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Robustness of size and value effects in emerging equity markets, 1985–2000

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Abstract

We examine the robustness of size and book-to-market effects in 35 emerging equity markets during 1985–2000. Mean returns for high book-to-market firms significantly exceed mean returns for low book-to-market firms. These findings are robust to tests that control for size effects and that remove extreme returns. Similarly, mean returns for small firms exceed mean returns for large firms. But, the firm size results lack robustness to the removal of extreme returns. Moreover, significant size effects are found in tests that define firm size relative to the local market average, but generally are not found in tests that use absolute firm size. Our findings are confirmed by cross-sectional regressions that control for systematic risk at the global and local levels.

Keywords: Book-to-market; Market capitalization; Emerging equity markets; Robustness

1. Introduction

Fama and French (1992, 1996, 1998) examine a number of securities markets and show that the common stocks of small firms generally provide higher mean returns than do the stocks of large firms and that stocks with low market price compared to book value, earnings, dividends, or cash flow generally outperform those at the

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opposite end of the value scale. These empirical observations are known as the firm size (or 'size') and book-to-market equity ('BE/ME' or 'value') effects. The work of Fama and French, and of others who have addressed size and BE/ME issues, challenges the validity of the Capital Asset Pricing Model (CAPM) because under the CAPM the only risk factor that affects the expected return of a security is the security's systematic risk, commonly measured by beta. Size and BE/ME effects are anomalies relative to the CAPM. Accordingly, the validity of size and BE/ME effects (as well as other empirical anomalies) is a controversial issue in empirical finance.[1]

The validity of size and BE/ME effects has been questioned by a number of scholars.[2] One approach has been to ask whether the effects hold generally or if they sample-specific; for example, Black (1993) and MacKinlay (1995) raise these issues. Early evidence on the size and BE/ME effects relied on Compustat-based samples. Davis (1994) provides evidence consistent with the value and size factors based on data that predates the Compustat tapes. Kim (1997) finds value and size effects remain after testing a sample that includes all non-Compustat firms.

Fama and French (1998) address the sample-specific nature of their results by studying global equity markets. They provide evidence on 13 developed countries over 1975–1995 and find statistically significant BE/ME and other value effects in 12 of them.[3] They also examine data on 16 emerging markets. They point out that

[1] Empirical research has identified a number of factors that are associated with observed stock returns. These factors include: firm size (Banz and Rolf, 1981; Reinganum, 1982; Keim, 1983 and Fama and French, 1992); the ratio of price to earnings (Basu, 1997, 1983; Reinganum, 1981 and Cook and Rozeff, 1984); the ratio of price to book value (Rosenberg et al., 1985; Fama and French, 1992 and Hawawini and Keim, 1991, trading volume (Roll, 1981); and momentum (Brennan et al., 1998), among others. Loughran (1997) observes seasonality in the BE/ME factor and notes that small growth stocks have especially low returns in the United States.

[2] For example, Berk and Jonathan (1995, 1997) argue that a firm's market value measures risk and, thus, that the existence of market value effects does not invalidate the CAPM. He develops a theory arguing that the market value of the firm predicts expected returns because market value is negatively related to the unmeasured risk of the firm, and he shows that after controlling for size as measured by market value, other size proxies such as book value of assets and sales are unrelated to average returns. Black (1995) warns against using models based solely on empirical observations but which lack theoretical motivation. To provide a rationale for the value premium, Fama and French (1995) show that firms with high BE/ME ratios often are distressed firms, characterised by depressed earnings and highly uncertain future earnings. Chen and Zheng (1998) find that value stocks are characterized by high financial risk, high earnings uncertainty and high distress (proxied by frequency of dividend cuts). In contrast, Daniel and Titman (1997) contend that the risk model cannot be distinguished from a behavioral overreaction model (see De Bondt and Thaler, 1985, 1987) since both models are consistent with relative distress compensation factors. Davis et al. (2000) address this dilemma by showing that the size and BE/ME patterns in average returns are better explained by rational compensation for risk than by an overreaction hypothesis. Taking a different approach, Chan et al. (1998) examine the ability of different factors to explain correlations across stocks returns. The authors find that firm size and BE/ME are two of the more important sources of covariation among stock returns for the US, UK and Japanese equity markets. These findings support the argument that size and BE/ME proxy for priced risk factors.

