.94)	(-0.26)	(-0.74)	(1.39)	(1.26)	(-0.49)
Denmark	-18.0934	0.0099	-0.0010	0.0072	-0.7138	0.0124	-0.0190	0.0078	-0.5354	0.0108	0.0526	0.0053
	(-1.32)	(3.45)	(-0.22)	(2.22)	(-0.71)	(2.00)	(-0.42)	(2.15)	(-0.34)	(1.17)	(0.84)	(1.15)
Finland	-13.9004	0.0124	-0.0011	0.0083	-0.0361	0.0086	-0.0374	0.0094	-0.8596	0.0157	-0.0331	0.0095
	(-1.10)	(2.33)	(-0.23)	(1.71)	(-0.05)	(1.39)	(-0.70)	(1.92)	(-0.86)	(2.05)	(-0.36)	(1.54)
France	-4.0615	0.0069	-0.0090	0.0062	0.0059	0.0062	-0.0714	0.0087	-0.2636	0.0087	0.0525	0.0039
	(-0.26)	(2.32)	(-1.62)	(2.08)	(0.01)	(1.51)	(-1.25)	(2.41)	(-0.34)	(1.32)	(0.50)	(0.62)
Germany	-6.0958	0.0057	-0.0066	0.0044	-0.2794	0.0070	-0.0558	0.0063	-0.5740	0.0121	0.0451	0.0029
	(-0.40)	(1.80)	(-1.27)	(1.43)	(-0.79)	(2.15)	(-1.28)	(1.85)	(-1.32)	(2.64)	(0.49)	(0.54)
Greece	-29.2535	0.0141	0.0024	0.0030	-0.5649	0.0130	0.1198	-0.0023	-0.3498	0.0099	0.1250	-0.0021
	(-2.95)	(2.31)	(0.27)	(0.49)	(-1.27)	(1.77)	(1.34)	(-0.32)	(-0.86)	(1.20)	(1.38)	(-0.27)
Hong Kong	-7.2336	0.0107	-0.0013	0.0093	-0.6586	0.0167	0.0441	0.0071	-0.9275	0.0238	0.0214	0.0079
	(-0.63)	(2.60)	(-0.20)	(2.52)	(-1.38)	(3.06)	(0.69)	(1.53)	(-1.66)	(2.99)	(0.24)	(1.13)
Ireland	-39.1857	0.0117	0.0080	0.0051	-0.5345	0.0111	0.0201	0.0043	-0.5491	0.0112	0.0408	0.0038
	(-1.41)	(2.79)	(1.36)	(1.34)	(-0.87)	(1.98)	(0.41)	(1.12)	(-0.59)	(1.29)	(0.72)	(0.82)

	V_m	Constant	Sk_m	Constant	V_{vw}	Constant	Sk_{vw}	Constant	V_{ew}	Constant	Sk_{ew}	Constant
Italy	4.0650	0.0026	-0.0052	0.0034	0.6240	-0.0014	0.0054	0.0032	0.7735	-0.0027	0.0484	0.0008
	(0.25)	(0.60)	(-0.77)	(0.92)	(0.78)	(-0.23)	(0.09)	(0.72)	(0.75)	(-0.34)	(0.49)	(0.11)
Japan	17.3664	-0.0028	0.0103	-0.0003	0.1597	-0.0012	0.0403	-0.0014	0.3827	-0.0037	0.0072	-0.0000
	(1.23)	(-0.70)	(2.09)	(-0.10)	(0.32)	(-0.25)	(0.55)	(-0.39)	(0.60)	(-0.54)	(0.07)	(-0.01)
Netherlands	-10.7066	0.0077	-0.0107	0.0059	-0.4372	0.0092	-0.0902	0.0084	-0.2118	0.0077	-0.0687	0.0090
	(-0.59)	(2.99)	(-2.26)	(1.87)	(-0.70)	(2.65)	(-2.18)	(2.53)	(-0.22)	(1.34)	(-0.95)	(1.72)
New Zealand	-30.7936	0.0108	0.0008	0.0070	-1.3415	0.0155	0.0353	0.0061	-0.6876	0.0132	0.0423	0.0059
	(-1.43)	(3.37)	(0.17)	(2.14)	(-2.05)	(3.78)	(0.73)	(1.70)	(-0.65)	(1.53)	(0.57)	(1.41)
Norway	-12.3468	0.0102	-0.0034	0.0071	-1.0142	0.0179	-0.0822	0.0100	-1.4291	0.0255	-0.0735	0.0103
	(-0.82)	(2.65)	(-0.70)	(1.78)	(-1.66)	(3.06)	(-1.50)	(2.08)	(-1.60)	(2.49)	(-0.82)	(1.58)
Portugal	-13.7953	0.0048	-0.0005	0.0028	-0.8187	0.0087	-0.0325	0.0039	-0.7914	0.0090	-0.0209	0.0036
	(-0.99)	(1.23)	(-0.08)	(0.75)	(-1.64)	(1.93)	(-0.67)	(1.01)	(-0.96)	(1.29)	(-0.35)	(0.83)
Singapore	14.9401	0.0032	-0.0023	0.0051	0.2504	0.0028	0.1115	-0.0001	0.4614	-0.0015	0.1585	-0.0037
	(0.51)	(0.71)	(-0.30)	(1.37)	(0.43)	(0.55)	(1.25)	(-0.02)	(0.73)	(-0.18)	(1.75)	(-0.68)
Spain	5.7257	0.0049	-0.0086	0.0057	0.9629	-0.0004	-0.0793	0.0080	0.8152	0.0006	-0.0519	0.0081
	(0.40)	(1.37)	(-1.44)	(1.67)	(1.06)	(-0.07)	(-1.45)	(2.12)	(0.59)	(0.06)	(-0.58)	(1.52)
Sweden	1.9261	0.0071	-0.0034	0.0078	-0.0221	0.0078	-0.0946	0.0110	-0.2071	0.0109	0.0241	0.0063
	(0.13)	(1.71)	(-0.51)	(1.96)	(-0.05)	(1.78)	(-1.68)	(2.57)	(-0.46)	(1.73)	(0.27)	(0.96)
Switzerland	-19.2931	0.0093	-0.0064	0.0073	-0.2562	0.0085	-0.0334	0.0081	-0.5733	0.0103	0.0014	0.0072
	(-1.01)	(3.54)	(-1.30)	(2.92)	(-0.35)	(2.37)	(-0.80)	(2.94)	(-0.52)	(1.86)	(0.02)	(1.94)
UK	-13.1315	0.0066	-0.0018	0.0047	-0.6837	0.0101	-0.0814	0.0071	-0.9667	0.0141	0.0197	0.0042
	(-0.77)	(2.76)	(-0.37)	(1.74)	(-1.01)	(2.36)	(-1.48)	(2.36)	(-0.92)	(1.60)	(0.35)	(1.15)

Table 3. 4 Multivariate regressions

This table reports results from the one-month ahead multivariate predictive regressions of market excess returns on two distinct combinations of lagged market excess return (r_m), market variance (V_m), market skewness (Sk_m), value-weighted average variance (V_{vw}), equal-weighted average variance (V_{ew}), value-weighted average skewness (Sk_{vw}) and equal-weighted average skewness (Sk_{ew}) for various countries. t-statistics are adjusted for autocorrelation and heteroskedasticity using the Newey-West (1987) procedure. The dependent and independent variables are defined in Table 1. The returns used to calculate the variables are in local currencies. The sample period is from January 1990 to September 2019.

