Value and Momentum

in

Frontier Emerging Markets*

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Abstract

We document the presence of economically and statistically significant value and momentum effects in the new emerging equity markets in the world, the so-called frontier emerging markets. We are the first to investigate the characteristics of individual stocks in these markets. Our unique survivorship-bias free data set consists of more than 1,400 stocks over the period 1997 to 2008 and covers 24 of the most liquid frontier emerging markets. Our results serve as out-of-sample evidence for the existence of value and momentum effects that have previously been reported for developed and emerging markets. Further, we provide empirical evidence that value and momentum strategies within frontier markets are negatively correlated, and are uncorrelated with the same value and momentum strategies in developed and emerging markets. Our mean-variance spanning tests indicate that investors who expand their investment opportunity set with value and momentum investment strategies based on stocks from frontier markets can significantly improve the efficiency of their investment portfolio.

Keywords: Alpha, Behavioral finance, Emerging markets, Frontier Markets, Momentum effect, Value effect

JEL classification: F21, F30, G11, G15

1. Introduction

Traditional emerging markets have developed rapidly over the past decades, both economically and financially. A group of countries less developed than emerging markets with established stock exchanges has appeared on the radar screen of global investors. These new emerging markets as a group are also known as frontier emerging markets, or in short, frontier markets. These countries vary greatly in their economic development. The GDP per capita in 2008 of Bangladesh, for example is just $497 while that of Slovenia is $27,019.[2] The market capitalization of stocks in frontier emerging markets in October 2008 is $113.6 billion.[3] Although still smaller than traditional emerging and developed stock markets, these markets are becoming more important, as evidenced for example by recent listings of new mutual funds and exchange-traded funds on frontier markets.[4] In addition, frontier emerging markets are an untapped data source that provides excellent out-of-sample research opportunities.

Investors who are interested in improving the risk-return trade-off of their portfolios could expand their investment horizon by including frontier equity markets. Goetzmann, Li, and Rouwenhorst (2005) indicate that investors should be willing to keep expanding their investment horizon to new and less integrated equity markets to get a better diversified portfolio. Speidell and Krohne (2007) also mention diversification benefits as a key motivation for investors to include frontier markets in their investment portfolios. Both these studies consider frontier markets as a group or consider them at the country level. However, little is known about the risk and return

[2] Data source: World Bank Development Indicators, available online at http://data.worldbank.org. For comparison the GDP per capita of some other countries: Brazil $8,205, Russia $11,832, India $1,019, China $3,267, Afghanistan $366, Portugal $22,923, and the United States $46,350.

[3] This is the market capitalisation of the constituents of the S&P Frontier BMI. Actual market capitalisation is higher because of exchange listed stocks that are not in this index and adjustments made to exclude the market capitalization part of the company that is inaccessible to (foreign) investors.

[4] For example, the Harding Loevner Frontier Emerging Markets Institutional (HLFMX) fund was launched on 27 May 2008 (total assets 30/6/2010, $22 mln), the Morgan Stanley Frontier Emerging Markets (FFD) fund was launched on 22 August 2008 (total assets 30/6/2010, $92 mln), the Templeton Frontier Markets (TFMAX) fund was launched on 14 October 2008 (total assets 30/6/2010, $72 mln), the Forward Frontier Markets (FRNMX) fund was launched on 31 December 2008 (total assets 30/6/2010, $71 mln) and the Claymore/BNY Mellon Frontier Markets (FRN) exchange-traded fund was launched on 12 June 2008 (total assets 31/1/2010, $31mln). Sources: Morningstar and Yahoo Finance.

characteristics of investment strategies based on individual stock data in frontier markets.[5] Our paper aims to fill this gap in the literature.

This paper contributes to the literature on at least two dimensions. First, our results provide out-of-sample evidence for the existence of value and momentum effects. Sorting stocks in frontier markets on value characteristics, such as book-to-price ratios, or momentum characteristics, such as past 6-month returns, yield statistically significant positive excess returns for the top-quintile portfolios versus the bottom quintile. Our study extends the results by Fama and French (1998) and Rouwenhorst (1999) for international evidence on the value effect. Our results also reinforce the international evidence of the momentum effect reported by Griffin, Ji, and Martin (2003) and Rouwenhorst (1998, 1999). Our results are striking, as frontier markets are not well integrated with developed and emerging equity markets. Our results are further empirical evidence that value and momentum are present everywhere, as suggested by Asness, Moskowitz, and Pedersen (2009).

Second, we document that also in frontier markets value and momentum strategies are negatively correlated, which suggests that investors combining these strategies obtain diversification benefits. Moreover, value and momentum strategies are virtually uncorrelated to the same value and momentum strategies in developed and emerging markets. This indicates that investors who wish to exploit the value and momentum effect may benefit from diversification by expanding their investment opportunity set internationally with frontier emerging markets. We show that expanding the investment horizon with frontier markets leads to economically and statistically improved risk-adjusted returns.[6]

Our paper is organized as follows. We start in Section 2 by describing the data used in our analyses. We investigate the value and momentum effect in more detail in Sections 3 and 4, respectively. Section 5 examines whether investors may benefit from diversification effects between investment strategies in frontier, emerging, and

[5] A notable exception is Girard and Sanha (2008), who also use individual stock data of frontier markets to assess the importance of political risk in frontier market investments.
[6] Inclusion of frontier markets may make these so-called quant strategies less vulnerable; see Khandani and Lo (2008) for a description of the quant crisis of August 2007.

developed markets. Finally, Section 6 provides a conclusion and summary of our results.

2. Data and methodology

Our research on individual stocks in frontier emerging markets makes use of a unique data set with high quality data from different sources. In this section we describe our data collection procedure.

All stocks are index constituents of the Standard & Poor's Frontier Broad Market Index (S&P Frontier BMI). The sample period runs from the inception of the index in January 1997 to November 2008, meaning our sample contains almost 12 years of data. The firm characteristics that we use to investigate the value effect are book-to-market ratios, earnings-to-price ratios, and dividend yields. We use past local stock returns ranging from 1 to 36 months to investigate momentum strategies.[7]

2.1 Sample selection

Standard and Poor's (S&P) selects the S&P Frontier BMI constituents according to their country as well as according to company selection criteria. To select countries, they analyze potential frontier markets for investor interest and accessibility. A market's turnover, number of listings and whether it has attracted a minimum amount of foreign investor interest are considered. S&P also considers a market's development prospects and, in particular, whether a market is likely to develop in breadth, depth and infrastructure. These requirements ensure that many small and inaccessible countries are not included in our data set.

In each country, S&P selects the publicly listed equities, including local listings and listings from Hong Kong, London and New York, based on market capitalization and lack of foreign investment restrictions. The aggregation of the market capitalization of selected stocks should exceed 80% of the total market capitalization of each country. S&P reduces the number of shares outstanding used in the index calculation to reflect any limits or restrictions on investments by foreign investors or entities. Hence, our

[7] This is in line with Bhojraj and Swaminathan (2006), whose results suggest that using local returns for international momentum strategies leads to higher excess returns.

sample contains only the larger and more investable part of frontier equity markets. Our sample does not suffer from survivorship bias, as the index constituents are known real-time. Each month, we include only those stocks in our sample that are index constituents at that moment in time.[8]

Table 1 shows the frontier market countries in our sample with, in column two, the region classification and, in columns three to seven, country inclusion information: dates of inclusion in index, country index weights and number of firms at the moment of inclusion and as of the last sample month of October 2008. The largest countries (in terms of index weight) in October 2008 are Kazakhstan, Lebanon and Slovenia. During the sample period, the number of countries increased from 14 to 24, and the number of firms increased from 204 to 290.

<< insert Table 1 about here >>

2.2 Returns and market capitalizations

We calculate stock returns as monthly total returns in US dollars. Since S&P does not provide total return data for individual stocks in frontier markets, we use total monthly returns from the FactSet Prices Database as our first data source. If total return data is not available from FactSet, then we aggregate S&P monthly price returns and the cumulative daily dividend in that month divided by the price at the previous month-end to get monthly total returns. In case of extreme monthly return observations with large differences between the above two data sources, we check with alternative data sources, such as Bloomberg or the local stock exchange.[9] If one of the total returns still cannot be confirmed, we use the smallest available in absolute value to limit the potential influence of outliers. To further gauge the quality of our data, we replicate the index returns for the individual countries in the S&P Frontier BMI in US dollars and local currency using total returns, S&P market capitalization, and index constituent identifiers in our individual stock database. The correlation

[8] Still, one could wonder whether the historical index has been constructed using future information. We verified with the IFC Emerging Stock Markets Factbook 1998 and the index construction methodology by S&P that no surviving countries were later added to the historical index. We also verified that no countries were excluded from the index during our sample period.

[9] We define monthly total returns larger than 100% and smaller than -60% as extreme returns.

between our replication and the index returns reported by S&P is above 98%. This high number gives us additional comfort that our data set is of high quality.

Table 1 shows information on return data per country and for the total market. The average monthly return of the equally- and value-weighted frontier market portfolio equals 0.82% and 0.74%, respectively. This is higher than in developed and emerging markets over this sample period, where the average equally-weighted returns are respectively 0.53% and 0.64%.[10] The standard deviation of the equally-weighted frontier markets index return is 4.1%. This is marginally lower than the volatility of developed markets (4.4%) and substantially lower than the volatility of the emerging markets index (7.2%). Note that the low volatility in frontier markets is mainly due to low correlation among this group of countries. Individual country volatilities can be above 15% per month.[11]

2.3 Accounting data

For the firm characteristics book-to-market and earnings-to-price ratio, we use S&P as our first data source. If for a particular stock S&P data is not available, we use Worldscope data, which we lag with 6 months to account for delayed availability of the annual reports. We extract dividend yield data from the FactSet Prices database, which we calculate as the cumulative daily dividend payments over the past twelve months, divided by the price at each month-end.

We check the data quality of each of these variables using various statistics, such as coverage, median, maximum value and minimum value in each month during our sample period. In addition, we examine alternative data sources, such as Bloomberg, in the case of suspicious values. This battery of quality checks has led to a unique, high-quality frontier emerging markets data set.

We summarize these firm characteristics of our sample data with statistics in the last columns of Table 1. We can see that the median firm size of frontier market stocks is

[10] The developed markets universe consists of stocks included in the FTSE World index and for emerging markets it is stocks in the S&P/IFCI Emerging Markets index.

[11] Erb, Harvey, and Viskanta (1996) predict the risk of equity markets in 135 countries. For the frontier markets, they predict 8-14% volatility on a monthly basis. This is roughly in line with our summary statistics in Table 1 for the individual countries.

USD 35.6 million. This is substantially lower than in emerging markets (EM) where the median firm size is approximately ten times larger at USD 336.6 million. The median book-to-market ratio is 0.75 (EM 0.56), the median earnings-to-price ratio 8.5% (EM 6.1%) and the median dividend yield 2.5% (EM 1.7%). Based on these value characteristics, frontier market stocks are considered to have been cheaper than emerging markets stocks over this sample period. Kazakhstan and Panama do not have any dividend yield data, as they only entered the index in December 2007 and have a history of less than one year. Furthermore, for the entire sample of frontier markets, approximately one-third of the stocks have a dividend yield equal to 0%.

2.4 Data coverage of stock and firm characteristics

Figure 1 presents the number of S&P Frontier BMI constituents through time and the number of firms that have data available for the different characteristics. The number of index constituents is stable, with 204 at the start and varying between 250 and 300 over our sample period. There were 290 stocks at the end of the sample period in October 2008. Since stocks enter and exit the index, the total number of individual stocks over the entire sample period is slightly more than 1,400. For each stock, the market capitalization is available. For the return-related variables we show only the coverage of 1-month momentum, for which we have almost 100% data coverage.[12] The coverage of the book-to-market and earnings-to-price ratio is almost 100% before 2007, and slightly decreased thereafter, because our data sources do not provide information for several stocks that newly entered the index. Dividend yield is the characteristic with the lowest data coverage, as it depends on a single data source. Nonetheless, dividend yields are available for at least 200 firms in most of the months of the sample period, meaning that the average coverage is above 80%.

<< insert Figure 1 about here >>

We conclude that the data coverage and quality is amply sufficiently high to examine the profitability of investment strategies in frontier markets.

2.5 Portfolio construction methodology

[12] To prevent losing three years of our sample for the 36-month momentum variable, we assume an expanding window in the beginning of our sample period starting with 12 monthly return observations.