[3] Similarly, Arshanapalli et al. (1998) examine 18 global stock markets and find superior performance associated with size and BE/ME.

security returns in emerging markets are generally leptokurtic and right skewed, so they stress that statistical inference can be 'hazardous.' Nevertheless, they conclude that the evidence is generally consistent with the existence of value effects based on the BE/ME measure. They note that equity portfolios with low BE/ME outperformed high BE/ME portfolios in 12 of the 16 countries they examined.[4] Evidence on size in their sample is less pronounced (differences in returns across extreme size portfolios are less than two standard deviations from zero).

Patel (1998) and Rouwenhorst (1999) support the findings of Fama and French (1998) by finding a premium for value stocks and small firms in emerging markets. Hart et al. (2001) also report a significant value effect as well as momentum and earnings revision effects in emerging markets, and they find that these strategies could be implemented in practice by large investors even after considering the practical difficulties and costs of trading in emerging markets. However, they find no significant firm size effect, and the direction of the effect changes when they impose a minimum capitalization requirement.[5] Achour et al. (1998, 1999a,b,c) provide a comprehensive examination of stock selection strategies based on fundamental, expectation and technical factors within Mexico, South Africa and Malaysia.[6] In their 1998 paper, they find strong value effects in South Africa and Malaysia. No value effects are found in Mexico. Their value factors include BE/ME, trailing earnings yield, prospective earnings yield and cash earnings-to-price yield.

Claessens et al. (1993, 1995, 1998) also examine market anomalies in emerging markets.[7] They find that portfolio returns in most of the markets are non-normal

[4] Fama and French's results on value are less prominent when the proxy for 'value' is the price-to-earnings ratio instead of BE/ME; see Fama and French (1998, p. 1996).

[5] Hart et al. (2001) also find selection strategies of high earnings to price and stocks with positive analysts' earnings revisions to carry a premium. Results from their momentum strategy are mixed depending on the type of investment strategy employed. A multivariate strategy combining value, momentum and earnings revisions improves results. They find it is best to apply these results to all emerging markets, as opposed to country by country.

[6] They consider BE/ME, cash flow-to-price, earnings-to-price, earnings-to-price, dividends-to-price, earnings growth, revenue growth, debt/equity ratios, return on equity, market capitalization, prospective earnings-to-price, IBES revisions, prospective earnings growth and a number of momentum measures.

[7] Fama and French (1998) address the differences between their results and those of Claessens et al. (1998) for emerging markets. They suggest that differences in sample periods might explain some of the differences in results but that differences in estimation techniques are likely the main explanation. They argue in particular that cross-sectional regressions (the main methodology used by Claessens et al., 1998) are sensitive to outliers and that such outliers are common in emerging markets. In contrast, the methodology used by Fama and French is based on differences in returns across portfolios formed on the basis of a single factor at a time. Another difference between tests based on differences in returns for ranked portfolios and cross-sectional regressions is that the regressions make an explicit assumption about functional form (e.g. effects are linear) while portfolio differences do not assume such forms. Durham (2000) argues that studies that have reported statistically significant anomalies in emerging equity markets suffer from specification bias. He suggests applying extreme bound analysis as a remedy. He examines 16 emerging markets over 1988–1995, finding price-to-book, country risk and relative market size to have robust effects on returns.

and that beta is generally insignificant in explaining returns. They observe inconsistent size effects and conclude that the size effect does not seem to prevail in emerging markets to the degree that it has in developed markets. They find evidence of strong BE/ME effects, but the direction of the effect is often the reverse of Fama and French (1998), Patel (1998), Rouwenhorst (1999), Hart et al. (2001) and of earlier work on developed markets.[8] Fama and French (1998) point out that the differences may be due to the different sample periods used, but is more likely due to the different methodologies employed and the effects of outliers. Shumway (1997) and Shumway and Warther (1999) examine the bias in returns caused by omitting the post-delisting returns of stocks that are delisted for negative performance reasons from the NYSE or NASDAQ. Shumway (1997) finds that delisting has especially important effects on size-based returns but not on book-to-market-based returns for NYSE stocks. Shumway and Warther (1999) find that the size effect disappears entirely from NASDAQ data when they correct for the delisting bias. They conclude, 'Consequently, there is no evidence that there ever was a size effect among Nasdaq stocks.' (Shumway and Warther (1999, p. 2378).