	r_m	V_m	Sk_m	V_{vw}	Sk_{vw}	Constant	r_m	V_m	Sk_m	V_{ew}	Sk_{ew}	Constant
Australia	0.0198	48.6946	0.0053	-1.6433	-0.0800	0.0155	-0.0134	-18.1460	0.0030	-0.3308	0.0121	0.0137
	(0.31)	(0.74)	(1.24)	(-1.07)	(-1.40)	(2.35)	(-0.17)	(-0.69)	(0.78)	(-0.69)	(0.16)	(1.34)
Austria	0.1805	-46.1513	0.0030	0.9701	-0.0775	0.0040	0.1868	-15.0122	-0.0007	-0.6262	-0.0393	0.0095
	(2.13)	(-1.96)	(0.53)	(1.06)	(-1.51)	(0.78)	(2.20)	(-0.68)	(-0.13)	(-0.68)	(-0.78)	(1.80)
Belgium	0.1615	-58.0655	-0.0023	1.3590	0.0180	0.0024	0.1536	-58.2677	-0.0010	2.9575	0.0146	-0.0044
	(2.51)	(-0.77)	(-0.63)	(0.84)	(0.50)	(0.61)	(2.27)	(-0.81)	(-0.31)	(0.99)	(0.33)	(-0.47)
Canada	0.1016	-17.6430	-0.0017	-0.0097	0.0098	0.0058	0.0817	-17.8798	-0.0015	-0.0087	0.0754	0.0013
	(1.47)	(-0.91)	(-0.38)	(-0.09)	(0.14)	(0.78)	(1.25)	(-1.03)	(-0.34)	(-0.09)	(1.54)	(0.16)
Denmark	0.0752	-19.3620	-0.0010	-0.3319	-0.0051	0.0105	0.0495	-49.2710	-0.0019	1.4073	0.0326	0.0015
	(1.24)	(-0.93)	(-0.21)	(-0.32)	(-0.11)	(1.82)	(0.77)	(-2.01)	(-0.42)	(0.89)	(0.79)	(0.19)
Finland	0.2389	-29.3931	-0.0076	1.8745	-0.0898	-0.0004	0.2664	0.6714	-0.0087	-0.0868	-0.0893	0.0103
	(4.27)	(-1.98)	(-1.21)	(2.25)	(-1.33)	(-0.07)	(4.12)	(0.04)	(-1.61)	(-0.07)	(-0.91)	(1.18)
France	0.1446	-2.6868	-0.0012	0.4674	-0.1029	0.0053	0.1618	2.5238	-0.0045	0.3131	-0.1143	0.0070
	(2.82)	(-0.07)	(-0.25)	(0.61)	(-1.53)	(1.41)	(3.31)	(0.08)	(-1.15)	(0.37)	(-1.56)	(1.04)
Germany	0.0740	11.8257	0.0005	-0.4327	-0.0341	0.0070	0.0652	11.4651	-0.0016	-0.6915	0.0207	0.0105
	(1.36)	(0.27)	(0.10)	(-0.51)	(-0.54)	(1.88)	(1.12)	(0.39)	(-0.37)	(-1.29)	(0.22)	(2.09)
Greece	0.0979	-28.3682	-0.0057	0.4428	0.0652	0.0002	0.1064	-18.5217	-0.0025	-0.0064	-0.0026	0.0072
	(1.87)	(-1.37)	(-0.67)	(0.55)	(0.72)	(0.02)	(1.89)	(-1.45)	(-0.31)	(-0.02)	(-0.03)	(0.75)
Hong Kong	0.0606	24.1604	-0.0049	-0.9410	0.1119	0.0093	0.0805	22.6542	0.0011	-1.1645	0.0075	0.0224
	(0.80)	(1.02)	(-0.71)	(-1.09)	(1.40)	(1.26)	(1.07)	(1.12)	(0.17)	(-1.56)	(0.08)	(2.30)
Ireland	0.0751	-54.5881	0.0098	0.3619	0.0335	0.0068	0.0796	-50.5040	0.0115	0.4312	0.0166	0.0064
	(1.28)	(-1.78)	(2.03)	(1.40)	(0.79)	(1.58)	(1.18)	(-1.42)	(2.49)	(0.68)	(0.37)	(1.16)

	r_m	V_m	Sk_m	V_{vw}	Sk_{vw}	Constant	r_m	V_m	Sk_m	V_{ew}	Sk_{ew}	Constant
Italy	0.0312	1.2819	-0.0063	0.8274	0.0563	-0.0062	0.0047	-3.0913	-0.0059	1.4804	0.1267	-0.0150
	(0.50)	(0.04)	(-0.83)	(0.75)	(0.66)	(-1.02)	(0.07)	(-0.10)	(-0.91)	(1.20)	(1.20)	(-1.61)
Japan	0.1050	11.7688	0.0044	-0.4760	-0.0749	0.0060	0.1182	7.3930	0.0032	-0.4087	-0.0802	0.0065
	(1.29)	(0.62)	(0.81)	(-0.67)	(-0.90)	(1.06)	(1.42)	(0.47)	(0.66)	(-0.45)	(-0.81)	(0.72)
Netherlands	0.1468	0.4049	-0.0032	0.1160	-0.0795	0.0062	0.1549	-20.7859	-0.0047	1.1576	-0.0906	0.0031
	(2.00)	(0.01)	(-0.71)	(0.13)	(-1.78)	(1.44)	(2.17)	(-0.57)	(-1.04)	(1.03)	(-1.52)	(0.50)
New Zealand	-0.0146	-23.9392	-0.0064	-0.8861	0.0542	0.0081	-0.0032	-36.5799	-0.0049	-0.2542	0.0044	0.0079
	(-0.21)	(-1.10)	(-1.82)	(-1.54)	(1.08)	(2.50)	(-0.04)	(-1.59)	(-1.40)	(-0.32)	(0.07)	(1.33)
Norway	0.0823	27.2411	-0.0078	-1.4759	0.0270	0.0143	0.1132	8.2506	-0.0066	-1.3263	-0.0367	0.0217
	(1.19)	(1.26)	(-1.49)	(-2.41)	(0.44)	(2.86)	(1.51)	(0.48)	(-1.43)	(-1.89)	(-0.47)	(2.61)
Portugal	0.1947	28.4162	0.0019	-0.7177	0.0077	0.0049	0.2251	11.2553	0.0043	-0.4378	-0.1180	0.0105
	(3.32)	(0.68)	(0.37)	(-0.73)	(0.17)	(1.07)	(3.63)	(0.41)	(0.97)	(-0.39)	(-2.31)	(1.35)
Singapore	0.1158	62.7456	-0.0083	-0.7152	0.1443	-0.0021	0.0794	20.1491	-0.0045	0.1301	0.1076	-0.0051
	(1.18)	(1.05)	(-1.31)	(-0.80)	(1.49)	(-0.47)	(0.76)	(0.48)	(-0.64)	(0.18)	(1.12)	(-0.70)
Spain	0.1072	2.8797	-0.0046	1.0422	-0.0270	-0.0009	0.0941	8.6235	-0.0061	1.3389	0.0288	-0.0057
	(1.87)	(0.09)	(-0.72)	(0.96)	(-0.51)	(-0.17)	(1.54)	(0.36)	(-1.10)	(1.10)	(0.46)	(-0.73)
Sweden	0.1332	-9.2744	0.0017	0.7237	-0.0738	0.0045	0.0673	17.5661	-0.0028	-0.1198	0.1584	-0.0028
	(2.26)	(-0.25)	(0.29)	(0.79)	(-1.06)	(1.02)	(1.18)	(0.58)	(-0.48)	(-0.15)	(1.88)	(-0.31)
Switzerland	0.1672	-2.7745	-0.0066	0.3440	0.0062	0.0036	0.1852	15.9279	-0.0056	-0.5627	-0.0262	0.0072
	(3.02)	(-0.06)	(-1.16)	(0.34)	(0.13)	(1.04)	(2.68)	(0.40)	(-1.19)	(-0.38)	(-0.43)	(1.42)
UK	0.0734	15.9189	-0.0044	-0.1636	-0.0371	0.0048	0.1116	5.1223	-0.0049	0.0831	-0.0516	0.0038
	(1.39)	(0.69)	(-1.06)	(-0.35)	(-0.59)	(1.53)	(1.73)	(0.27)	(-1.28)	(0.13)	(-1.43)	(0.67)
US	0.0208	-15.7432	0.0012	-0.1977	-0.0782	0.0126	-0.0016	-45.6046	-0.0000	0.3496	-0.1184	0.0081
	(0.34)	(-0.55)	(0.28)	(-0.36)	(-1.14)	(3.73)	(-0.03)	(-2.16)	(-0.01)	(1.28)	(-1.30)	(1.44)

Table 3.5 Controlling for business cycle and market liquidity

This table reports results from the one-month ahead multivariate predictive regressions of market excess returns on value-weighted average skewness (Sk_{vw}), equal-weighted average skewness (Sk_{ew}), dividend yield, relative interest rate and expected market illiquidity for various countries. The two specifications estimated for each country include either Sk_{vw} or Sk_{ew} which are defined in Table 1. DY is the dividend yield associated with the value-weighted market portfolio. RREL is calculated as the current risk-free rate minus its 12-month backward moving average. $ILLIQ^E$ is calculated from a regression of log market illiquidity on its one-month lagged value where market illiquidity is equal to the average of the Amihud's (2002) illiquidity measures across all stocks within each month. t-statistics are adjusted for autocorrelation and heteroskedasticity using the Newey-West (1987) procedure. The returns used to calculate the variables are in local currencies. The sample period is from January 1990 to September 2019.