We form investment portfolios in a style similar to, e.g., Jegadeesh and Titman (1993). At the end of each month, we rank the stocks on a particular characteristic.[13] We form equally-weighted portfolios from the top and bottom 20% of the ranking. We label these portfolios top (for most attractive 20%) and bottom (for least attractive 20%).[14] Each month, new portfolios are constructed based on this ranking procedure. Unless otherwise indicated, we hold stocks for a period of six months. The portfolios are not rebalanced, except for stocks for which return data is no longer available. These stocks exit the relevant portfolio, and the weights of the remaining stocks are adjusted proportionally. As we construct new portfolios every month and use a 6-month holding period, at any point in time the strategies effectively hold stocks from six portfolios, each formed one month apart. We calculate monthly returns for a particular strategy as the average of the returns of the six portfolios. All returns are expressed in US dollars. For country- or region-neutral portfolios, we require the same number of stocks from a country or region to be in the top and bottom portfolios. In this way, country or regional effects are hedged out in long-short strategies.

3. The value effect in frontier emerging markets

We start by investigating value investment strategies for which Fama and French (1992) and Lakonishok, Shleifer, and Visney (1994) report significantly positive excess returns for US stocks. Fama and French (1998) and Rouwenhorst (1999) find out-of-sample evidence for international developed and emerging equity markets. We rank the stocks in our sample on three value characteristics: the book-to-market ratio (B/M), earnings-to-price ratio (E/P), and dividend-to-price ratio (D/P). Stocks with high B/M, E/P, and D/P ratios have on average higher returns than stocks with low ratios. This is called the value effect.

<< insert Table 2 about here >>

[13] Note that we treat companies that pay no dividend at all separately when calculating the excess return for the D/P strategy. We treat them in the same way as firms with missing data and rank them in the middle. This methodology of dealing with companies that pay no dividend and the empirical results are in line with Fama and French (1993).

[14] A firm with missing data in a month is ranked in the middle, so that it does not appear in the top or bottom portfolio that month.

Our sample of frontier market stocks also exhibits strong value effects. The first row in Table 2 indicates that B/M sorted portfolios have a top-minus-bottom (TMB) excess return of 1.40% per month, which is statistically significant with a t-value of 3.36.[15] For portfolios ranked on the other value measures, E/P and D/P, we find similar results with economically and statistically significant TMB returns of 1.53% and 0.59% per month, respectively. We compare our results to those of more developed equity markets. Fama and French (1998) report 0.64% excess return per month for B/M, 0.57% for E/P, and 0.46% for D/P for a global equity portfolio consisting of 13 countries over the period 1975 to 1995. They furthermore show that these results hold for most countries individually and are not limited only to the US. Rouwenhorst (1999) reports a 0.72% per month excess return for B/M for stocks in 20 emerging markets over the period 1987 to 1997, and Van der Hart, De Zwart, and Van Dijk (2005) report 0.73% and 0.68% per month excess return for B/M and E/P in 31 emerging markets over the period 1988 to 2004. Thus, the excess returns based on value-characteristics sorted investment strategies in frontier markets are economically at least as large as those reported in the literature for developed and emerging stock markets.

We also investigate whether the excess returns from the strategies are due to the positive excess returns of the top portfolio versus the market average, or the negative excess returns of the bottom portfolio versus the market average. The latter would be more difficult to exploit, as for most frontier equity markets it is nearly impossible to short sell stocks. Of course, in a portfolio management context, the short portfolio can be used to underweight assets relative to the benchmark index. A lower portfolio weight than in the benchmark index means in essence a short position for the portfolio manager. The benchmark weight of each individual stock determines the extent to which these underweights can be exploited. Table 2 shows that the documented excess return of the B/M strategy is almost equally split between the long and the short side, as the return of the B/M factor of 1.40% can be decomposed into 0.65% for the long side (Top-Minus-Index) and 0.76% for the short side (Index-Minus-Bottom). Given the reduced volatility of this top-minus-index strategy, the statistical significance, as measured by the t-value, remains approximately the same. For the

[15] Throughout our paper, we use the method described in Newey and West (1987) to calculate t-values that are robust to heteroskedasticity and autocorrelation.

other value strategies, the long sides of the strategies are driving the excess returns. Hence, concerns that our conclusions are driven by the short side of the investment strategy are not warranted.

As our results might be driven by frontier market risk, we also calculate the alphas relative to a single-factor model with the equally-weighted frontier market index as the risk factor. The betas of the TMB strategies are close to zero for each of the value strategies (not reported). This implies that the alphas reported in Table 2 ('Market risk adjusted') here are close to the raw TMB returns reported before. For example, the 1.40% raw excess return of the B/M strategy is reduced to a risk-adjusted alpha of 1.32% per month. Hence, these results indicate that unconditional beta risk cannot explain the excess returns on the value investment strategies. This observation is in line with results documented for value strategies in developed and emerging equity markets.

We now proceed with a series of robustness analyses on the value effect. We start by analyzing region and country effects. Next, we aim to account for liquidity effects by using three liquidity proxies. These results are followed by an investigation whether our results are caused by countries with more or less capital constraints, for which we use three classifications for liberalization. Finally, we analyze whether our results are sensitive to the chosen holding period of six months.

3.1 Region and country influences

As these investment strategies rank all stocks at each period in time, the raw results reported in the first row of Table 2 might be influenced by regional effects. Therefore, we also calculate each of the investment strategies per region and also display the region-neutral investment strategies in the second part of Table 2. These investment strategies require an equal number of stocks, namely 20%, from a region to be in the top and bottom portfolios.[16] The results in Table 2 indicate that the results are not driven by regional effects. We document a positive TMB return for each of the four regions separately, except for the D/P strategy in Asia, which has as a -0.03% excess

[16] The number of stocks is not exactly equal with or without region or country neutrality imposed, as we require each region or country to have at least 4 stocks available and data coverage of at least 40% at a point in time to be included in the analysis. The average number of stocks in the strategy per region is as follows: Africa 35, Europe 103, Africa 80, Asia 49.

return. Furthermore, the region-neutral strategy yields value returns of 1.38% (B/M), 1.39% (E/P), and 0.96% (D/P) per month, which are all statistically significant and as similar in magnitude as the non-neutral returns. Therefore, we conclude that the presence of the value effect is robust with respect to regional influences.

While the value effect is present in each region, it is possible that differences in country-specific accounting standards or currency effects might drive our results, at least to some extent. Therefore, we take the analysis one step further and calculate country-neutral investment strategies. This means that we require at each point in time the same number of stocks of each country to be in the top and bottom portfolios. In this way, country and currency effects are completely hedged out. Table 2 shows that imposing country neutrality does not alter our conclusions about the significant presence of value effects in frontier markets. Nevertheless, part of the global TMB returns can be attributed to country allocation, as TMB returns for the country-neutral strategy are about half of the non-neutral returns. This is in line with Asness, Moskowitz, and Pedersen (2009), who report that ranking country indexes based on valuation measures leads to significant excess returns.

3.2 Proxies for liquidity

Houge and Loughran (2006) suggest that the value effect is driven by stocks with little liquidity and hence cannot be exploited by investors. This might be a particular issue for frontier markets, as, in general, liquidity is lower than for more developed markets. Nevertheless, one should bear in mind that our data provider S&P explicitly takes liquidity into account when deciding to include a country or a stock in the index. Hence, we expect that the stocks in our sample can be traded in reasonable quantities.[17] We perform several analyses to ensure our results are not driven by investing in illiquid stocks.[18] Our first proxy for liquidity is firm size measured by equity market capitalization. Given that the number of stocks in our sample is reasonably constant and close to 300 over time, we select the largest 150 stocks at each point in time and use this restricted sample of the largest stocks to investigate the

[17] See Bekaert, Harvey, and Lundblad (2007) for a detailed investigation of liquidity in emerging markets.

[18] Unfortunately, we do not have a reliable source to directly measure liquidity in frontier markets using such variables as trading volume or bid/ask spread. In Section 5, we show that our results cannot be explained by the traded liquidity factor of Pastor and Stambaugh (2003) and non-traded liquidity factors of Sadka (2006).

excess returns of these strategies. The results from this analysis are displayed in the third part of Table 2. We see that the excess returns from this investment strategy are qualitatively similar to the initial results that we presented for the whole sample. For example, the B/M strategy results in a statistically significant TMB return of 1.15% per month. In addition, we also used value-weighted returns instead of equally-weighted returns for top and bottom portfolios. In this way, the influence of the largest and likely more liquid stocks is larger in the overall result. We also see that this leads to qualitatively the same results. In fact, this leads to economically larger excess returns. Liquidity is also sometimes associated with the speed in which trades can be executed. Especially in frontier markets it might take some time to implement trades. In order to deal with a potential implementation lag between the ranking of the stocks and the actual investment, we skip one month between ranking and portfolio formation. This robustness analysis also does not alter our conclusion that the value effect is present in frontier emerging markets. Results are comparable with 1.62%, 1.51%, and 0.65% per month excess return for the B/M, E/P, and D/P strategies, respectively.

3.3 Capital constraints

Our results could be related to capital constraints in frontier equity markets, as these markets have not always been as open as they currently are. Although our data provider takes these requirements into account before admitting a country to the frontier markets index, the investment strategies could potentially still be tilted towards countries with the most or least investment restrictions in our sample. Although *a priori* it is not clear what the effect would be of this tilt, we want to make sure that our findings are robust in this respect. Therefore, we use data on financial market liberalization to separate the frontier markets into a most and least liberalized group and verify whether our results still hold for these sub-samples.[19]

We use three different measures of financial market liberalization, namely relevant sub-indices of the Index of Economic Freedom reported by The Heritage Foundation

[19] See Bekaert and Harvey (2003) for an overview on integration and liberalization measures for emerging markets. Unfortunately, Bekaert and Harvey (1995, 2000) do not have integration data available for the frontier equity markets in our sample.

(HF)[20], the KOF Index of Globalization constructed by the ETH Zurich (KOF)[21] and the Economic Freedom of the World (EFW) reported by the Fraser Institute.[22] We choose sub-indices in such a way that they best represent investment freedom.[23] The higher the score, the higher the financial liberalization, meaning it is less likely that capital constraints play an important role in that country. We omit scores when a country is not yet included in the S&P Frontier BMI. For all three indices the coverage is high, although not all data is always available, such as KOF and EFW data for Lebanon. As can be expected, the rank correlations between these indices are relatively high with roughly 75% over the sample period. Nevertheless, some differences are present and therefore we investigate the impact of each of the three measures separately.

At the end of each month, we rank all countries based on each of the three financial liberalization indices.[24] We choose the thresholds to split the countries into a most and least liberalized group in such a way that the two groups contain approximately an equal number of stocks. We then form investment portfolios on the most and least liberalized stocks separately. The bottom part of Table 2 contains the results for the sub-samples with the highest and lowest financial liberalization according to each of these measures. We observe that the returns on value strategies are somewhat higher for the least liberalized countries, but this does not always imply that statistical significance is higher. The E/P strategy has the most pronounced difference, with returns and t-values higher for the least liberalized sub-sample. Overall, we observe

[20] Data are available at http://www.heritage.org. We use the average of the sub-indices Financial Freedom and Investment Freedom, as these two are closest to the definition of freedom that we prefer to measure for our analyses.

[21] Data available at http://globalization.kof.ethz.ch. For more details on this index: see Dreher (2006). We use the Economic Globalization dimension scores, as the Political and Social Globalization dimensions are less relevant for our analyses.

[22] Data from the Fraser Institute available at http://www.freetheworld.com. We use the area Freedom to Trade Internationally as this area most directly represents the measure we are interested in.

[23] Appendix A contains the annual scores per frontier country and a comparison of the liberalization measures for frontier markets with developed and emerging countries.

[24] We incorporate appropriate time lags when using the index scores. Heritage Foundation informed us that annual scores have become available in the first quarter. Therefore we use the scores as of the end of March every year. KOF data has become available every year around January based on data of two years ago. So, around January 2008, the new index became available based on 2005 data. To be conservative, we use a two years and one quarter lag, meaning we assume 2005 data is available at the end of March 2008. Note that this index contains a look-ahead bias, as data of previous years changes with the introduction of a new methodology. The same holds for EFW, although data becomes available a bit earlier. We use a one year and three quarters lag, meaning that we assume 2005 data is available at the end of September 2007.

that value strategies still deliver significantly positive excess returns liberalized as well as non-liberalized countries, both from an economic and statistical point of view. Therefore, we conclude that capital constraints do not seem to drive the value effects.