A similar argument is made in Bossaerts and Fohlin (2000) in their study of German stocks over the period 1881–1913. They observe a size effect within the German data, but they argue the effect is likely caused by selection bias. It disappears later in their sample. Moreover, they find a BE/ME effect, but they point out that the direction of the effect is opposite the effect observed in recent US data (i.e. in their sample, growth stocks outperform value stocks).

Controversy remains over the existence and importance of size and book-to-market effects in financial markets. In this paper, we provide new evidence about the size and BE/ME effects in emerging market returns. We perform a comprehensive analysis, focusing on the robustness of the estimated premiums for size and BE/ME, and use a more extensive sample than has been used in prior work on emerging markets. Our sample uses data over a 15-year period from 35 emerging markets; previous tests of size and value effects have been limited to 10 years of data and examine one market at a time. Because of the high volatility of emerging markets, it is especially important to examine longer sample periods. We also provide evidence based on a variety of empirical methods designed to overcome concerns raised about the methodologies used in earlier tests. We perform our tests on portfolios, which lessens the effects of outliers. We provide evidence based on standard *t*-tests, but we also conduct non-parametric statistics that are unaffected by non-normality in the data. We use: univariate portfolio tests; multivariate portfolio tests (portfolios based on one factor are formed within portfolios based on the other factor); tests including all data vs. tests excluding extreme returns;

[8] Additional evidence from emerging markets includes Herrera and Lockwood (1994), who show that the relationship among average returns, beta and firm size for Mexican firms is nearly identical to that of a matched set of NASDAQ firms, and Chui and Wei (1998) who examine five Pacific Basin emerging markets over 1977–1993 and report a weak beta effect and significant BE/ME and size effects.

tests on subperiods within the entire sample period and that control for seasonality effects; tests based on cross-sectional returns (with and without the extreme returns) before and after controlling for beta risk relative to local and global markets; and tests employing relative as well as absolute size measures. Thus, we provide a comprehensive set of results designed to examine the robustness of the conclusions we can reach regarding size and value effects in emerging markets.

We find evidence of a strong and persistent book-to-market effect in which mean returns for high book-to-market (value) firms significantly exceed mean returns for low book-to-market (growth) firms. These findings hold consistently across parametric and non-parametric tests that examine book-to-market independently and that control for firm size. Similarly, when defining firm size relative to local market average size, mean returns for small firms significantly exceed mean returns for large firms. The results are not driven by January effects. Our findings hold after controlling for book-to-market effects using parametric tests, but the results using non-parametric tests are mixed. When using absolute firm size, the firm size premium often disappears. Our findings are confirmed by cross-sectional regressions that control for systematic risk at the global and domestic levels.

We re-examine all results after omitting observations with returns in the upper or lower 1% tails of the distribution of returns. This approach addresses the concerns of Fama and French (1998) with outliers. In univariate and multivariate portfolio tests with extreme returns removed, we continue to find strong BE/ME effects, but the size effects are appreciably diminished or missing altogether.

Our results consistently point to a robust BE/ME effect in emerging markets with and without extreme returns. The size effect is generally present when measuring size in terms relative to a firm's local market, and when extreme returns are included, but is generally not observable if extreme returns are omitted, or if size is measured in absolute terms. Therefore, our findings provide important out-of-sample evidence of a return premium for value stocks. The robustness of our results, combined with results of studies on other markets, demonstrates that value effects persist around the world and that BE/ME partially explains differences in average returns. These results are particularly important because the BE/ME factor also has been shown to explain covariation among stocks in various markets and has been used to proxy for distress risk.[9] Thus, the BE/ME factor appears to pass the robust acid test for inclusion in multifactor pricing models.