	r_m	Sk_{vw}	DY	RREL	$ILLIQ^E$	Constant	r_m	Sk_{ew}	DY	RREL	$ILLIQ^E$	Constant
Australia	0.0481	-0.0584	0.0018	0.7640	0.0014	0.0051	0.0327	0.0061	0.0021	0.7797	0.0019	0.0045
	(0.66)	(-0.93)	(0.45)	(0.26)	(0.34)	(0.18)	(0.37)	(0.08)	(0.52)	(0.27)	(0.45)	(0.15)
Austria	0.2122	-0.0781	-0.0036	-14.4169	0.0111	0.0870	0.2048	-0.0321	-0.0038	-14.5199	0.0113	0.0874
	(2.14)	(-1.67)	(-0.91)	(-2.71)	(2.74)	(2.81)	(2.11)	(-0.66)	(-0.95)	(-2.73)	(2.80)	(2.79)
Belgium	0.1918	-0.0051	-0.0010	-9.4074	0.0032	0.0287	0.1906	0.0010	-0.0010	-9.4408	0.0032	0.0284
	(2.76)	(-0.15)	(-0.34)	(-1.58)	(1.23)	(1.57)	(2.82)	(0.02)	(-0.35)	(-1.56)	(1.17)	(1.51)
Canada	0.1354	0.0013	0.0022	0.1256	0.0016	0.0037	0.1099	0.0879	0.0027	0.6673	0.0019	-0.0026
	(1.60)	(0.02)	(0.47)	(0.04)	(0.45)	(0.21)	(1.43)	(1.67)	(0.57)	(0.24)	(0.57)	(-0.15)
Denmark	0.1106	-0.0298	0.0018	-3.4088	0.0002	0.0048	0.0900	0.0247	0.0020	-3.0390	0.0003	0.0039
	(1.58)	(-0.58)	(0.26)	(-1.08)	(0.05)	(0.15)	(1.29)	(0.56)	(0.28)	(-0.94)	(0.08)	(0.12)
Finland	0.2328	-0.1201	-0.0013	-10.3542	0.0000	0.0125	0.2450	-0.1248	-0.0009	-10.4855	-0.0021	-0.0006
	(4.22)	(-2.08)	(-0.42)	(-2.03)	(0.00)	(0.28)	(3.84)	(-1.30)	(-0.28)	(-2.15)	(-0.33)	(-0.01)
France	0.1433	-0.1048	0.0037	-1.6801	0.0020	0.0084	0.1635	-0.1363	0.0020	-1.6550	0.0040	0.0278
	(2.88)	(-1.80)	(0.69)	(-0.49)	(0.45)	(0.25)	(3.28)	(-1.88)	(0.36)	(-0.47)	(0.89)	(0.77)
Germany	0.0827	-0.0333	0.0042	-4.6481	-0.0005	-0.0086	0.0792	-0.0087	0.0043	-4.6255	-0.0006	-0.0098
	(1.54)	(-0.62)	(0.60)	(-0.91)	(-0.26)	(-0.33)	(1.31)	(-0.10)	(0.59)	(-0.90)	(-0.26)	(-0.33)
Greece	0.1142	0.0272	0.0046	7.4876	-0.0022	-0.0219	0.1193	-0.0115	0.0047	7.5159	-0.0025	-0.0217
	(2.28)	(0.33)	(1.04)	(1.03)	(-0.83)	(-1.23)	(2.24)	(-0.16)	(1.05)	(1.04)	(-0.95)	(-1.23)
Hong Kong	0.0890	0.0675	0.0217	4.2022	0.0008	-0.0541	0.0759	0.1046	0.0236	4.7893	0.0016	-0.0556
	(1.26)	(0.77)	(2.62)	(0.74)	(0.19)	(-1.23)	(1.02)	(0.94)	(2.69)	(0.84)	(0.39)	(-1.28)
Ireland	0.0981	0.0554	-0.0127	-26.3586	-0.0021	0.0103	0.0950	0.0554	-0.0119	-25.8878	-0.0018	0.0101
	(1.62)	(1.03)	(-1.78)	(-1.83)	(-0.43)	(0.34)	(1.27)	(0.69)	(-1.69)	(-1.81)	(-0.39)	(0.34)

	r_m	Sk_{vw}	DY	RREL	$ILLIQ^E$	Constant	r_m	Sk_{ew}	DY	RREL	$ILLIQ^E$	Constant
Italy	0.0150	0.0366	-0.0013	-3.3097	0.0049	0.0429	-0.0070	0.1276	-0.0011	-3.4920	0.0054	0.0402
	(0.29)	(0.50)	(-0.31)	(-0.76)	(1.37)	(1.23)	(-0.12)	(1.22)	(-0.26)	(-0.80)	(1.48)	(1.15)
Japan	0.0981	-0.0231	0.0089	-5.2047	0.0009	0.0000	0.1089	-0.0440	0.0088	-4.5855	0.0008	0.0008
	(1.35)	(-0.34)	(1.79)	(-0.59)	(0.24)	(0.00)	(1.49)	(-0.50)	(1.82)	(-0.52)	(0.24)	(0.02)
Netherlands	0.1165	-0.0950	-0.0031	-13.3384	-0.0025	-0.0023	0.1388	-0.1153	-0.0037	-13.0477	-0.0029	-0.0007
	(1.67)	(-2.02)	(-0.67)	(-2.23)	(-0.40)	(-0.05)	(1.97)	(-1.76)	(-0.80)	(-2.23)	(-0.45)	(-0.01)
New Zealand	-0.0461	0.0141	-0.0033	-7.4822	-0.0080	-0.0281	-0.0307	-0.0145	-0.0033	-7.5950	-0.0078	-0.0260
	(-0.66)	(0.29)	(-1.13)	(-2.55)	(-1.07)	(-0.61)	(-0.43)	(-0.25)	(-1.14)	(-2.61)	(-1.03)	(-0.56)
Norway	0.0760	-0.0239	0.0052	-8.1408	-0.0106	-0.0943	0.1365	-0.1509	0.0066	-9.6931	-0.0143	-0.1226
	(0.97)	(-0.41)	(1.68)	(-2.37)	(-2.01)	(-1.91)	(1.63)	(-1.79)	(2.23)	(-2.92)	(-2.64)	(-2.50)
Portugal	0.1780	0.0130	-0.0039	-10.0727	0.0085	0.0518	0.2135	-0.1038	-0.0036	-9.7213	0.0061	0.0453
	(3.10)	(0.31)	(-1.23)	(-2.08)	(1.39)	(1.45)	(3.86)	(-1.97)	(-1.14)	(-2.07)	(0.99)	(1.26)
Singapore	0.1020	0.0732	0.0184	-4.1292	-0.0053	-0.0746	0.0760	0.0913	0.0186	-4.3188	-0.0052	-0.0763
	(1.02)	(0.69)	(1.86)	(-0.66)	(-1.55)	(-1.74)	(0.75)	(0.88)	(1.84)	(-0.66)	(-1.47)	(-1.76)
Spain	0.0853	-0.0332	0.0008	-2.2494	0.0030	0.0260	0.0755	0.0168	0.0009	-2.0092	0.0035	0.0279
	(1.66)	(-0.78)	(0.29)	(-0.51)	(0.51)	(0.52)	(1.38)	(0.27)	(0.33)	(-0.46)	(0.59)	(0.54)
Sweden	0.0818	-0.0394	0.0053	-13.2326	-0.0049	-0.0472	0.0383	0.1050	0.0059	-12.6429	-0.0045	-0.0524
	(1.47)	(-0.60)	(0.83)	(-3.41)	(-1.20)	(-0.99)	(0.66)	(0.97)	(0.89)	(-3.25)	(-1.10)	(-1.10)
Switzerland	0.1594	-0.0232	0.0010	-4.5293	0.0014	0.0160	0.1778	-0.0457	0.0009	-4.7790	0.0012	0.0147
	(3.04)	(-0.58)	(0.34)	(-0.96)	(0.44)	(0.54)	(2.67)	(-0.73)	(0.28)	(-1.03)	(0.34)	(0.48)
UK	0.0667	-0.0611	0.0057	-0.7883	0.0006	-0.0076	0.1002	-0.0498	0.0047	-1.3749	-0.0000	-0.0122
	(1.30)	(-1.00)	(1.51)	(-0.24)	(0.18)	(-0.22)	(1.59)	(-1.36)	(1.17)	(-0.39)	(-0.00)	(-0.34)
US	0.0634	-0.0970	0.0073	7.1051	0.0027	0.0295	0.0632	-0.0798	0.0068	6.4532	0.0022	0.0249
	(1.03)	(-1.88)	(1.26)	(1.92)	(0.78)	(0.55)	(0.99)	(-1.01)	(1.12)	(1.68)	(0.60)	(0.43)

Table 3.6 Appendix Tables

Table I Correlation matrices

This table provides summary statistics for one-month-ahead market excess returns (fr_m), market excess returns (r_m), market variance (V_m), market skewness (Sk_m), value-weighted average variance (V_{vw}), equal-weighted average variance (V_{ew}), value-weighted average skewness (Sk_{vw}) and equal-weighted average skewness (Sk_{ew}) for various countries. All variables are measured at a monthly frequency. The variables are defined in Table 1. The returns used to calculate the variables are in local currencies. The sample period is from January 1990 to September 2019.