3.4 Holding period returns

The investment strategies analyzed thus far use a 6-month holding period. This implies that such a naïve portfolio would trade twice a year. In order to analyze the sensitivity to the 6-month holding period, we show the TMB returns for holding periods ranging from 1 to 36 months. In Figure 2 it can be seen that our results are not sensitive to the chosen holding period. In Table 2 we indicate that the average monthly return for the E/P strategy is 1.53%. This strategy can be found in Figure 2 at the 6-month holding period and the cumulative excess return of approximately 9%. All three value strategies keep increasing returns after our initial holding period of 6-months, with the B/M strategy continuing to deliver the strongest results. The average return per month for B/M, gross of transactions costs, is fairly constant as indicated by the almost linear relationship between holding period and TMB excess return.[25] Figure 2 indicates that holding periods longer than the 6 months chosen in our research seem to be viable for value investment strategies. For practitioners, a longer holding period implies lower transactions costs and could increase real-life investment returns.

<< insert Figure 2 about here >>

In sum, we conclude that there is a robust, economically and statistically significant value effect present in this previously unexplored data set of individual stocks in frontier emerging equity markets.

4. The momentum effect in frontier emerging markets

In this section, we investigate the profitability of momentum strategies in frontier emerging markets. This means that stocks are ranked on their past returns. Stocks with higher past returns are expected to have higher future returns. Jegadeesh and

[25] Unreported results show that beyond a holding period of 36 months, the excess returns of the value portfolios are positive, but substantially lower.

Titman (1993) report significantly positive excess returns for winner stocks relative to loser stocks over the past 3 to 12 months in the US, and Rouwenhorst (1998, 1999) confirms these findings for international developed and emerging market stocks.

<< insert Table 3 about here >>

Our sample of frontier market stocks also exhibits strong momentum effects. Table 3 shows that past winner stocks outperform past loser stocks from 1 month to 12 months, regardless of the formation period. For example, on the 6-month horizon the excess return for the 6-month momentum TMB portfolio is 1.69% per month, with a t-value of 3.01. We see that these results are robust and do not depend on a particular formation or holding period around this strategy. We observe that for longer formation and holding periods the returns tend to be lower than for shorter periods. For formation periods of 36 months, the excess returns are low and insignificant, except for the 1-month holding period.

The magnitude of our momentum profits in the medium term (3 to 12 months) is in line with those observed for developed and emerging markets. Jegadeesh and Titman (2001) report an excess return of 1.09% per month for past 6-month winners relative to losers for the US over the period 1965 to 1997. Rouwenhorst (1998, 1999) documents 1.16% per month for European stock markets (1980-1995) and 0.39% per month for emerging markets (1982-1997). Van der Hart, De Zwart, and Van Dijk (2005) report 0.74% for their sample of 31 emerging markets over the period 1988 to 2004. The short-term momentum returns are in line with Chan, Hameed, and Tong (2000), who report a 1.1% per month excess return for short-term country momentum strategies using a sample of 23 developed and emerging countries over the period 1980 to 1995. We conclude that the excess returns from our frontier equity markets momentum strategies are economically at least as strong as those reported previously for developed and emerging equity markets.

<< insert Table 4 about here >>

We now repeat each of the robustness analyses that we presented for value strategies in the previous section for three momentum strategies: short term (1-month), medium-

term (6-months), and long-term (12-months) formation and holding periods. In addition, we perform an analysis on the influence of cultural individualism on momentum profits.

We also investigate whether momentum returns are due to the excess return of the long or short side versus the equally-weighted average. In case the excess return is primarily driven by the short side, it might be more difficult to profit from momentum in investment portfolios. From Table 4 we observe that the medium-term momentum return is primarily driven by the excess return of the top quintile relative to the index, with 1.12% of 1.69% coming from the long side of the trade. Since the risk of the top-minus-index (TMI) strategy is lower, the t-value is higher for TMI than for TMB. The other 0.58% of the total momentum return comes from the short side. The excess returns for the short-term and long-term momentum strategies are also driven by the long side of the trade, so this is no barrier to profit from the momentum effects.

We also calculate the alphas relative to a single-factor model with the equally-weighted frontier market index as the risk factor. The betas of the TMB strategies are slightly negative for each of the momentum strategies (not reported). This implies that the alphas reported in Table 4 are slightly higher than the raw TMB returns reported before. Hence, these results indicate that unconditional beta risk cannot explain the excess returns of the momentum investment strategies. This is in line with results documented for momentum strategies in developed and emerging equity markets.

4.1 Region and country influences

In the second part of Table 4 we investigate in more detail the influence of country and regional effects on the return of momentum strategies. We see that the raw momentum returns slightly decrease when we impose region neutrality. For example, the medium-term momentum strategy decreases from 1.69% per month to 1.40% per month. For this strategy, each of the regions separately also have a positive excess return, with Africa the strongest (2.16% per month) and America the weakest (0.44% per month).

Imposing country neutrality further reduces the momentum profits to 0.50% per month, implying that country momentum is part of the total momentum profit.

Rouwenhorst (1998), Chan, Hameed, and Tong (2000) and Bhojraj and Swaminathan (2006) provide empirical evidence of momentum profits at the country level for developed and emerging equity markets. Our results confirm the existence of country momentum within the group of frontier markets and may serve as out-of-sample evidence for what is sometimes called macro-momentum, since it is at the country level.

Our raw short-term momentum returns deserve some more attention. We find positive and significant 1-month momentum returns. However, most studies on individual stock returns document 1-month contrarian profits consistent with Jegadeesh (1990) within US equity markets. Note that our raw results may contain country and region momentum effects. Table 4 shows that the region-neutral 1-month momentum return is still present, although somewhat smaller and that the country-neutral momentum return even disappears, indicating that the reported raw momentum return is purely a country momentum effect. This pattern is in line with the strong short-term country momentum returns reported by Chan, Hameed, and Tong (2000) in developed markets of 1.1% per month.[26] It is also consistent with Van der Hart, Slagter, and Van Dijk (2003), who find a zero excess return for the 1-month past return strategy for emerging markets on a country neutral basis. For the medium- and long-term momentum strategies, we observe that country momentum is somewhat weaker, but remains positive. This also seems to be in line with, for example, Bhojraj and Swaminathan (2006), who document lower country momentum returns for longer holding periods.

4.2 Proxies for liquidity

In similar fashion as for the value strategies, we investigate the excess returns of the momentum strategy for the largest half of our sample, using value-weighted instead of equal-weighted portfolios, and skipping one month between the ranking and portfolio formation. The results of each of these analyses are very similar to each other and with the raw results presented before. Short- and medium-term momentum returns remain economically and statistically significant.

[26] In addition, Moskowitz and Grinblatt (1999) report a 1-month momentum effect at the industry level for US equity markets.

4.3 Capital constraints

We also check the influence of capital constraints of each of the countries on our momentum results. Although *a priori* it is not clear what the effect would be of this loading, we want to make sure that our findings are robust in this respect. We use the same three measures of financial market liberalization as before. At the end of each month, we rank all countries based on each of the three financial liberalization indices. We form investment portfolios on the most and least liberalized stocks separately, similar to our earlier analyses. Table 4 indicates that the medium-term momentum strategy is most pronounced for the countries with the highest financial liberalization. For the valuation strategies in the previous section, we observed that the returns were somewhat stronger in the least liberalized sub-sample. Overall, our momentum strategies still deliver substantial positive excess returns in both sub-samples. Therefore, we conclude that capital constraints do not seem to drive momentum returns.

4.4 Cultural individualism

Chui, Titman, and Wei (2010) link the existence of the momentum effect to the degree of individualism of investors within a country.[27] Their results suggest that countries with a high Hofstede score on individualism also earn higher average momentum returns.[28] For several of the frontier markets countries, a score on individualism is available; see Hofstede (2001) and Appendix B. The average score is low for frontier markets for which the score is available. A low score suggests that social groups such as families play a more important role than individuals.

Chui, Titman, and Wei (2010) claim that the medium-term momentum effect is weaker for countries with low individualism. The low individualism score for frontier markets would imply that momentum effects in these markets are rather small. Hence, we investigate the momentum returns for the sub-sample of countries with a low individualism score. Estonia, Jamaica, Lebanon, and Slovakia are excluded because they have an individualism score above the threshold of the low individualism sub-sample from Chui, Titman, and Wei (2010). From the bottom part of Table 4, we

[27] Speidell (2009) reports some anecdotal evidence of differences in investor behavior in frontier markets.

[28] See www.geert-hofstede.com for detailed information on the scores on different aspects of culture.

observe that the momentum returns from our low individualism sub-sample are at least as high as those in the full sample. Hence, our results do not seem to indicate that momentum is weak in countries with a low score on cultural individualism.

4.5 Holding period returns

Momentum has been attributed to irrational investor behavior. Jegadeesh and Titman (2001) developed hypotheses about the post-holding period return of momentum strategies. Investor underreaction is consistent with an upward sloping cumulative momentum return in the first months after portfolio formation and a flat return afterwards. Investor overreaction and subsequent price reversals cause prices to move back after the momentum holding period. Based on these arguments, medium-term momentum strategies should produce positive excess returns, while for longer holding periods the returns of these medium-term momentum strategies should revert back to zero.[29] Jegadeesh and Titman (2001) find empirical evidence that supports the initial underreaction and delayed overreaction hypothesis in the US for the period 1965-1981. For the period 1982-1997, their results are consistent only with the underreaction hypothesis, meaning that after 12 months the cumulative excess return is flat. Behavioral models consistent with initial underreaction and subsequent overreaction can be based on different assumptions such as: conservatism and representativeness heuristic (Barberis, Shleifer, and Vishny 1998), self-attribution bias (Daniel, Hirshleifer, and Subramanyam 1998), and investor segmentation into "news watchers" and "trend followers" (Hong and Stein 1999).

<< insert Figure 3 about here >>

We analyze the holding period returns until 36 months after formation to investigate whether investor under- or overreaction can explain our findings on momentum strategies. Figure 3 shows that initially the cumulative momentum returns are positive and increasing, but that they start reversing after 12 months. After slightly more than 30 months, the 12-month cumulative momentum return is equal to zero. Unfortunately, our time series is too short to meaningfully investigate the 60-month mean-reversion strategies analyzed by De Bondt and Thaler (1985). The excess

[29] In case momentum is due to differences in unconditional expected returns as hypothesized by Conrad and Kaul (1998), the momentum portfolio should keep increasing also after the initial holding period.

returns on the 1- and 6-month momentum strategies decline at a somewhat slower pace than the 12-month momentum strategy, remaining positive until the end of our window of 36 months. Our results are consistent with the under- and overreaction hypothesis and qualitatively similar to the results by Van der Hart, De Zwart, and Van Dijk (2005) for emerging markets.

The analyses in this section show that the momentum effect is strongly present in the out-of-sample data set consisting of frontier emerging equity stocks.

5. Diversification benefits

In the previous sections we showed that value and momentum strategies have positive returns in frontier emerging markets. In this section we investigate whether value and momentum strategies are correlated within frontier markets, whether these strategies are correlated with value and momentum strategies in other markets and whether a global investor should include these frontier market strategies in an optimal portfolio.

5.1 Diversification between value and momentum effects

Asness, Moskowitz, and Pedersen (2009) indicate that value and momentum strategies are negatively correlated within asset classes. This negative correlation implies diversification benefits from combining value and momentum effects in one investment strategy. We start by investigating the correlation between the three value strategies and the three momentum strategies that we analyzed before.

<< insert Table 5 about here >>

In Table 5, the correlations over the period 1997 to 2008 are displayed. The valuation strategies are positively correlated. The correlation between B/M and E/P strategies is highest with 0.26. This suggests that combining different valuation indicators improves the risk-adjusted performance of a valuation investment strategy. The momentum strategies are also positively correlated, with 0.71 correlation between the 6- and 12- month momentum strategies. The off-diagonal block of the correlation matrix indicates that valuation strategies are negatively related to medium-term and

long-term momentum strategies and have a correlation around zero with the short-term momentum strategy. Hence, the diversification benefits between value and momentum within frontier markets are large.

An equally-weighted portfolio of the six strategies analyzed in Table 5 would yield an outperformance equal to the average outperformance of each of the individual strategies (1.32% per month), but the t-value would increase to 7.73 because of the diversification effects between the individual strategies. This increased t-value implies that the volatility adjusted return has increased substantially.