	Australia							Austria						
	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.03							0.21						
V_m	-0.09	-0.38						-0.17	-0.46					
Sk_m	0.05	0.15	0.01					0.01	0.17	0.05				
V_{vw}	-0.13	-0.28	0.90	0.02				-0.11	-0.36	0.86	-0.02			
V_{ew}	-0.10	-0.13	0.64	-0.04	0.78			-0.13	-0.28	0.75	-0.01	0.89		
Sk_{vw}	-0.05	0.25	0.09	0.42	0.11	0.08		-0.04	0.23	0.03	0.50	0.01	0.00	
Sk_{ew}	0.01	0.54	-0.14	0.07	-0.08	0.10	0.41	0.04	0.35	-0.17	0.24	-0.18	-0.16	0.53

	Belgium							Canada						
	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.20							0.13						
V_m	-0.15	-0.44						-0.11	-0.35					
Sk_m	-0.02	0.10	0.14					-0.01	0.11	0.00				
V_{vw}	-0.06	-0.32	0.81	0.10				-0.06	-0.07	0.61	0.12			
V_{ew}	-0.03	-0.27	0.75	0.04	0.85			-0.03	-0.03	0.47	0.13	0.90		
Sk_{vw}	0.02	0.13	0.13	0.43	0.11	0.13		0.05	0.46	-0.05	0.06	0.22	0.17	
Sk_{ew}	0.08	0.33	-0.03	0.12	-0.04	0.04	0.34	0.10	0.34	-0.11	0.00	0.23	0.23	0.77

Denmark	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.10						
V_m	-0.12	-0.35					
Sk_m	-0.01	0.16	0.05				
V_{vw}	-0.11	-0.27	0.79	0.10			
V_{ew}	-0.05	-0.19	0.79	0.11	0.80		
Sk_{vw}	0.01	0.29	0.02	0.36	0.06	0.10	
Sk_{ew}	0.08	0.38	-0.15	0.11	-0.17	-0.06	0.46

Finland	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.23						
V_m	-0.04	-0.15					
Sk_m	-0.04	0.16	0.00				
V_{vw}	0.06	-0.02	0.75	0.06			
V_{ew}	-0.01	0.01	0.66	0.07	0.89		
Sk_{vw}	-0.04	0.20	0.04	0.40	0.10	0.11	
Sk_{ew}	0.03	0.41	-0.03	0.24	-0.02	0.03	0.60

France	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.12						
V_m	-0.02	-0.36					
Sk_m	-0.05	0.07	0.09				
V_{vw}	0.01	-0.23	0.86	0.04			
V_{ew}	0.02	-0.14	0.67	0.00	0.87		
Sk_{vw}	-0.07	0.18	0.06	0.55	0.08	0.08	
Sk_{ew}	-0.03	0.41	-0.25	0.18	-0.23	-0.09	0.47

Germany	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.07						
V_m	-0.04	-0.33					
Sk_m	-0.02	0.06	0.12				
V_{vw}	-0.05	-0.24	0.89	0.13			
V_{ew}	-0.08	-0.13	0.60	0.10	0.80		
Sk_{vw}	-0.02	0.19	0.07	0.64	0.14	0.17	
Sk_{ew}	0.02	0.42	-0.13	0.27	-0.03	0.16	0.59

Greece	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.11						
V_m	-0.09	-0.11					
Sk_m	0.00	0.15	-0.01				
V_{vw}	-0.03	-0.01	0.73	-0.04			
V_{ew}	-0.03	0.03	0.42	-0.01	0.67		
Sk_{vw}	0.04	0.16	-0.05	0.55	-0.05	0.06	
Sk_{ew}	0.05	0.35	-0.18	0.33	-0.19	-0.07	0.54

Hong Kong	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.06						
V_m	-0.01	-0.32					
Sk_m	0.02	0.15	0.12				
V_{vw}	-0.03	-0.16	0.85	0.13			
V_{ew}	-0.07	-0.09	0.67	0.14	0.87		
Sk_{vw}	0.07	0.30	0.05	0.64	0.11	0.11	
Sk_{ew}	0.03	0.53	-0.20	0.27	-0.11	0.02	0.64

Ireland	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.18						
V_m	-0.18	-0.39					
Sk_m	0.16	0.21	-0.03				
V_{vw}	-0.08	-0.17	0.72	0.05			
V_{ew}	-0.09	-0.17	0.73	0.01	0.81		
Sk_{vw}	0.12	0.36	0.04	0.48	0.06	0.11	
Sk_{ew}	0.10	0.47	-0.08	0.18	-0.02	0.04	0.61

Italy	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.02						
V_m	0.04	-0.31					
Sk_m	-0.02	0.10	0.06				
V_{vw}	0.07	-0.12	0.78	0.07			
V_{ew}	0.08	-0.09	0.77	0.06	0.92		
Sk_{vw}	0.03	0.12	0.00	0.51	0.06	0.07	
Sk_{ew}	0.06	0.36	-0.13	0.34	-0.05	0.00	0.67

Japan	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.09						
V_m	-0.03	-0.28					
Sk_m	0.03	0.10	0.02				
V_{vw}	-0.04	-0.15	0.80	-0.01			
V_{ew}	-0.04	-0.17	0.76	-0.01	0.94		
Sk_{vw}	-0.02	0.17	0.10	0.54	0.13	0.16	
Sk_{ew}	0.00	0.42	0.01	0.30	0.05	0.10	0.74

Netherlands	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.13						
V_m	-0.07	-0.47					
Sk_m	-0.07	0.05	0.13				
V_{vw}	-0.04	-0.35	0.85	0.09			
V_{ew}	-0.01	-0.31	0.82	0.06	0.92		
Sk_{vw}	-0.10	0.08	0.09	0.44	0.07	0.07	
Sk_{ew}	-0.04	0.35	-0.11	0.27	-0.08	-0.05	0.57

New Zealand	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.01						
V_m	-0.10	-0.25					
Sk_m	-0.08	0.19	0.06				
V_{vw}	-0.10	-0.06	0.58	0.08			
V_{ew}	-0.06	-0.03	0.41	0.07	0.79		
Sk_{vw}	0.03	0.30	0.00	0.37	0.13	0.07	
Sk_{ew}	0.00	0.57	-0.15	0.21	0.01	0.07	0.48

Norway	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.10						
V_m	-0.08	-0.33					
Sk_m	-0.05	0.17	0.04				
V_{vw}	-0.12	-0.33	0.89	0.00			
V_{ew}	-0.12	-0.26	0.76	0.00	0.89		
Sk_{vw}	0.00	0.31	0.02	0.45	0.07	0.06	
Sk_{ew}	0.04	0.58	-0.23	0.11	-0.24	-0.15	0.52

	Portugal							Singapore						
	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.19							0.12						
V_m	-0.06	-0.35						0.04	-0.24					
Sk_m	0.07	0.20	-0.04					0.00	0.16	0.09				
V_{vw}	-0.06	-0.24	0.86	-0.05				0.04	-0.09	0.91	0.11			
V_{ew}	-0.04	-0.11	0.68	-0.13	0.76			0.07	0.01	0.76	0.07	0.86		
Sk_{vw}	0.06	0.22	-0.01	0.45	0.04	-0.07		0.11	0.37	0.09	0.54	0.18	0.18	
Sk_{ew}	-0.05	0.28	-0.09	0.25	-0.07	-0.05	0.45	0.13	0.65	-0.07	0.32	0.06	0.12	0.70

	Spain							Sweden						
	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.08							0.11						
V_m	0.04	-0.32						0.02	-0.23					
Sk_m	-0.05	0.07	0.07					0.00	0.08	0.14				
V_{vw}	0.06	-0.20	0.82	0.07				0.04	-0.12	0.90	0.14			
V_{ew}	0.07	-0.15	0.70	0.02	0.78			0.03	-0.07	0.76	0.07	0.88		
Sk_{vw}	-0.03	0.15	0.06	0.44	0.08	0.01		-0.01	0.28	0.13	0.57	0.18	0.13	
Sk_{ew}	0.03	0.33	-0.12	0.23	-0.11	-0.17	0.55	0.14	0.54	-0.11	0.12	-0.08	0.02	0.52

	Switzerland							UK						
	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.15							0.04						
V_m	-0.05	-0.41						0.01	-0.32					
Sk_m	-0.06	0.07	0.04					-0.06	0.17	0.08				
V_{vw}	-0.03	-0.33	0.87	0.07				0.00	-0.21	0.82	0.07			
V_{ew}	-0.04	-0.26	0.82	0.04	0.92			0.01	-0.11	0.66	0.08	0.84		
Sk_{vw}	-0.02	0.11	0.03	0.56	0.06	0.05		-0.05	0.22	0.11	0.54	0.18	0.14	
Sk_{ew}	0.04	0.49	-0.17	0.25	-0.14	-0.07	0.41	-0.04	0.59	-0.29	0.20	-0.21	-0.06	0.40

	US							US (International Screening)						
	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}	fr_m	r_m	V_m	Sk_m	V_{vw}	V_{ew}	Sk_{vw}
r_m	0.05							0.05						
V_m	-0.12	-0.36						-0.12	-0.36					
Sk_m	-0.03	0.12	0.05					-0.03	0.12	0.05				
V_{vw}	-0.12	-0.24	0.79	0.09				-0.12	-0.24	0.79	0.09			
V_{ew}	-0.02	-0.05	0.68	0.07	0.86			-0.07	-0.13	0.73	0.08	0.93		
Sk_{vw}	-0.08	0.14	0.08	0.57	0.22	0.17		-0.08	0.14	0.08	0.57	0.22	0.19	
Sk_{ew}	-0.06	0.25	0.11	0.42	0.31	0.32	0.79	-0.06	0.22	0.13	0.43	0.33	0.35	0.80

Table II Demeaning daily returns with average market returns

This table reports results from the one-month ahead multivariate predictive regressions of market excess returns on two distinct combinations of lagged market excess return (r_m), market variance (V_m), market skewness (Sk_m), value-weighted average variance ($V_{vw,m}$), equal-weighted average variance ($V_{ew,m}$), value-weighted average skewness ($Sk_{vw,m}$) and equal-weighted average skewness ($Sk_{ew,m}$) for various countries. t-statistics are adjusted for autocorrelation and heteroskedasticity using the Newey-West (1987) procedure. The dependent and independent variables are defined in Table 1 with the exception that average daily market returns rather than average daily stock returns are used in the demeaning procedure. The returns used to calculate the variables are in local currencies. The sample period is from January 1990 to September 2019.

	r_m	V_m	Sk_m	$V_{vw,m}$	$Sk_{vw,m}$	Constant	r_m	V_m	Sk_m	$V_{ew,m}$	$Sk_{ew,m}$	Constant
Australia	-0.0055	35.6196	0.0043	-1.3636	-0.0440	0.0148	-0.0020	-17.2976	0.0030	-0.2998	0.0237	0.0132
	(-0.09)	(0.56)	(1.04)	(-0.97)	(-0.90)	(2.16)	(-0.03)	(-0.68)	(0.76)	(-0.70)	(0.48)	(1.29)
Austria	0.1580	-47.5629	0.0019	0.9073	-0.0696	0.0035	0.1376	-16.2524	-0.0009	-0.4903	-0.0463	0.0087
	(1.88)	(-1.98)	(0.36)	(1.01)	(-1.62)	(0.63)	(1.35)	(-0.73)	(-0.19)	(-0.51)	(-1.02)	(1.51)
Belgium	0.1602	-70.6588	-0.0013	1.6572	-0.0072	0.0018	0.1592	-56.1041	-0.0010	2.3435	-0.0054	-0.0028
	(2.51)	(-0.89)	(-0.38)	(1.05)	(-0.23)	(0.42)	(2.40)	(-0.74)	(-0.31)	(0.89)	(-0.14)	(-0.32)
Canada	0.1028	-18.9186	-0.0018	0.0071	0.0087	0.0049	0.1136	-16.7057	-0.0018	-0.0062	0.0436	0.0031
	(1.65)	(-1.06)	(-0.40)	(0.07)	(0.15)	(0.74)	(1.76)	(-1.08)	(-0.40)	(-0.07)	(0.78)	(0.39)
Denmark	0.0742	-16.4681	-0.0014	-0.4404	0.0160	0.0104	0.0938	-41.4136	-0.0014	0.9441	0.0416	0.0025
	(1.27)	(-0.70)	(-0.30)	(-0.42)	(0.36)	(1.72)	(1.34)	(-1.62)	(-0.31)	(0.65)	(1.02)	(0.31)
Finland	0.2045	-35.6797	-0.0086	2.0078	-0.1084	-0.0005	0.1658	-9.7305	-0.0096	0.8222	-0.1693	0.0079
	(3.73)	(-2.32)	(-1.61)	(2.44)	(-1.85)	(-0.09)	(2.85)	(-0.70)	(-1.83)	(0.81)	(-2.39)	(1.04)
France	0.1119	-5.0048	-0.0020	0.4533	-0.0906	0.0053	0.0965	1.1330	-0.0057	0.3623	-0.0557	0.0035
	(2.11)	(-0.12)	(-0.43)	(0.64)	(-1.57)	(1.41)	(1.43)	(0.04)	(-1.45)	(0.47)	(-0.97)	(0.55)
Germany	0.0611	1.3180	0.0036	-0.1653	-0.0918	0.0087	0.0741	10.3132	-0.0014	-0.5811	0.0093	0.0107
	(1.09)	(0.03)	(0.78)	(-0.21)	(-1.41)	(2.32)	(1.15)	(0.37)	(-0.34)	(-1.29)	(0.15)	(2.23)
Greece	0.1096	-25.2140	-0.0090	0.2371	0.1498	-0.0017	0.1092	-20.1069	-0.0030	0.1071	0.0237	0.0042
	(2.08)	(-1.18)	(-1.14)	(0.30)	(1.87)	(-0.19)	(2.22)	(-1.53)	(-0.39)	(0.26)	(0.33)	(0.48)
Hong Kong	0.0790	27.1301	-0.0055	-0.9765	0.1281	0.0093	0.0864	21.7576	0.0008	-0.9729	0.0292	0.0206
	(1.08)	(1.16)	(-0.78)	(-1.26)	(1.81)	(1.19)	(1.17)	(1.09)	(0.11)	(-1.48)	(0.49)	(2.37)
Ireland	0.0853	-49.3676	0.0104	0.2284	0.0276	0.0073	0.0882	-48.7568	0.0115	0.3498	0.0241	0.0062
	(1.44)	(-1.63)	(2.24)	(1.00)	(0.84)	(1.70)	(1.54)	(-1.35)	(2.51)	(0.58)	(0.58)	(1.12)

	r_m	V_m	Sk_m	$V_{vw,m}$	$Sk_{vw,m}$	Constant	r_m	V_m	Sk_m	$V_{ew,m}$	$Sk_{ew,m}$	Constant
Italy	0.0332	0.3283	-0.0033	0.8064	-0.0033	-0.0037	0.0376	-4.9482	-0.0038	1.4051	0.0336	-0.0097
	(0.50)	(0.01)	(-0.46)	(0.79)	(-0.05)	(-0.60)	(0.59)	(-0.16)	(-0.61)	(1.23)	(0.55)	(-1.21)
Japan	0.0874	12.2271	0.0049	-0.4158	-0.0908	0.0067	0.0809	6.8203	0.0036	-0.3211	-0.0919	0.0063
	(1.05)	(0.66)	(0.96)	(-0.64)	(-1.26)	(1.17)	(1.01)	(0.44)	(0.80)	(-0.39)	(-1.47)	(0.72)
Netherlands	0.1252	-1.6365	-0.0027	0.1678	-0.0916	0.0068	0.1171	-16.7666	-0.0060	0.7920	-0.0319	0.0019
	(1.63)	(-0.04)	(-0.58)	(0.20)	(-2.04)	(1.56)	(1.44)	(-0.44)	(-1.34)	(0.76)	(-0.78)	(0.31)
New Zealand	0.0022	-19.4251	-0.0066	-1.0784	0.0757	0.0083	0.0013	-35.0101	-0.0052	-0.2454	0.0389	0.0067
	(0.03)	(-0.82)	(-1.88)	(-2.01)	(1.78)	(2.44)	(0.02)	(-1.55)	(-1.49)	(-0.35)	(0.76)	(1.20)
Norway	0.0906	27.4931	-0.0071	-1.3897	0.0109	0.0151	0.0985	10.5181	-0.0065	-1.2836	0.0087	0.0209
	(1.38)	(1.30)	(-1.39)	(-2.33)	(0.19)	(3.15)	(1.47)	(0.61)	(-1.43)	(-1.93)	(0.17)	(2.68)
Portugal	0.1878	24.7216	0.0033	-0.5517	-0.0332	0.0061	0.0999	1.6540	0.0022	-0.0634	-0.1343	0.0081
	(3.25)	(0.60)	(0.70)	(-0.60)	(-0.81)	(1.28)	(1.42)	(0.06)	(0.49)	(-0.06)	(-3.29)	(1.11)
Singapore	0.1326	52.2477	-0.0071	-0.4798	0.1163	-0.0017	0.1073	22.8078	-0.0044	0.0889	0.0905	-0.0037
	(1.43)	(0.92)	(-1.10)	(-0.59)	(1.45)	(-0.41)	(1.10)	(0.55)	(-0.62)	(0.14)	(1.58)	(-0.54)
Spain	0.0855	0.8751	-0.0041	1.1106	-0.0525	-0.0010	0.1132	11.4107	-0.0058	0.9912	0.0173	-0.0041
	(1.35)	(0.03)	(-0.69)	(1.10)	(-1.14)	(-0.19)	(1.65)	(0.47)	(-1.08)	(0.91)	(0.33)	(-0.58)
Sweden	0.1216	-6.3014	0.0063	0.6890	-0.1737	0.0082	0.1320	22.5322	-0.0022	-0.2233	0.0602	0.0038
	(2.09)	(-0.18)	(1.15)	(0.82)	(-2.55)	(1.86)	(2.45)	(0.76)	(-0.38)	(-0.31)	(0.88)	(0.43)
Switzerland	0.1696	5.9266	-0.0067	0.0389	0.0099	0.0042	0.1627	21.2451	-0.0057	-0.9088	-0.0206	0.0088
	(3.15)	(0.13)	(-1.20)	(0.04)	(0.20)	(1.12)	(3.04)	(0.53)	(-1.22)	(-0.67)	(-0.53)	(1.70)
UK	0.0668	14.9484	-0.0039	-0.1206	-0.0509	0.0054	0.0698	5.7093	-0.0050	0.0144	-0.0355	0.0037
	(1.27)	(0.68)	(-0.99)	(-0.28)	(-0.90)	(1.65)	(1.30)	(0.29)	(-1.34)	(0.02)	(-1.27)	(0.64)
US	0.0010	-17.0000	0.0020	-0.1506	-0.0937	0.0137	-0.0228	-45.8074	0.0003	0.3123	-0.1179	0.0079
	(0.02)	(-0.63)	(0.47)	(-0.32)	(-1.58)	(4.01)	(-0.41)	(-2.29)	(0.06)	(1.31)	(-1.68)	(1.47)