5.2 International diversification

Global investors might want to include these frontier markets investment strategies in their portfolios, but could be concerned about the correlation with other strategies that are already in their portfolio. Griffin, Ji, and Martin (2003, 2005), Naranjo and Porter (2007), and Asness, Moskowitz, and Pedersen (2009) suggest that investors may benefit from combining value and momentum strategies in different countries, as the returns from these strategies are far from perfectly positively correlated.

Miles (2005), Speidell and Krohne (2007), and Pukthuanthong, Yang, and Berger (2010) indicate that investors may benefit from the diversification opportunities of frontier equity market returns. They consider frontier markets as a group at the index level or at the country index level. We want to go one step further in our analysis and examine whether value and momentum strategies in frontier markets correlate with the same strategies in developed and emerging equity markets. If the correlation is low, investors may consider expanding their investment opportunity set with frontier markets to achieve higher risk-adjusted performance.

In order to calculate the international diversification benefits we need to construct international portfolios. The global developed markets size, value, and momentum returns are constructed as follows. Using a survivorship-bias free data set of stock constituents of the FTSE World index, we form monthly rankings according to the three value and momentum measures. We form an equally-weighted portfolio from the top and bottom 20% ranked stocks. Each stock receives an equal weight. For the

value strategies, we again calculate portfolio returns using a 6-month holding period. Returns are hedged to US dollars.

We also take the perspective of a global emerging markets investor. For the emerging markets factor returns we use the same methodology based on all stocks in the S&P/IFCI Emerging Markets index. Returns of these strategies are measured in US dollars.[30]

<< insert Table 6 about here >>

We start by calculating the correlation of returns for the investigated value and momentum factors between the frontier, emerging and developed markets. Table 6 contains the estimated correlations over the full sample period 1997-2008 and two sub-sample periods from 1997-2002 and 2003-2008. The correlation between the frontier market index and the emerging and developed market indexes over the entire sample period is moderately positive (0.49 and 0.43 respectively), confirming the other studies stating that diversification benefits may be obtained from investing in frontier markets. The sub-sample analysis suggests that recently the correlation has increased, although this could be due to the financial crisis in the second half of 2008 in which all risky asset classes were highly correlated.

A different picture emerges when looking at the international correlation of investment strategies based on individual stocks. Strikingly, none of the correlations of the long-short investment strategies on the full sample exceed 0.2, with the average correlation below 0.10. As an example, the correlation of the 6-month momentum strategy between frontier markets and emerging markets is -0.13 and between frontier and developed markets is 0.15. Furthermore, we do not find higher correlations between frontier and emerging markets than between frontier and developed markets. In the most recent sub-sample, correlations slightly increased, but are still low with an average below 0.2. These preliminary results indicate that investors exploiting these

[30] Hedging emerging markets currencies for the entire index for our entire sample period is virtually impossible because of a lack of sufficiently liquid instruments for some emerging currencies, especially in the beginning of our sample period.

strategies in developed and emerging equity markets might improve their risk-adjusted returns by including frontier equity market strategies.

<< insert Table 7 about here >>

In order to further strengthen our results on the diversification benefits of frontier markets, we analyze the portfolio returns of global stock selection strategies that invest proportionally to the number of stocks available in the frontier, emerging, and developed markets indices. This means that frontier markets get a relatively small weight in the total portfolio of approximately 8%.[31] Results can be found in Table 7. First, we see that the strategies for developed markets over our sample period are positive, but not statistically significant, apart from the 6-month momentum strategy. The economic magnitude is still sizeable, as a top-minus-bottom strategy based on E/P would have generated a return difference of 0.42% per month over the period 1997-2008. We see that return differences are inversely related to the development of the market, as generally speaking they are larger for emerging markets and even larger for frontier markets.

The last columns indicate that applying the investment strategies to frontier markets in addition to a global portfolio increases the returns and associated t-values of the returns. For example, an investor following an E/P value strategy in emerging markets sees his excess return increase from 0.59% per month to 0.76% per month by including on average 18% frontier market stocks. Because of the low correlation, the associated t-value increases substantially, from 1.83 to 2.90. The last column indicates that a global investor that allocates on average 36% to emerging markets and 8% to frontier markets attains an excess return of 0.57% (with a t-value of 2.38) for the E/P strategy, whereas an investor using only developed markets would be left with 0.42% (with a t-value of 1.38). These diversification benefits hold more generally for each of the value and momentum strategies investigated in this paper.

5.3 Mean-variance spanning tests

[31] The reason not to choose market capitalization weights is driven by the size as measured by market capitalization of frontier equity markets, which is below 1% of the global equity markets. Our approach is consistent with the other strategies analyzed in this paper and related literature, in which stocks are equally weighted.

We continue by investigating whether the mean-variance efficient frontier can be expanded by including investment strategies from frontier markets. This is illustrated by Figure 4, in which the average return and volatility risk of the four developed markets benchmark assets are displayed, as well as the dashed line that represents the mean-variance frontier based on these assets. The square indicates the B/M strategy in frontier markets. The optimal benchmark portfolio scaled to sum to 100% consists of 17% in the entire market, -1% in the size strategy, 41% in the value strategy and 44% in the momentum strategy. This strategy is shown on the mean-variance frontier with a triangle at a risk of 1.6% per month. In case the B/M strategy based on frontier markets is added to the investment opportunity set, the mean-variance frontier expands with the optimal weight to this new asset class of 22%. This portfolio is also shown on the mean-variance frontier.

<< insert Figure 4 about here >>

Whether this portfolio weight of 22% is also significantly different from zero from a statistical point of view can be tested using mean-variance spanning tests; see De Roon and Nijman (2001) for an overview of interpretations of mean-variance spanning tests. They also indicate that tests for differences in Sharpe ratios of these two efficient portfolios, for example using the Jobson and Korkie (1981) test, is closely related to using alphas from regression-based mean-variance spanning tests. Sharpe ratios can be used to determine whether one portfolio is to be preferred over another, whereas alpha answers the question whether investors can improve the efficiency of their portfolio by investing in the new asset. In case the optimal portfolio weight of the new asset would be zero, the mean-variance frontiers would coincide, the alpha would be zero, and the Sharpe ratios of both portfolios would be the same.

We determine whether mean-variance investors should increase their investment opportunity set with frontier market strategies using regression-based spanning tests; see Huberman and Kandel (1987). First, we assume that an investor follows four investment strategies using stocks from global equity markets.[32] In addition to

[32] We have also analyzed the spanning tests using only US-based factors from the online data library of Kenneth French. The results are qualitatively the same, see Appendix C. We also show in Appendix C

following the market index, the investor follows a value, momentum, and size strategy. These essentially are the same four investment strategies used by Carhart (1997) as benchmark assets to evaluate mutual fund performance in the US. The portfolios for global developed and emerging markets are formed using the same method as described earlier. We form monthly rankings according to size (measured by market capitalization), value (measured by book-to-market ratio), and momentum (measured by prior 6-month return).

We use the following regression equation to investigate whether the frontier markets investment strategies can expand the mean-variance frontier on top of the aforementioned four strategies:

$$R^e_{TMB,t} = \alpha + \beta_M \cdot R^e_{M,t} + \beta_{SMB} \cdot R^e_{SMB,t} + \beta_{HML} \cdot R^e_{HML,t} + \beta_{UMD} \cdot R^e_{UMD,t} + \varepsilon_t \qquad (1)$$

with SMB the size factor, HML the value factor, and UMD the momentum factor. In the case that the investment opportunity set is spanned, the betas in Equation (1) should be such that the alpha in this regression equation is no longer significantly positive. In such case, an investor could form a portfolio of benchmark assets that generates the same expected return as the frontier markets strategy. This would mean that the frontier markets strategy would not add any value for these investors. An alpha statistically different from zero implies that frontier market strategies add value for investors.

The estimation results of Equation (1) are displayed in Table 8. Panel A contains the estimates for global developed equity investment strategies and Panel B for global emerging equity investment strategies.[33] The positive alphas reported in Panel A and Panel B are similar to the previously reported excess returns and are statistically significantly different from zero.

<< insert Table 8 about here >>

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that our results cannot be explained by the traded liquidity factor of Pastor and Stambaugh (2003) and non-traded liquidity factors of Sadka (2006).

[33] We do not take into account short sales restrictions as in De Roon, Nijman, and Werker (2001) as our investment strategies are effectively long-short portfolios and hence contain short sales by construction.

For example, the E/P strategy has a statistically significant alpha of 1.51% and 1.44% per month relative to respectively the developed and emerging strategies. Corresponding t-values are 4.23 and 3.95, respectively. The excess return of the TMB strategy reported before was 1.53%, as indicated in the first column. For the 6-month momentum strategy the alpha even increases to 1.96% (t-value 3.45) for developed and 1.86% (t-value 3.40) for emerging compared to a TMB excess return of 1.69% per month. These results reinforce our earlier results that correlations between investment strategies on frontier markets, developed and emerging markets are generally low, and imply that the mean-variance frontier has significantly shifted by including frontier market strategies. The results from Panel A are in line with the findings by Van der Hart, De Zwart, and Van Dijk (2005), who claim that value and momentum investment strategies in emerging markets are not exposed to global risk factors.

In summary, our results on mean-variance spanning indicate that investors that hold global portfolios consisting of the market, size, value, and momentum strategies in developed or emerging equity markets may benefit from investing in value and momentum strategies in frontier markets.

6. Conclusions

The new emerging equity markets, the so-called frontier emerging markets, are attracting increased attention from foreign investors. Research on these frontier markets is scarce and mostly conducted using the frontier market as a whole or at the country level. In this paper, we dig one step deeper and analyze the individual stock returns. Our research on individual stocks in frontier emerging markets makes use of a unique high-quality and survivorship-bias free dataset. We use data from more than 1,400 stocks from 24 frontier markets over a 12-year period from 1997 to 2008. This previously untapped data source provides excellent opportunities for out-of-sample research related to investment strategies that were previously analyzed in developed and emerging markets.

Our empirical results indicate that portfolios based on value and momentum in frontier markets generate economically and statistically significant excess returns of about 1% per month. The magnitude of these excess returns is at least as large as those found before in developed and emerging markets. This is a striking observation, as integration of frontier markets with developed and emerging markets is generally low. Our results are valuable out-of-sample evidence of the profitability of value and momentum strategies previously documented in other markets. These results are robust as they still hold after performing a battery of robustness analyses, such as an analysis by geographical region, several proxies for liquidity and financial liberalization. Because of data limitations, we cannot investigate in more detail whether these returns are a compensation for risk or caused by behavioral biases. Hence, more research is needed to classify our findings as anomalies.

We also analyze the diversification benefits of including stocks from frontier markets in portfolios that try to exploit value and momentum in developed and emerging markets. Our mean-variance spanning tests indicate that including frontier markets investment strategies significantly shifts the mean-variance frontier outward, indicating that investors who include frontier markets strategies obtain more efficient portfolios. We show that this also holds for the more recent period, in which the correlations between the frontier market index with emerging and developed market indexes have increased.

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Table 1: Summary statistics of frontier markets firms

The table gives for each country the *region* classification, the *inclusion date* in the S&P Frontier BMI, the (end of month) *index weights* at the inclusion date and in October 2008, the *number of firms* at the inclusion date and October 2008, the *average monthly return* and the *standard deviation* of the returns of the equally-weighted index of the sample firms over the period since the inclusion date until November 2008, both in local currency (LC) and US dollars (USD). The last four columns show the summary statistics median *firm size*, median *book-to-market ratio (B/M)*, median *earnings-to-price ratio (E/P)*, and median *dividend yield (D/P)* of the sample firms. Size is measured as the market capitalization of the firms in millions of US dollars. The medians are computed per month across firms, and the table reports the time series average of these monthly medians. The bottom two rows show statistics for the equally-weighted (EW) and value-weighted (VW) index.