Table III Controlling for square root of average variance

This table reports results from the one-month ahead multivariate predictive regressions of market excess returns on two distinct combinations of lagged market excess return (r_m), market variance (V_m), market skewness (Sk_m), square root of value-weighted average variance ($V_{vw}^{1/2}$), square root of equal-weighted average variance ($V_{ew}^{1/2}$), value-weighted average skewness (Sk_{vw}) and equal-weighted average skewness (Sk_{ew}) for various countries. t-statistics are adjusted for autocorrelation and heteroskedasticity using the Newey-West (1987) procedure. The dependent and independent variables are defined in Table 1. The returns used to calculate the variables are in local currencies. The sample period is from January 1990 to September 2019.

	r_m	V_m	Sk_m	$V_{vw}^{1/2}$	Sk_{vw}	Constant	r_m	V_m	Sk_m	$V_{ew}^{1/2}$	Sk_{ew}	Constant
Australia	0.0119	10.1368	0.0053	-0.2230	-0.0783	0.0248	-0.0148	-23.2099	0.0031	-0.0843	0.0100	0.0191
	(0.19)	(0.23)	(1.22)	(-0.82)	(-1.38)	(1.26)	(-0.18)	(-0.93)	(0.79)	(-0.60)	(0.13)	(0.95)
Austria	0.1820	-40.6024	0.0031	0.1786	-0.0774	-0.0040	0.1833	-21.6633	-0.0005	-0.0311	-0.0379	0.0088
	(2.13)	(-2.34)	(0.55)	(1.14)	(-1.52)	(-0.36)	(2.16)	(-1.17)	(-0.11)	(-0.18)	(-0.76)	(0.74)
Belgium	0.1594	-49.2036	-0.0022	0.1944	0.0171	-0.0044	0.1518	-52.0014	-0.0009	0.4071	0.0114	-0.0183
	(2.49)	(-0.79)	(-0.61)	(0.89)	(0.47)	(-0.41)	(2.24)	(-0.84)	(-0.29)	(1.08)	(0.26)	(-0.86)
Canada	0.1015	-18.0497	-0.0017	-0.0031	0.0091	0.0061	0.0817	-17.9485	-0.0015	-0.0052	0.0754	0.0021
	(1.47)	(-1.04)	(-0.38)	(-0.05)	(0.13)	(0.44)	(1.25)	(-1.08)	(-0.34)	(-0.09)	(1.54)	(0.13)
Denmark	0.0745	-18.2579	-0.0009	-0.0886	-0.0054	0.0151	0.0501	-42.9456	-0.0019	0.2176	0.0345	-0.0072
	(1.23)	(-1.13)	(-0.19)	(-0.53)	(-0.11)	(1.28)	(0.78)	(-2.38)	(-0.42)	(0.86)	(0.83)	(-0.40)
Finland	0.2434	-22.5452	-0.0075	0.3283	-0.0888	-0.0147	0.2645	-2.1648	-0.0088	0.0522	-0.0889	0.0058
	(4.45)	(-1.46)	(-1.20)	(1.91)	(-1.32)	(-1.22)	(4.13)	(-0.14)	(-1.63)	(0.21)	(-0.91)	(0.31)
France	0.1471	3.4466	-0.0013	0.0687	-0.1024	0.0023	0.1621	2.7552	-0.0045	0.0662	-0.1151	0.0037
	(2.92)	(0.10)	(-0.27)	(0.50)	(-1.53)	(0.28)	(3.31)	(0.09)	(-1.15)	(0.35)	(-1.58)	(0.24)
Germany	0.0712	2.5014	0.0005	-0.0520	-0.0360	0.0091	0.0643	6.7715	-0.0017	-0.1345	0.0170	0.0170
	(1.32)	(0.07)	(0.09)	(-0.37)	(-0.59)	(1.11)	(1.10)	(0.24)	(-0.39)	(-1.06)	(0.18)	(1.63)
Greece	0.0982	-26.5499	-0.0058	0.1092	0.0658	-0.0062	0.1049	-20.2744	-0.0025	0.0400	-0.0020	0.0022
	(1.88)	(-1.42)	(-0.68)	(0.52)	(0.73)	(-0.31)	(1.87)	(-1.58)	(-0.31)	(0.28)	(-0.02)	(0.12)
Hong Kong	0.0647	26.9587	-0.0049	-0.3023	0.1086	0.0291	0.0809	22.3175	0.0011	-0.3498	0.0051	0.0473
	(0.88)	(1.46)	(-0.73)	(-1.80)	(1.36)	(1.99)	(1.07)	(1.20)	(0.17)	(-1.83)	(0.06)	(2.31)
Ireland	0.0771	-53.4514	0.0102	0.1013	0.0289	0.0008	0.0816	-46.1721	0.0116	0.0786	0.0170	0.0026
	(1.31)	(-1.82)	(2.10)	(1.49)	(0.68)	(0.13)	(1.19)	(-1.38)	(2.50)	(0.56)	(0.38)	(0.23)

	r_m	V_m	Sk_m	$V_{vw}^{1/2}$	Sk_{vw}	Constant	r_m	V_m	Sk_m	$V_{ew}^{1/2}$	Sk_{ew}	Constant
Italy	0.0345	9.1862	-0.0064	0.0917	0.0587	-0.0090	0.0080	4.2669	-0.0060	0.2033	0.1340	-0.0228
	(0.56)	(0.28)	(-0.85)	(0.49)	(0.69)	(-0.77)	(0.12)	(0.14)	(-0.93)	(0.90)	(1.26)	(-1.27)
Japan	0.1021	5.0590	0.0046	-0.0501	-0.0773	0.0074	0.1177	2.7114	0.0033	-0.0348	-0.0836	0.0066
	(1.26)	(0.33)	(0.84)	(-0.37)	(-0.93)	(0.65)	(1.42)	(0.20)	(0.68)	(-0.19)	(-0.84)	(0.38)
Netherlands	0.1488	5.7953	-0.0032	-0.0159	-0.0794	0.0075	0.1590	-9.9448	-0.0049	0.1318	-0.0891	-0.0008
	(2.02)	(0.17)	(-0.72)	(-0.12)	(-1.78)	(0.93)	(2.20)	(-0.32)	(-1.10)	(0.75)	(-1.50)	(-0.07)
New Zealand	-0.0159	-25.3971	-0.0063	-0.1399	0.0531	0.0134	-0.0036	-34.8109	-0.0049	-0.0759	0.0054	0.0124
	(-0.22)	(-1.12)	(-1.81)	(-1.38)	(1.07)	(2.01)	(-0.04)	(-1.51)	(-1.39)	(-0.52)	(0.09)	(1.05)
Norway	0.0865	6.9512	-0.0071	-0.2043	0.0177	0.0228	0.1155	0.7452	-0.0064	-0.2261	-0.0414	0.0316
	(1.24)	(0.40)	(-1.41)	(-1.65)	(0.29)	(2.31)	(1.53)	(0.05)	(-1.42)	(-1.47)	(-0.53)	(1.97)
Portugal	0.1956	28.0627	0.0017	-0.1646	0.0069	0.0129	0.2269	12.5412	0.0041	-0.1046	-0.1187	0.0159
	(3.28)	(1.05)	(0.32)	(-1.21)	(0.15)	(1.45)	(3.60)	(0.54)	(0.91)	(-0.57)	(-2.33)	(1.07)
Singapore	0.1188	62.1989	-0.0082	-0.1857	0.1464	0.0077	0.0854	32.4295	-0.0048	-0.0355	0.1133	-0.0008
	(1.21)	(1.10)	(-1.32)	(-0.98)	(1.53)	(0.65)	(0.81)	(0.80)	(-0.68)	(-0.21)	(1.17)	(-0.05)
Spain	0.1108	19.4185	-0.0047	0.0488	-0.0253	-0.0006	0.0949	11.8453	-0.0061	0.1923	0.0288	-0.0126
	(1.92)	(0.62)	(-0.72)	(0.28)	(-0.48)	(-0.06)	(1.54)	(0.50)	(-1.09)	(0.99)	(0.46)	(-0.87)
Sweden	0.1404	18.1308	0.0014	-0.0167	-0.0666	0.0075	0.0689	23.2762	-0.0029	-0.0935	0.1610	0.0054
	(2.41)	(0.54)	(0.23)	(-0.08)	(-0.97)	(0.59)	(1.21)	(0.81)	(-0.51)	(-0.44)	(1.93)	(0.25)
Switzerland	0.1682	13.1616	-0.0065	-0.0445	0.0065	0.0067	0.1848	16.9670	-0.0057	-0.1159	-0.0260	0.0123
	(3.02)	(0.36)	(-1.14)	(-0.32)	(0.13)	(0.88)	(2.69)	(0.50)	(-1.20)	(-0.59)	(-0.42)	(1.08)
UK	0.0727	12.7119	-0.0043	-0.0146	-0.0385	0.0051	0.1117	5.2856	-0.0049	0.0164	-0.0516	0.0030
	(1.37)	(0.63)	(-1.05)	(-0.16)	(-0.62)	(0.82)	(1.73)	(0.29)	(-1.28)	(0.13)	(-1.42)	(0.27)
US	0.0198	-19.3577	0.0013	-0.0288	-0.0816	0.0138	0.0110	-36.7424	-0.0003	0.0995	-0.1069	0.0001
	(0.32)	(-0.89)	(0.29)	(-0.26)	(-1.19)	(1.69)	(0.18)	(-2.07)	(-0.06)	(1.02)	(-1.14)	(0.01)

Table IV Controlling for logarithm of average variance

This table reports results from the one-month ahead multivariate predictive regressions of market excess returns on two distinct combinations of lagged market excess return (r_m), market variance (V_m), market skewness (Sk_m), logarithm of value-weighted average variance (log V_{vw}), logarithm of equal-weighted average variance (log V_{ew}), value-weighted average skewness (Sk_{vw}) and equal-weighted average skewness (Sk_{ew}) for various countries. t-statistics are adjusted for autocorrelation and heteroskedasticity using the Newey-West (1987) procedure. The dependent and independent variables are defined in Table 1. The returns used to calculate the variables are in local currencies. The sample period is from January 1990 to September 2019.

	r_m	V_m	Sk_m	log V_{vw}	Sk_{vw}	Constant	r_m	V_m	Sk_m	log V_{ew}	Sk_{ew}	Constant
Australia	0.0083	-8.4079	0.0053	-0.0070	-0.0789	-0.0275	-0.0157	-26.6028	0.0031	-0.0052	0.0082	-0.0131
	(0.13)	(-0.25)	(1.21)	(-0.70)	(-1.40)	(-0.53)	(-0.20)	(-1.07)	(0.80)	(-0.53)	(0.11)	(-0.34)
Austria	0.1835	-34.6216	0.0031	0.0065	-0.0772	0.0431	0.1815	-25.1644	-0.0004	0.0009	-0.0371	0.0118
	(2.13)	(-2.26)	(0.55)	(1.12)	(-1.52)	(1.37)	(2.14)	(-1.48)	(-0.09)	(0.13)	(-0.74)	(0.31)
Belgium	0.1605	-39.1897	-0.0022	0.0052	0.0168	0.0365	0.1522	-44.4165	-0.0010	0.0119	0.0098	0.0731
	(2.51)	(-0.73)	(-0.61)	(0.81)	(0.46)	(0.93)	(2.25)	(-0.82)	(-0.30)	(1.12)	(0.22)	(1.19)
Canada	0.1014	-18.3181	-0.0017	-0.0002	0.0084	0.0049	0.0816	-18.0376	-0.0015	-0.0007	0.0753	-0.0011
	(1.47)	(-1.14)	(-0.39)	(-0.02)	(0.12)	(0.21)	(1.25)	(-1.12)	(-0.34)	(-0.08)	(1.53)	(-0.05)
Denmark	0.0738	-17.9755	-0.0008	-0.0047	-0.0060	-0.0164	0.0510	-37.8494	-0.0019	0.0073	0.0356	0.0467
	(1.23)	(-1.17)	(-0.16)	(-0.80)	(-0.13)	(-0.50)	(0.80)	(-2.58)	(-0.41)	(0.79)	(0.86)	(0.95)
Finland	0.2485	-13.6084	-0.0073	0.0104	-0.0864	0.0640	0.2637	-3.5124	-0.0089	0.0042	-0.0880	0.0312
	(4.55)	(-0.89)	(-1.18)	(1.35)	(-1.28)	(1.50)	(4.14)	(-0.24)	(-1.64)	(0.39)	(-0.90)	(0.56)
France	0.1495	9.2332	-0.0014	0.0015	-0.1014	0.0146	0.1623	2.9395	-0.0045	0.0034	-0.1160	0.0260
	(2.99)	(0.30)	(-0.30)	(0.26)	(-1.52)	(0.46)	(3.31)	(0.10)	(-1.14)	(0.36)	(-1.59)	(0.54)
Germany	0.0706	0.8199	0.0004	-0.0022	-0.0356	-0.0065	0.0647	2.6846	-0.0017	-0.0054	0.0105	-0.0214
	(1.31)	(0.03)	(0.07)	(-0.41)	(-0.60)	(-0.20)	(1.11)	(0.10)	(-0.38)	(-0.83)	(0.11)	(-0.63)
Greece	0.1002	-22.0897	-0.0060	0.0035	0.0660	0.0208	0.1039	-21.5160	-0.0025	0.0049	-0.0019	0.0281
	(1.91)	(-1.38)	(-0.70)	(0.30)	(0.73)	(0.37)	(1.86)	(-1.69)	(-0.31)	(0.47)	(-0.02)	(0.61)
Hong Kong	0.0657	25.1809	-0.0050	-0.0183	0.1046	-0.0864	0.0809	21.2047	0.0010	-0.0241	0.0018	-0.0974
	(0.90)	(1.49)	(-0.75)	(-2.36)	(1.31)	(-2.20)	(1.06)	(1.22)	(0.16)	(-2.14)	(0.02)	(-1.88)
Ireland	0.0820	-46.7340	0.0104	0.0035	0.0269	0.0267	0.0838	-41.4721	0.0116	0.0021	0.0181	0.0198
	(1.39)	(-1.61)	(2.16)	(1.03)	(0.63)	(1.44)	(1.21)	(-1.29)	(2.50)	(0.34)	(0.40)	(0.60)