		Inclusion	Index weights (%)		Number of firms		LC Return (%)		USD Return (%)		Median	Median	Median	Median
Country	Region	date	Begin	Oct-08	Begin	Oct-08	Mean	Std.Dev.	Mean	Std.Dev.	size	B/M	E/P (%)	D/P (%)
Bangladesh	Asia	Jan-97	19.1	4.7	46	25	0.5	7.6	0.2	7.8	17.0	0.8	8.8	3.3
Botswana	Africa	Jan-97	1.6	2.4	7	6	2.6	5.0	2.1	5.8	101.5	0.2	8.2	5.6
Bulgaria	Europe	Jan-97	0.03	0.9	12	11	1.4	8.8	1.4	11.2	19.5	1.6	9.3	0.2
Côte d'Ivoire	Africa	Jan-97	4.2	5.0	7	13	1.3	4.9	1.4	6.0	45.9	0.7	11.7	5.6
Croatia	Europe	Jan-98	9.1	5.4	8	15	1.6	9.0	1.7	9.3	86.7	1.5	9.9	0.9
Ecuador	America	Jan-97	8.7	3.2	11	6	1.7	5.2	0.4	7.0	86.3	0.9	10.6	4.4
Estonia	Europe	Jan-98	5.4	1.0	12	7	0.2	9.0	0.6	9.2	45.3	0.6	8.1	2.0
Ghana	Africa	Jan-97	8.0	1.4	7	10	3.2	6.7	1.9	7.4	29.7	0.4	17.7	3.5
Jamaica	America	Jan-97	11.3	3.5	22	15	2.2	8.4	1.6	8.3	45.3	0.9	12.8	3.4
Kazakhstan	Europe	Dec-07	17.9	13.8	13	13	-2.0	19.8	-2.0	19.7	600.4	0.5	10.1	-
Kenya	Africa	Jan-97	10.9	4.8	16	20	1.8	7.0	1.6	7.9	45.8	0.5	8.5	4.4
Latvia	Europe	Jan-98	1.3	0.2	11	9	0.1	8.9	0.2	9.2	7.2	2.8	10.0	0.3
Lebanon	Asia	Sep-99	8.4	11.4	5	5	1.3	7.8	1.3	7.8	331.2	1.0	2.7	0.9
Lithuania	Europe	Jan-97	2.2	0.9	31	15	0.6	6.9	0.9	7.7	23.4	1.1	9.5	0.7
Mauritius	Africa	Jan-97	6.6	3.9	13	9	1.0	4.3	0.7	4.8	44.9	0.9	11.2	4.8
Namibia	Africa	Sep-99	2.1	0.3	9	4	1.4	6.5	1.2	8.9	21.1	0.6	14.4	3.1
Panama	America	Dec-07	2.4	5.6	11	11	-2.7	6.7	-0.1	1.5	76.7	0.6	7.2	-
Romania	Europe	Jan-98	3.8	4.3	33	15	1.1	9.7	0.3	10.8	36.1	0.8	6.1	0.2
Slovakia	Europe	Nov-04	2.1	0.7	4	6	2.1	5.3	2.7	7.2	40.1	2.4	10.3	2.8
Slovenia	Europe	Jan-97	5.2	10.2	10	10	1.0	5.6	0.9	6.5	166.3	1.1	6.2	1.7
Trinidad & Tobago	America	Jan-97	7.8	6.5	11	6	1.3	4.3	1.3	4.4	236.7	0.3	6.5	2.3
Tunisia	Africa	Jan-97	14.4	3.5	11	17	0.6	4.0	0.4	4.4	57.3	0.7	8.0	4.2
Ukraine	Europe	Jan-98	4.2	2.3	17	18	3.9	17.9	3.1	18.3	70.2	2.3	12.4	0.0
Vietnam	Asia	Dec-06	9.4	4.0	18	24	-2.3	17.5	-2.4	17.9	106.5	0.1	2.7	0.0
EW Index	-	Jan-97	-	100	-	290	1.15	3.5	0.82	4.1	35.6	0.75	8.5	2.5
VW Index	-	Jan-97	-	100	-	290	1.00	4.0	0.74	4.6	-	-	-	-

Table 2: Excess returns of portfolios sorted on value characteristics

At the end of each month between January 1997 and October 2008, all stocks in the S&P Frontier BMI for which the necessary information is available are ranked in descending order according to their value characteristics; B/M is the book-to-market ratio; E/P is the earnings-to-price ratio; D/P is the dividend-to-price ratio. The holding period is 6 months. The columns TMB contain the average monthly percentage excess returns of the equally-weighted top 20% minus bottom 20% portfolio and the corresponding t-values. T-values are corrected for heteroskedasticity and autocorrelation using Newey and West (1987). The rows with "top-minus-index" and "index-minus-bottom" split the results in excess returns of the top and bottom versus the equally-weighted average. The "market risk adjusted" row contains the alphas relative to a single-factor model with the equally-weighted frontier market index as the risk factor. The region (country) neutral results have the same number of stocks from each region (country) in the top and bottom portfolios. The "largest 150" row contains the sample in which each month the largest 150 stocks are selected. The "value weighted" row contains the results in which portfolios are market capitalization weighted instead of equally weighted. The "one-month skip" row contains results that skip one month between ranking and portfolio formation. Finally, the sample is split in a half from the most and least liberalized countries according to three definitions of liberalization (Hertiage Foundation (HF), ETH Zurich (KOF), and Fraser Institute (EFW)). The split is in such a way that at each point in time about half the stocks are in the sample that is most liberalized, and half that is least liberalized.

	B/M		E/P		D/P	
Value effects	TMB	*t-value*	TMB	*t-value*	TMB	*t-value*
Frontier markets	1.40	*3.36*	1.53	*4.32*	0.59	*2.09*
Top-Minus-Index	0.65	*2.53*	1.25	*5.29*	0.41	*1.57*
Index-Minus-Bottom	0.76	*2.90*	0.28	*1.36*	0.18	*0.89*
Market risk adjusted	1.32	*3.20*	1.49	*4.05*	0.76	*2.95*
Region and country influences						
Region neutral	1.38	*4.41*	1.39	*4.04*	0.96	*4.30*
America	1.87	*2.44*	1.24	*1.77*	0.28	*0.45*
Europe	1.36	*2.25*	0.82	*1.29*	0.62	*1.29*
Africa	0.72	*1.85*	1.59	*3.02*	1.36	*3.56*
Asia	0.85	*1.03*	0.91	*1.39*	-0.03	*-0.07*
Country neutral	0.72	*3.05*	0.92	*2.88*	0.45	*2.64*
Proxies for liquidity						
Largest 150 stocks	1.15	*2.61*	1.19	*2.58*	0.85	*2.55*
Value weighted	1.66	*3.46*	2.06	*3.33*	0.99	*2.51*
One-month skip	1.62	*3.78*	1.51	*4.49*	0.65	*2.35*
Capital constraints						
HF: Most liberalized	1.38	*2.86*	1.08	*3.09*	0.50	*1.30*
Least liberalized	1.79	*2.43*	2.25	*3.41*	0.58	*1.73*
KOF: Most liberalized	1.23	*2.38*	0.80	*1.91*	0.35	*0.95*
Least liberalized	1.35	*2.01*	2.45	*4.09*	0.99	*3.22*
EFW: Most liberalized	1.13	*2.12*	0.76	*1.66*	0.90	*2.49*
Least liberalized	1.31	*2.16*	2.01	*4.14*	0.48	*1.40*

Table 3: Excess returns on momentum strategies for different formation and holding periods.

At the end of each month between January 1997 and October 2008, all stocks with return data are ranked in descending order according to their past returns for formation periods ranging from 1 to 36 months and holding periods ranging from 1 to 12 months. TMB contains the average monthly excess returns of the equally weighted top 20% minus bottom 20% portfolio and the corresponding t-values. T-values are corrected for heteroskedasticity and autocorrelation using Newey and West (1987).

			Holding period				
			1	3	6	9	12
Formation period	1	TMB	1.85	1.81	1.46	1.35	1.25
		t-value	*3.51*	*5.10*	*5.58*	*5.39*	*5.59*
	3	TMB	2.22	2.53	1.90	1.77	1.69
		t-value	*3.30*	*4.98*	*4.11*	*4.28*	*4.69*
	6	TMB	2.01	2.08	1.69	1.52	1.19
		t-value	*3.08*	*3.29*	*3.01*	*3.06*	*2.80*
	9	TMB	1.93	1.82	1.52	1.18	0.83
		t-value	*2.86*	*2.91*	*2.69*	*2.42*	*2.04*
	12	TMB	2.25	1.94	1.47	1.15	0.87
		t-value	*3.88*	*3.40*	*2.99*	*2.81*	*2.52*
	36	TMB	1.21	0.94	0.60	0.41	0.21
		t-value	*2.02*	*1.64*	*1.09*	*0.75*	*0.41*

Table 4: Excess returns of portfolios sorted on momentum characteristics

At the end of each month between January 1997 and October 2008, all stocks in the S&P Frontier BMI with return data are ranked in descending order according to their past returns for formation and holding periods of 1, 6, and 12 months. The columns TMB contain the average monthly percentage excess returns of the equally weighted top 20% minus bottom 20% portfolio and the corresponding t-values. T-values are corrected for heteroskedasticity and autocorrelation using Newey and West (1987). The rows with "top-minus-index" and "index-minus-bottom" split the results in excess returns of the top and bottom versus the equally weighted average. The "market risk adjusted" row contains the alphas relative to a single-factor model with the equally-weighted frontier market index as the risk factor. The region (country) neutral results have the same number of stocks from each region (country) in the top and bottom portfolios. The "largest 150" row contains the sample in which each month the largest 150 stocks are selected. The "value weighted" row contains the results in which portfolios are market capitalisation weighted instead of equally weighted. The "one-month skip" row contains results that skip one month between ranking and portfolio formation. Additionally, the sample is split in a half from the most and least liberalized countries according to three definitions of liberalization (Hertiage Foundation (HF), ETH Zurich (KOF), and Fraser Institute (EFW)). The split is in such a way that at each point in time about half the stocks are in the sample that is most liberalized, and half that is least liberalized. Finally, the last row indicates the results for the countries with a low individualism score.

	(1,1)		(6,6)		(12,12)	
Momentum effects	TMB	*t-value*	TMB	*t-value*	TMB	*t-value*
Frontier markets	1.85	*3.51*	1.69	*3.01*	0.87	*2.52*
Top-Minus-Index	1.35	*4.79*	1.12	*4.32*	0.59	*3.08*
Index-Minus-Bottom	0.50	*1.71*	0.58	*1.68*	0.28	*1.37*
Market risk adjusted	1.96	*3.49*	1.93	*3.39*	0.91	*2.77*
Region and country influences						
Region neutral	1.13	*2.70*	1.40	*3.33*	0.66	*2.15*
America	-0.87	*-0.99*	0.44	*0.88*	0.00	*-0.38*
Europe	0.53	*0.63*	1.15	*1.64*	-0.03	*-0.07*
Africa	2.81	*5.06*	2.16	*4.99*	1.66	*3.64*
Asia	1.23	*1.41*	1.62	*2.05*	1.59	*2.87*
Country neutral	-0.08	*-0.24*	0.50	*1.63*	0.23	*0.93*
Proxies for liquidity						
Largest 150 stocks	2.42	*5.01*	1.98	*4.19*	1.04	*2.90*
Value weighted	2.00	*4.22*	1.72	*3.12*	0.64	*1.44*
One-month skip	1.28	*2.33*	1.65	*3.62*	0.55	*1.69*
Capital constraints						
HF: Most liberalized	1.29	*2.26*	2.15	*4.66*	1.07	*3.38*
Least liberalized	1.96	*2.51*	1.20	*1.45*	0.40	*0.64*
KOF: Most liberalized	1.28	*2.61*	2.01	*3.98*	0.93	*2.56*
Least liberalized	2.07	*2.49*	1.34	*1.73*	0.67	*1.21*
EFW: Most liberalized	2.20	*3.32*	2.02	*3.50*	0.60	*1.22*
Least liberalized	1.23	*1.64*	1.16	*1.82*	0.95	*2.06*
Cultural individualism						
Low individualism	1.81	*2.91*	2.09	*3.22*	1.18	*2.28*

Table 5: Correlation between value and momentum strategies in frontier markets

The table contains the correlations between the monthly TMB excess returns of the value and momentum TMB strategies in frontier emerging markets. All value portfolios are formed as described in Table 2 and all momentum portfolios as in Table 4.

	Value			Momentum		
	B/M	E/P	D/P	(1,1)	(6,6)	(12,12)
B/M	1	0.26	0.14	0.16	-0.31	-0.44
E/P		1	0.22	-0.11	-0.09	-0.25
D/P			1	0.15	-0.06	-0.09
(1,1)				1	0.60	0.34
(6,6)					1	0.71
(12,12)						1

Table 6: Correlation between frontier, emerging, and developed market investment strategies

The first row contains the correlations between the equally-weighted market portfolios. The next rows contain the correlations of monthly excess returns of the value and momentum TMB portfolios between frontier markets (FM), emerging markets (EM) and developed markets (DM), for which we respectively use the S&P Frontier BMI, S&P/IFCI Emerging Markets and the FTSE World index. All value portfolios are formed as described in Table 2 and all momentum portfolios as in Table 4. The row denoted by "average" contains the average correlation of the value and momentum strategies. The table contains correlations over the full sample period January 1997 to October 2008 and two sub-samples January 1997 to December 2002 and January 2003 to October 2008.

	1997-2008		1997-2002		2003-2008	
	FM, EM	FM, DM	FM, EM	FM, DM	FM, EM	FM, DM
Market	0.49	0.43	0.08	-0.01	0.80	0.74
B/M	0.07	0.05	0.08	0.06	0.04	0.00
E/P	-0.10	-0.11	-0.20	-0.16	0.16	0.01
D/P	0.16	-0.04	0.09	-0.12	0.28	0.04
Average value	0.04	-0.03	-0.01	-0.07	0.16	0.02
(1,1)	-0.05	0.05	-0.10	-0.10	0.16	0.29
(6,6)	-0.13	0.15	-0.10	-0.05	0.01	0.20
(12,12)	0.05	0.01	0.04	0.01	0.05	0.02
Average momentum	-0.04	0.07	-0.05	-0.05	0.07	0.17

Table 7: Excess returns of characteristics-sorted portfolios applied to frontier, emerging, developed markets and diversified portfolios

This table reports the average monthly excess returns and the corresponding t-values of the TMB portfolio returns of the value and momentum strategies in frontier (FM), emerging (EM) and developed (DM) markets, for which we respectively use the S&P Frontier BMI, S&P/IFCI Emerging Markets and the FTSE World index. The last three columns report the returns of strategies that invest proportionally to the number of stocks available in the three indices. This means that frontier markets get a relatively small weight in the total portfolio (DM+EM+FM) of approximately 8%. Value portfolios are formed as described in Table 2 and momentum portfolios as in Table 4. The last row denotes the average number of stocks per month. T-values are corrected for heteroskedasticity and autocorrelation using Newey and West (1987).

		FM	EM	DM	EM+FM	DM+EM	DM+EM+FM
B/M	TMB	1.40	0.57	0.36	0.72	0.44	0.52
	t-value	*3.36*	0.90	*0.94*	*1.36*	*1.06*	*1.35*
E/P	TMB	1.53	0.59	0.42	0.76	0.49	0.57
	t-value	*4.32*	*1.83*	*1.38*	*2.90*	*1.87*	*2.38*
D/P	TMB	0.59	1.40	0.41	1.25	0.80	0.78
	t-value	*2.09*	*4.09*	*1.30*	*4.26*	*3.21*	*3.37*
(1,1)	TMB	1.85	0.55	-0.13	0.78	0.14	0.27
	t-value	*3.51*	*0.90*	*0.37*	*1.57*	*0.34*	*0.73*
(6,6)	TMB	1.69	1.20	0.79	1.29	0.95	1.01
	t-value	*3.01*	*1.97*	*1.97*	*2.59*	*2.42*	*2.77*
(12,12)	TMB	0.85	0.20	0.44	0.32	0.35	0.39
	t-value	*2.52*	*0.31*	*0.94*	*0.57*	*0.80*	*0.96*
Average # stocks		266	1239	1900			

Table 8: Mean-variance spanning tests for frontier value and momentum strategies

The table presents coefficient estimates and corresponding t-values from the regression equation that can be used to test for the existence of mean-variance spanning with a set of base assets: $R^e_{TMB,t} = \alpha + \beta_M \cdot R^e_{M,t} + \beta_{SMB} \cdot R^e_{SMB,t} + \beta_{HML} \cdot R^e_{HML,t} + \beta_{UMD} \cdot R^e_{UMD,t} + \varepsilon_t$, where $R^e_{TMB,t}$ is the return in month *t* of the top-minus-bottom portfolio of a particular strategy, $R^e_{M,t}$ the excess return of the equally-weighted equity markets portfolio in US dollars minus the 1-month US T-bill return in month *t*. $R^e_{SMB,t}$ (small-minus-big), $R^e_{HML,t}$ (high-minus-low), and $R^e_{UMD,t}$ (up-minus-down) are returns on respectively size, book-to-market, and momentum factor portfolios. Value portfolios are formed as described in Table 2 and momentum portfolios as in Table 4. t(.) is the t-value for the regression coefficients and are corrected for heteroskedasticity and autocorrelation using Newey and West (1987). Panel A takes as the set of base assets the four portfolios based on global developed equity markets and Panel B contains results based on base assets from global emerging equity markets.

	TMB	*t(TMB)*	α	*t*(α)	β_M	*t*(β_M)	β_{SMB}	*t*(β_{SMB})	β_{HML}	*t*(β_{HML})	β_{UMD}	*t*(β_{UMD})
Panel A: Global developed markets												
B/M	1.40	*3.36*	1.42	*3.05*	-0.03	*-0.18*	0.09	*0.45*	0.00	*-0.02*	-0.03	*-0.25*
E/P	1.53	*4.32*	1.51	*4.23*	0.16	*1.71*	0.13	*0.89*	-0.19	*-1.40*	0.02	*0.25*
D/P	0.59	*2.09*	0.67	*2.35*	-0.11	*-1.75*	-0.05	*-0.50*	0.00	*0.00*	-0.05	*-0.79*
(1,1)	1.85	*3.51*	2.09	*3.80*	-0.25	*-1.24*	-0.23	*-0.72*	0.06	*0.24*	-0.20	*-1.55*
(6,6)	1.69	*3.01*	1.96	*3.45*	-0.19	*-0.98*	0.04	*0.19*	-0.28	*-1.64*	-0.16	*-1.50*
(12,12)	0.87	*2.52*	0.91	*2.68*	0.01	*0.07*	0.04	*0.27*	-0.13	*-1.29*	-0.03	*-0.38*
			α	*t*(α)	β_M	*t*(β_M)	β_{SMB}	*t*(β_{SMB})	β_{HML}	*t*(β_{HML})	β_{UMD}	*t*(β_{UMD})
Panel B: Global emerging markets												
B/M	1.40	*3.36*	1.36	*3.12*	0.04	*0.47*	0.02	*0.13*	0.04	*0.38*	0.01	*0.20*
E/P	1.53	*4.32*	1.44	*3.95*	0.06	*1.11*	0.08	*0.63*	-0.04	*-0.54*	0.06	*1.06*
D/P	0.59	*2.09*	0.58	*2.04*	-0.08	*-2.03*	-0.08	*-0.70*	0.07	*1.13*	0.01	*0.16*
(1,1)	1.85	*3.51*	1.80	*3.50*	-0.15	*-1.19*	-0.22	*-1.14*	0.19	*1.49*	0.02	*0.28*
(6,6)	1.69	*3.01*	1.86	*3.40*	-0.17	*-1.65*	-0.26	*-1.44*	0.13	*1.39*	-0.13	*-1.92*
(12,12)	0.87	*2.52*	0.88	*2.61*	-0.02	*-0.24*	-0.10	*-0.81*	0.05	*0.75*	-0.04	*-0.88*

Figure 1: Data coverage of stock and firm characteristics

The bold black line represents the number of firms in the S&P Frontier BMI. The other lines represent the data availability for the book-to-market ratio (B/M), the earnings-to-price ratio (E/P), the dividend yield (D/P), and 1-month momentum (1MR).

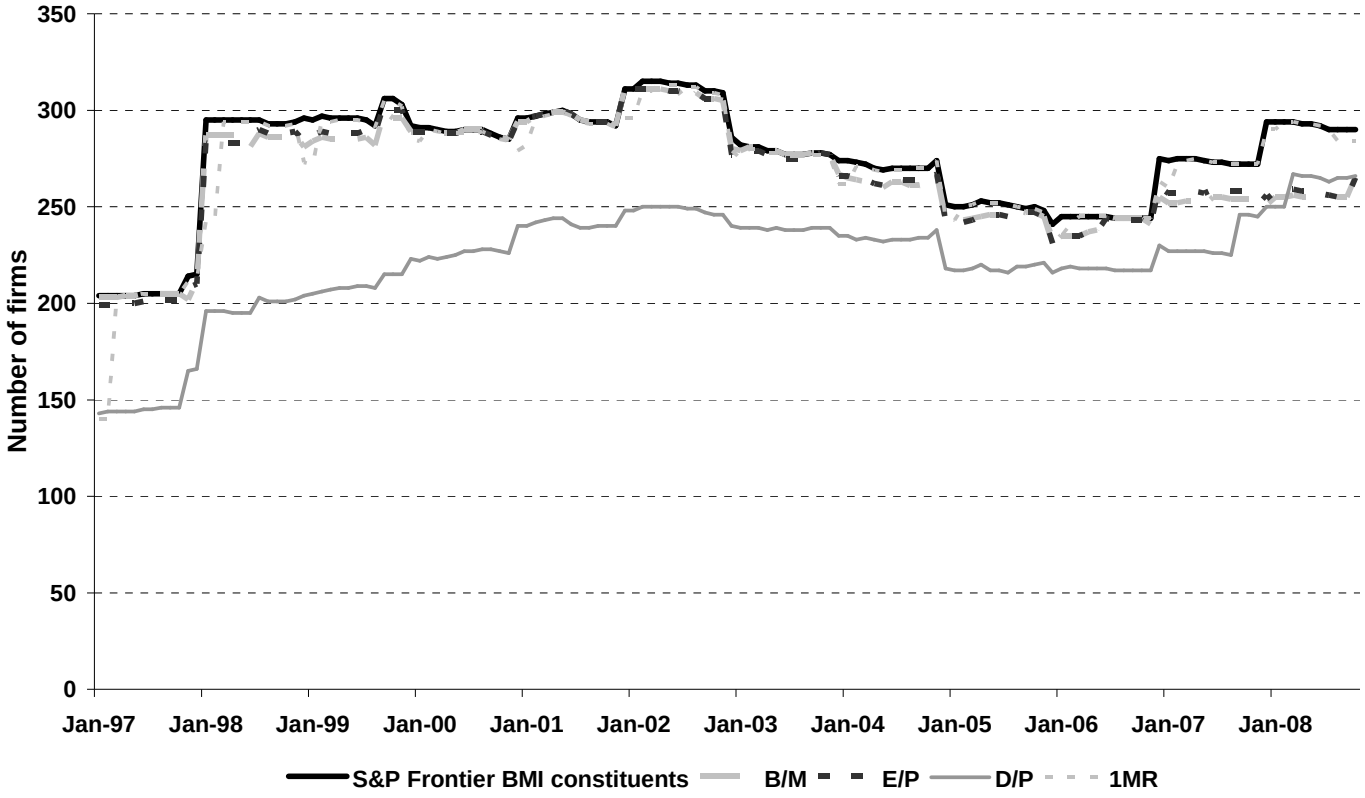


Figure 2: Cumulative excess returns of value portfolios for different holding periods

This figure shows the cumulative excess return of the top-minus-bottom (TMB) portfolio ranked on several characteristics for different holding periods after portfolio formation. Portfolios are formed as described in Table 2.