	r_m	V_m	Sk_m	log V_{vw}	Sk_{vw}	Constant	r_m	V_m	Sk_m	log V_{ew}	Sk_{ew}	Constant
Italy	0.0370	13.9663	-0.0064	0.0021	0.0599	0.0084	0.0110	9.9754	-0.0061	0.0062	0.1380	0.0240
	(0.61)	(0.46)	(-0.85)	(0.30)	(0.70)	(0.21)	(0.16)	(0.34)	(-0.95)	(0.65)	(1.28)	(0.48)
Japan	0.1010	2.1370	0.0047	-0.0010	-0.0792	-0.0016	0.1178	0.6952	0.0034	-0.0002	-0.0854	0.0024
	(1.25)	(0.15)	(0.86)	(-0.17)	(-0.95)	(-0.05)	(1.42)	(0.05)	(0.70)	(-0.03)	(-0.85)	(0.06)
Netherlands	0.1498	7.3387	-0.0033	-0.0014	-0.0793	-0.0012	0.1621	-2.7055	-0.0051	0.0026	-0.0880	0.0223
	(2.03)	(0.24)	(-0.73)	(-0.29)	(-1.78)	(-0.04)	(2.21)	(-0.10)	(-1.15)	(0.41)	(-1.48)	(0.63)
New Zealand	-0.0170	-27.3259	-0.0063	-0.0050	0.0522	-0.0230	-0.0042	-33.5604	-0.0049	-0.0045	0.0060	-0.0163
	(-0.24)	(-1.15)	(-1.81)	(-1.28)	(1.05)	(-1.05)	(-0.05)	(-1.44)	(-1.39)	(-0.70)	(0.10)	(-0.50)
Norway	0.0889	-1.0065	-0.0069	-0.0073	0.0137	-0.0300	0.1166	-3.5629	-0.0063	-0.0095	-0.0434	-0.0347
	(1.28)	(-0.06)	(-1.38)	(-1.32)	(0.23)	(-1.02)	(1.55)	(-0.24)	(-1.41)	(-1.17)	(-0.56)	(-0.91)
Portugal	0.1948	23.2149	0.0016	-0.0065	0.0057	-0.0332	0.2275	12.5250	0.0040	-0.0050	-0.1194	-0.0178
	(3.24)	(1.10)	(0.31)	(-1.58)	(0.13)	(-1.41)	(3.60)	(0.62)	(0.87)	(-0.69)	(-2.34)	(-0.48)
Singapore	0.1154	49.9367	-0.0081	-0.0073	0.1449	-0.0438	0.0868	33.9142	-0.0050	-0.0031	0.1147	-0.0186
	(1.17)	(1.02)	(-1.30)	(-0.92)	(1.53)	(-0.99)	(0.83)	(0.90)	(-0.70)	(-0.37)	(1.18)	(-0.46)
Spain	0.1131	30.0033	-0.0047	-0.0021	-0.0246	-0.0098	0.0972	16.2913	-0.0061	0.0053	0.0265	0.0288
	(1.97)	(1.02)	(-0.72)	(-0.35)	(-0.47)	(-0.28)	(1.58)	(0.68)	(-1.09)	(0.73)	(0.42)	(0.74)
Sweden	0.1413	29.4555	0.0011	-0.0058	-0.0620	-0.0247	0.0689	24.9875	-0.0030	-0.0078	0.1616	-0.0397
	(2.46)	(1.09)	(0.18)	(-0.70)	(-0.92)	(-0.53)	(1.22)	(0.95)	(-0.52)	(-0.63)	(1.94)	(-0.69)
Switzerland	0.1668	18.6483	-0.0065	-0.0038	0.0067	-0.0179	0.1841	17.4109	-0.0057	-0.0052	-0.0258	-0.0238
	(2.99)	(0.57)	(-1.15)	(-0.92)	(0.14)	(-0.72)	(2.69)	(0.55)	(-1.22)	(-0.81)	(-0.42)	(-0.64)
UK	0.0726	12.5446	-0.0043	-0.0007	-0.0383	0.0003	0.1119	5.8317	-0.0049	0.0005	-0.0514	0.0068
	(1.36)	(0.65)	(-1.05)	(-0.18)	(-0.62)	(0.01)	(1.73)	(0.34)	(-1.28)	(0.09)	(-1.41)	(0.24)
US	0.0194	-21.3733	0.0013	-0.0008	-0.0836	0.0076	0.0182	-30.6339	-0.0005	0.0060	-0.0942	0.0368
	(0.31)	(-1.18)	(0.30)	(-0.16)	(-1.23)	(0.29)	(0.29)	(-1.91)	(-0.12)	(0.85)	(-1.01)	(1.26)

Table V Using median variance and skewness

This table reports results from the one-month ahead multivariate predictive regressions of market excess returns on lagged market excess return (r_m), market variance (V_m), market skewness (Sk_m), median variance (V_{md}) and median skewness (Sk_{md}) for various countries. t-statistics are adjusted for autocorrelation and heteroskedasticity using the Newey-West (1987) procedure. r_m, V_m, and Sk_m are defined in Table 1. Median variance is equal to the median of the monthly cross-sectional distributions of individual stock variances where individual stock variance is equal to the squared daily demeaned stock returns adjusted for autocorrelation within each month. Median skewness is equal to the median of the monthly cross-sectional distributions of individual stock skewnesses where individual stock skewness is equal to the cubed daily demeaned stock returns standardized by standard deviation within each month. The returns used to calculate the variables are in local currencies. The sample period is from January 1990 to September 2019.

	r_m	V_m	Sk_m	V_{md}	Sk_{md}	Constant
Australia	0.0104	-20.8321	0.0032	-0.2703	-0.0586	0.0121
	(0.13)	(-0.72)	(0.81)	(-0.34)	(-0.62)	(1.72)
Austria	0.1974	1.5039	-0.0001	-1.9535	-0.0852	0.0111
	(2.22)	(0.07)	(-0.01)	(-2.37)	(-1.33)	(3.16)
Belgium	0.1646	-55.1134	-0.0011	3.7051	-0.0077	-0.0000
	(2.41)	(-0.77)	(-0.33)	(0.93)	(-0.15)	(-0.01)
Canada	0.0909	-23.4201	-0.0018	0.0697	0.0362	0.0006
	(1.38)	(-1.24)	(-0.41)	(0.38)	(0.72)	(0.08)
Denmark	0.0518	-55.1125	-0.0020	2.0539	0.0377	0.0037
	(0.83)	(-1.88)	(-0.44)	(0.90)	(0.72)	(0.63)
Finland	0.2578	1.9847	-0.0088	-0.2957	-0.0784	0.0104
	(4.27)	(0.13)	(-1.57)	(-0.22)	(-0.67)	(1.37)
France	0.1447	4.3119	-0.0049	0.5412	-0.0776	0.0053
	(2.89)	(0.14)	(-1.25)	(0.38)	(-0.94)	(0.80)
Germany	0.0535	29.6088	-0.0028	-2.2679	0.0765	0.0112
	(0.94)	(0.97)	(-0.65)	(-2.07)	(0.82)	(2.14)
Greece	0.0924	-16.5760	-0.0059	-0.1015	0.1110	0.0034
	(1.64)	(-1.32)	(-0.70)	(-0.25)	(0.95)	(0.42)
Hong Kong	0.0943	23.6560	0.0018	-1.4055	-0.0491	0.0210
	(1.25)	(1.12)	(0.28)	(-1.50)	(-0.53)	(2.71)
Ireland	0.0786	-59.4015	0.0113	0.9853	0.0202	0.0060
	(1.15)	(-1.87)	(2.42)	(1.15)	(0.37)	(1.30)
Italy	0.0161	11.0401	-0.0067	0.5600	0.1516	-0.0102
	(0.26)	(0.33)	(-1.06)	(0.37)	(1.50)	(-1.30)

	r_m	V_m	Sk_m	V_{md}	Sk_{md}	Constant
Japan	0.1092	13.7399	0.0033	-0.8559	-0.0721	0.0072
	(1.33)	(0.76)	(0.67)	(-0.72)	(-0.70)	(0.90)
Netherlands	0.1426	-29.1604	-0.0047	1.9784	-0.0744	0.0025
	(1.94)	(-0.82)	(-1.04)	(1.39)	(-1.23)	(0.49)
New Zealand	0.0170	-48.3296	-0.0045	0.7668	-0.0539	0.0056
	(0.19)	(-1.84)	(-1.24)	(0.57)	(-0.49)	(1.11)
Norway	0.0952	4.0927	-0.0067	-1.2415	0.0045	0.0139
	(1.29)	(0.22)	(-1.44)	(-1.18)	(0.06)	(1.99)
Portugal	0.2056	31.3230	0.0023	-1.7971	-0.0362	0.0079
	(3.49)	(1.26)	(0.49)	(-1.45)	(-0.66)	(1.57)
Singapore	0.1069	-11.1322	-0.0035	0.9197	0.0254	-0.0031
	(1.04)	(-0.25)	(-0.50)	(0.88)	(0.23)	(-0.49)
Spain	0.1122	17.5517	-0.0050	0.6655	-0.0354	0.0013
	(1.86)	(0.70)	(-0.85)	(0.42)	(-0.39)	(0.19)
Sweden	0.0857	3.9331	-0.0027	0.3820	0.1161	-0.0029
	(1.47)	(0.11)	(-0.46)	(0.31)	(1.11)	(-0.37)
Switzerland	0.1815	11.2102	-0.0055	-0.2930	-0.0319	0.0060
	(2.60)	(0.26)	(-1.13)	(-0.12)	(-0.40)	(1.29)
UK	0.1017	7.0400	-0.0048	0.1077	-0.0433	0.0042
	(1.55)	(0.34)	(-1.25)	(0.11)	(-1.09)	(0.97)
US	0.0145	-49.1066	0.0000	0.8040	-0.1205	0.0090
	(0.24)	(-1.27)	(0.01)	(0.79)	(-1.15)	(1.70)

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