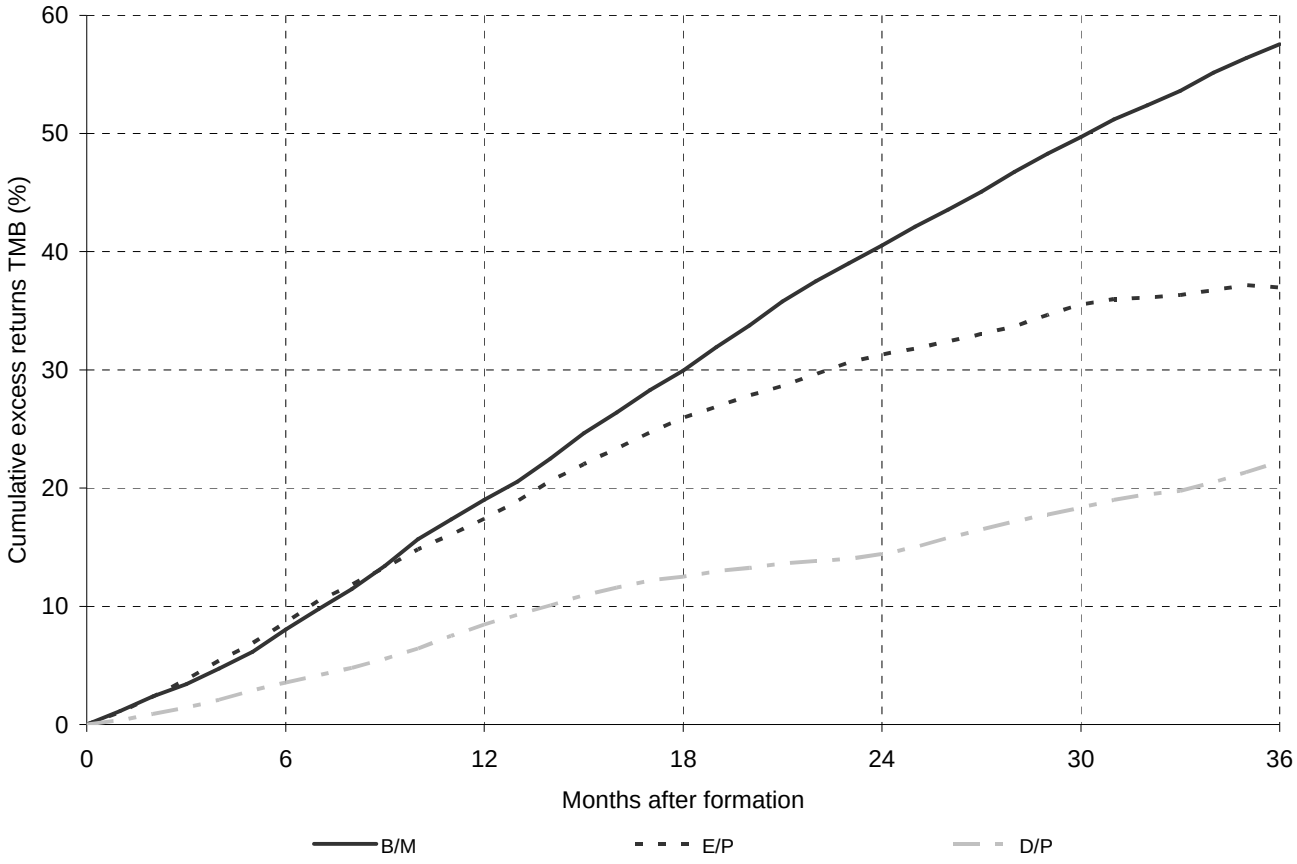


Figure 3: Cumulative excess returns of momentum portfolios for different holding periods

This figure shows the cumulative excess return of the top-minus-bottom (TMB) portfolio ranked on several characteristics for different holding periods after portfolio formation. Portfolios are formed as described in Table 4.

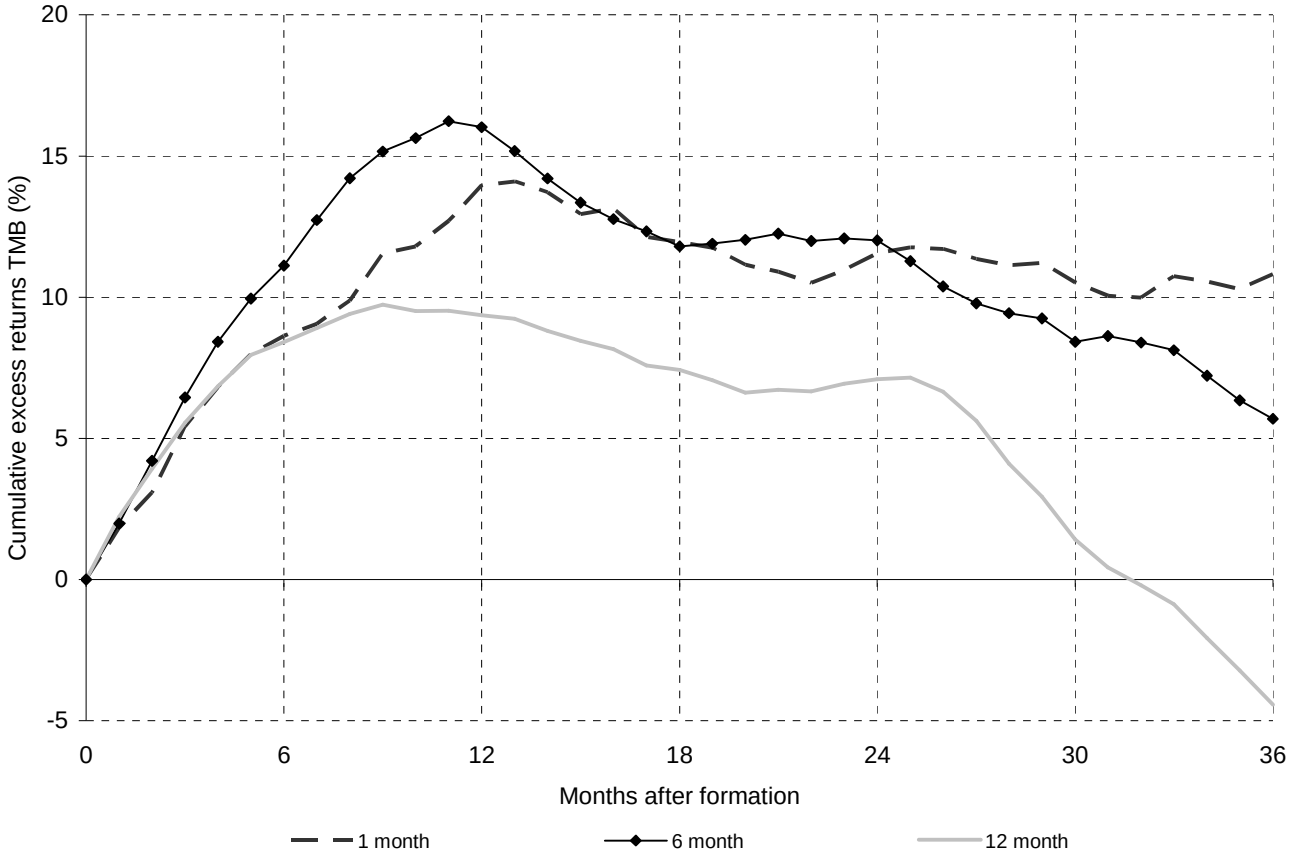
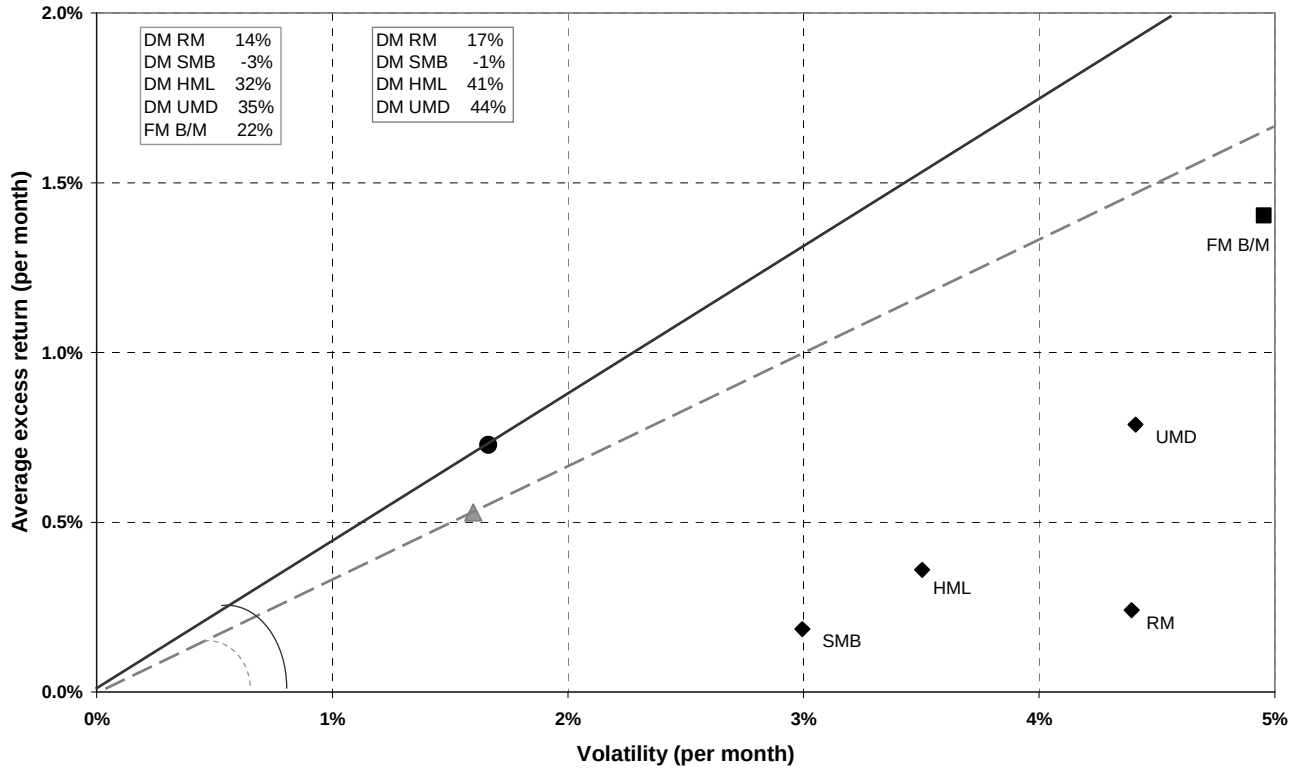


Figure 4: Mean-variance spanning tests for frontier markets B/M strategy.

This figure plots portfolios by their average excess return and volatility risk. The base assets are based on global developed markets and indicated with diamonds: RM is the market, SMB the size strategy, HML the value strategy, and UMD the momentum strategy. The dashed line is the mean-variance frontier of the four developed markets portfolios. The solid line is the mean-variance frontier with the four base assets from the developed markets (DM) and also the B/M value strategy based on frontier markets (FM), formed as described in Table 2. The stand-alone frontier market B/M strategy is indicated with a square. The portfolio weights from each of these lines are also displayed in the figure, scaled to sum to unity. These portfolios are indicated on the respective mean-variance frontiers with a triangle and circle.



Appendix A: Globalization scores for frontier market countries over time.

Panel A is based on the Index of Economic Freedom reported by The Heritage Foundation (HF), available at http://www.heritage.org. We report the average of the sub-indices Financial Freedom and Investment Freedom. Panel B is based on the KOF Index of Globalization constructed by the ETH Zurich (KOF), available at http://globalization.kof.ethz.ch. We report the Economic Globalization dimension scores. Panel C is based on the Economic Freedom of the World reported by Fraser Institute (EFW), available at http://www.freetheworld.com. The table reports the scores of the area Freedom to Trade Internationally. The column headers in the panels refer to the year the data have become available. We assume HF and KOF data have become available at the end of March every year, while EFW data have become available at the end of September every year. The last three rows show the average scores of frontier markets (FM), emerging markets (EM) based on stocks included in the S&P/IFCI Emerging Markets index and developed markets (DM) based on stocks in the FTSE World index.

Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Panel A: HF scores													
Bangladesh	50	50	50	40	40	40	40	40	40	20	30	25	20
Botswana	60	60	60	60	60	60	70	70	70	70	70	70	70
Bulgaria	60	50	50	60	60	60	60	50	60	60	70	60	60
Côte d'Ivoire	50	50	50	50	50	50	60	60	60	60	60	55	50
Croatia		50	50	50	50	50	50	50	60	60	60	55	55
Ecuador	60	60	60	60	60	50	50	50	50	40	40	45	45
Estonia		80	80	80	80	80	90	90	90	90	90	90	85
Ghana	50	50	50	50	50	50	50	50	50	40	50	50	50
Jamaica	70	70	70	60	60	50	60	80	80	80	80	70	70
Kazakhstan												45	45
Kenya	50	60	60	60	60	50	50	50	50	50	50	50	50
Latvia		70	70	70	70	70	70	70	70	70	70	70	70
Lebanon				60	60	60	60	60	60	50	50	50	50
Lithuania	40	60	60	60	60	60	60	70	80	80	80	75	75
Mauritius	-	-	-	60	60	60	60	60	60	60	60	65	65
Namibia				70	70	60	60	70	50	50	50	50	40
Panama												65	70
Romania		60	60	60	60	40	40	50	40	40	50	55	55
Slovakia									80	80	80	75	75
Slovenia	50	60	70	70	50	50	50	50	50	50	60	60	55
Trinidad and Tobago	80	80	80	80	80	80	70	70	70	70	70	70	70
Tunisia	70	70	70	60	60	60	60	50	50	30	30	30	30
Ukraine		40	40	40	40	40	40	40	40	40	40	40	40
Vietnam											30	30	30
average FM score	58	60	61	60	59	56	58	59	60	57	58	56	55
average EM score	58	58	60	59	57	55	57	54	53	51	50	50	52
average DM score	69	70	68	69	69	71	73	73	73	73	72	72	75

Appendix A: (continued)

Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Panel B: KOF scores													
Bangladesh	11	11	11	15	16	18	21	24	25	26	28	32	33
Botswana	52	54	59	61	64	64	64	67	73	76	74	72	65
Bulgaria	43	46	47	53	59	58	61	66	65	62	67	74	72
Côte d'Ivoire	31	34	34	34	36	39	41	45	44	45	45	45	48
Croatia		50	46	51	55	56	60	59	60	63	67	73	75
Ecuador	41	44	51	52	52	54	59	61	59	57	56	55	54
Estonia		76	76	78	87	86	87	89	90	89	91	93	92
Ghana	30	33	30	36	32	37	38	41	40	42	50	56	50
Jamaica	66	68	69	68	67	68	70	71	70	70	69	73	73
Kazakhstan												72	73
Kenya	40	38	37	32	33	32	32	33	32	34	39	37	37
Latvia		58	60	67	70	71	71	70	71	73	74	80	81
Lebanon				-	-	-	-	-	-	-	-	-	-
Lithuania	54	55	57	63	67	70	69	69	73	75	73	78	79
Mauritius	42	39	44	46	47	46	48	53	48	46	44	39	55
Namibia				56	55	56	50	55	54	60	57	59	59
Panama												79	78
Romania		34	36	41	46	50	51	54	54	54	56	65	69
Slovakia									78	72	68	89	87
Slovenia	52	52	52	56	59	59	59	63	66	69	73	79	79
Trinidad and Tobago	66	69	73	73	73	73	71	72	76	74	74	72	75
Tunisia	50	51	49	49	52	54	52	55	54	58	56	58	64
Ukraine		37	42	44	45	49	53	55	52	53	53	56	61
Vietnam											47	50	53
average FM score	44	47	49	51	53	55	56	58	59	60	60	65	66
average EM score	54	54	57	58	59	60	60	61	64	66	66	67	66
average DM score	72	74	74	75	77	80	81	84	81	80	80	79	79

Appendix A: (continued)

Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Panel C: EFW scores													
Bangladesh	1.8	3.1	3.1	3.1	3.1	3.1	5.1	5.4	5.6	5.4	5.4	5.5	5.9
Botswana	7.3	6.8	6.8	6.8	6.8	6.8	7.8	7.7	7.6	7.3	7.1	6.8	6.9
Bulgaria	4.3	6.9	6.9	6.9	6.9	6.9	7.2	7.1	6.7	7.2	7.3	7.2	7.7
Côte d'Ivoire	5.2	5.8	5.8	5.8	5.8	5.8	6.0	6.0	6.1	6.1	6.0	5.8	6.0
Croatia		6.0	6.0	6.0	6.0	6.0	6.2	6.5	6.4	6.6	6.7	6.5	6.7
Ecuador	5.8	6.7	6.7	6.7	6.7	6.7	7.1	7.0	6.5	6.5	6.6	6.7	6.6
Estonia		8.6	8.6	8.6	8.6	8.6	8.8	8.8	8.5	8.4	8.4	8.1	8.1
Ghana	5.0	5.8	5.8	5.8	5.8	5.8	7.2	7.3	6.9	7.2	7.1	5.6	7.0
Jamaica	5.4	7.5	7.5	7.5	7.5	7.5	7.2	7.2	7.0	6.7	6.9	6.9	7.0
Kazakhstan												7.1	6.9
Kenya	5.2	7.6	7.6	7.6	7.6	7.6	7.1	6.9	6.5	6.7	6.5	6.3	6.6
Latvia		8.0	8.0	8.0	8.0	8.0	7.2	7.6	7.4	7.5	7.4	7.4	7.4
Lebanon				-	-	-	-	-	-	-	-	-	-
Lithuania	-	8.2	8.2	8.2	8.2	8.2	7.3	7.8	7.7	7.6	7.5	7.5	7.5
Mauritius	5.6	7.2	7.2	7.2	7.2	7.2	6.8	7.0	6.5	6.3	6.1	7.2	7.4
Namibia				6.4	6.4	6.4	6.2	6.7	6.5	6.5	6.4	6.3	6.4
Panama												7.9	8.3
Romania		5.9	5.9	5.9	5.9	5.9	6.4	6.5	6.6	6.7	6.9	7.1	7.1
Slovakia									8.2	8.3	8.8	8.1	8.2
Slovenia	-	7.1	7.1	7.1	7.1	7.1	7.1	7.2	7.0	7.2	7.4	7.2	7.2
Trinidad and Tobago	3.9	7.3	7.3	7.3	7.3	7.3	6.7	7.2	6.9	6.9	7.1	6.9	7.1
Tunisia	6.0	6.2	6.2	6.2	6.2	6.2	6.0	6.4	6.0	6.0	6.2	6.0	6.2
Ukraine		6.2	6.2	6.2	6.2	6.2	7.0	6.8	7.1	6.9	7.0	6.5	6.4
Vietnam										6.8	6.7	6.6	6.9
average FM score	5.0	6.7	6.7	6.7	6.7	6.7	6.9	7.0	6.9	6.9	6.9	6.8	7.0
average EM score	5.9	5.9	5.8	5.8	5.8	5.8	6.7	7.1	7.2	7.1	7.1	7.2	7.1
average DM score	7.7	7.7	7.7	7.6	7.6	7.6	7.9	8.3	8.2	7.9	7.9	7.8	7.4

Appendix B: Individualism scores for frontier countries

Data on individualism obtained from www.geert-hofstede.com. The scores are displayed for the frontier countries for which the data is available. The group with low-individualism scores are all countries, except for Estonia, Jamaica, Lebanon, and Slovakia (in black), who have a score above the threshold of 32 that is the cut-off point of the bottom individualism group in Chui, Titman, and Wei (2010).

Country	Score	Country	Score
Bangladesh	20	Lebanon	38
Botswana	-	Lithuania	-
Bulgaria	30	Mauritius	-
Croatia	-	Namibia	-
Ecuador	8	Panama	11
Estonia	60	Romania	30
Ghana	20	Slovakia	52
IvoryCoast	-	Slovenia	-
Jamaica	39	Trinidad & Tobago	16
Kazakhstan	-	Tunisia	-
Kenya	27	Ukraine	-
Latvia	-	Vietnam	20
Average frontier markets below treshhold 32			20
Average bottom individualism Chui et al (2010)			22
World average as reported by Hofstede (2001)			43

Appendix C: Mean-variance spanning tests for frontier value and momentum strategies relative to US domestic investment portfolios.

Panel A of the table presents coefficient estimates and corresponding t-values from the regression equation that can be used to test for the existence of mean-variance spanning with a set of base assets: $R^e_{TMB,t} = \alpha + \beta_M \cdot R^e_{M,t} + \beta_{SMB} \cdot R^e_{SMB,t} + \beta_{HML} \cdot R^e_{HML,t} + \beta_{UMD} \cdot R^e_{UMD,t} + \varepsilon_t$, where $R^e_{TMB,t}$ is the return in month *t* of the top-minus-bottom portfolio of a particular strategy, $R^e_{M,t}$ the excess return of the US equity market portfolio in US dollars minus the 1-month US T-bill return in month *t*. $R^e_{SMB,t}$ (small-minus-big), $R^e_{HML,t}$ (high-minus-low), and $R^e_{UMD,t}$ (up-minus-down) are returns on US size, book-to-market, and momentum factor portfolios. Value portfolios are formed as described in Table 2 and momentum portfolios as in Table 4. Data on the US-based portfolios are from the online data library of Kenneth French. t(.) is the t-value for the regression coefficients and are corrected for heteroskedasticity and autocorrelation using Newey and West (1987). In Panel B we add as a fifth factor the traded liquidity factor (LIQ PS), obtained from the website of Luboš Pástor. Details on the liquidity factor can be found in Pastor and Stambaugh (2003). In Panel C, we add the non-traded fixed-transitory (LIQ S-FT) and variable-permanent (LIQ S-VP) liquidity factors, obtained from Ronnie Sadka and described in more detail in Sadka (2006).

			α	$t(\alpha)$	β_M	$t(\beta_M)$	β_{SMB}	$t(\beta_{SMB})$	β_{HML}	$t(\beta_{HML})$	β_{UMD}	$t(\beta_{UMD})$	$\beta_{LIQ\ PS}$	$t(\beta_{LIQ\ PS})$	$\beta_{LIQ\ S\text{-}FT}$	$t(\beta_{LIQ\ S\text{-}FT})$	$\beta_{LIQ\ S\text{-}VP}$	$t(\beta_{LIQ\ S\text{-}VP})$
Panel A: US; Market, Size, Value, and Momentum																		
B/M	1.40	*3.36*	1.31	*3.10*	-0.02	*-0.22*	0.14	*1.23*	0.20	*1.47*	-0.03	*-0.30*						
E/P	1.53	*4.32*	1.57	*4.50*	0.09	*0.97*	0.02	*0.26*	-0.02	*-0.18*	-0.05	*-1.03*						
D/P	0.59	*2.09*	0.65	*2.38*	-0.09	*-1.63*	0.03	*0.67*	-0.06	*-0.87*	-0.03	*-0.63*						
(1,1)	1.85	*3.51*	1.94	*3.62*	-0.12	*-0.60*	-0.18	*-1.29*	0.02	*0.08*	-0.04	*-0.50*						
(6,6)	1.69	*3.01*	1.87	*3.33*	-0.13	*-0.72*	-0.12	*-1.18*	-0.25	*-1.65*	-0.03	*-0.43*						
(12,12)	0.87	*2.52*	0.96	*2.88*	-0.04	*-0.33*	-0.05	*-0.54*	-0.16	*-1.44*	-0.03	*-0.59*						
Panel B: US; Market, Size, Value, Momentum, and Liquidity (PS)																		
B/M	1.40	*3.36*	1.23	*2.74*	-0.06	*-0.51*	0.13	*1.14*	0.17	*1.26*	-0.02	*-0.34*	0.10	*0.70*				
E/P	1.53	*4.32*	1.50	*4.02*	0.05	*0.51*	0.01	*0.14*	-0.05	*-0.44*	-0.05	*-1.09*	0.10	*0.87*				
D/P	0.59	*2.09*	0.64	*2.27*	-0.10	*-1.48*	0.03	*0.62*	-0.07	*-0.85*	-0.03	*-0.63*	0.01	*0.17*				
(1,1)	1.85	*3.51*	1.84	*2.94*	-0.17	*-0.89*	-0.20	*-1.31*	-0.03	*-0.16*	-0.05	*-0.53*	0.14	*0.72*				
(6,6)	1.69	*3.01*	1.85	*3.09*	-0.14	*-0.81*	-0.13	*-1.19*	-0.26	*-1.65*	-0.03	*-0.44*	0.02	*0.17*				
(12,12)	0.87	*2.52*	1.03	*2.96*	0.00	*-0.01*	-0.04	*-0.44*	-0.13	*-1.14*	-0.03	*-0.57*	-0.09	*-0.81*				
Panel C: US; Market, Size, Value, Momentum, and Liquidity (Sadka)																		
B/M	1.40	*3.36*	1.35	*3.42*	-0.09	*-0.88*	0.10	*0.82*	0.06	*0.42*	-0.07	*-1.02*			0.05	*2.80*	0.01	*1.73*
E/P	1.53	*4.32*	1.62	*4.96*	0.04	*0.44*	0.00	*-0.05*	-0.10	*-1.26*	-0.08	*-1.83*			0.02	*0.58*	0.01	*2.20*
D/P	0.59	*2.09*	0.64	*2.31*	-0.10	*-1.66*	0.02	*0.42*	-0.09	*-1.08*	-0.03	*-0.65*			0.02	*1.31*	0.00	*-0.10*
(1,1)	1.85	*3.51*	1.85	*3.67*	-0.07	*-0.45*	-0.19	*-1.35*	0.03	*0.13*	-0.01	*-0.11*			0.04	*1.23*	-0.02	*-1.17*
(6,6)	1.69	*3.01*	1.77	*3.22*	-0.05	*-0.40*	-0.11	*-1.08*	-0.18	*-1.20*	0.03	*0.40*			0.01	*0.50*	-0.02	*-1.83*
(12,12)	0.87	*2.52*	0.95	*2.84*	-0.01	*-0.15*	-0.03	*-0.38*	-0.12	*-1.08*	-0.01	*-0.29*			-0.01	*-0.83*	0.00	*-0.77*