The plan of the paper is as follows. In Section 2 we identify the data sources used in the study and present an overview of the properties of the sample. Section 3 provides results based on analyses of portfolios formed on the basis of only one factor at a time. Section 4 presents results for portfolios formed jointly on the basis of size and BE/ME. Section 5 describes results of our cross-sectional regression tests. Section 6 provides results in which absolute size is used rather than relative size. Section 7 summarizes the results of the paper.

[9] See Fama and French (1995) and Chan et al. (1998).

2. Data and methodology

We use Standard and Poor's Emerging Markets Data Base (2000) (EMDB), previously distributed by the International Finance Corporation. We use monthly data from this database on individual stocks in 35 emerging markets. The database contains historical prices, currency exchange rates, numbers of shares outstanding, earnings, dividends and other accounting and market data. We observe market capitalization (size) and book-to-market (BE/ME) ratios at the individual firm level and use those data to construct portfolios across the full set of emerging markets in the EMDB to test for size and BE/ME effects. We also provide cumulative returns over the sample period for portfolios based on size and BE/ME.

The sample period spans January 1985 through July 2000. The database provides coverage for approximately 2000 EM firms, but it is not exhaustive by any means. For example, the Emerging Stock Markets Factbook (2000) indicates that 487 companies were listed on the two principal Brazilian exchanges at the end of 1999, but only 90 were included in the EMDB.

We compute monthly returns for each firm in the EMDB as follows:

$$R_t = \frac{(P_t \times \text{Cap.Adj.}_t \div \text{Exch.Rt.}_t) + (\text{Div.}_t \div \text{Exch.Rt.}_t)}{(P_{t-1} \div \text{Exch.Rt.}_{t-1})} - 1 \tag{1}$$

where the adjustment for stock splits and rights offerings (Cap.Adj.), Exchange Rate (Exch.Rt.), Dividend (Div.) and stock price (P) are all obtained from the EMDB. All returns are denominated in US dollars, so historical prices in local currencies are adjusted for the exchange rate between the local currency and the US dollar. We use the EMDB to calculate size, and the database includes BE/ME ratios.

We report results based on relative BE/ME and both relative and absolute size. 'Relative BE/ME' for a stock is BE/ME for the stock divided by the average BE/ME ratio in the same market as the stock and for the same month. We use relative BE/ME instead of absolute BE/ME for a stock because accounting systems vary widely across the 35 markets in our sample.[10] For example, Latin American markets tend to use inflation accounting in constructing book values of assets and liabilities. Many markets do not. Thus, book value is measured differently in different markets, and it follows that while a given BE/ME value in one market is comparable to other BE/ME values in the same market, it is generally not comparable to a BE/ME value in a distinct market. Accordingly, we adjust BE/ME to account for these differences in accounting treatment. We refer to the resulting value as 'relative BE/ME' or just BE/ME for brevity.

[10] This is similar to the relative BE/ME measure used by Cohen and Polk (1997) to adjust for differences in accounting practice across industries within the US market.

Initially, we define size for each firm relative to each firm's local market average. Unlike BE/ME, which suffers from incomparability across markets due to differences in accounting, size is entirely comparable across markets: \$100 million in Brazil is exactly the same value as \$100 million in Zimbabwe. However, if size matters at the local level, then using absolute size in portfolios may mask the effect that size has in distinct markets and in fact could capture differences in performance across markets rather than the effect of size per se. For example, the average size of a stock in Brazil in our data is \$1.7 billion. The largest stock from Zimbabwe in our data is \$1.5 billion. If there is a local size effect due to the behavior of local investors in Zimbabwe and also a local size effect due to the behavior of local investors in Brazil, the use of absolute size in forming composite portfolios based on size could confound those effects. The use of relative size allows us to aggregate the relatively large stocks in Zimbabwe with those from Brazil, and so on, and that will provide us with more powerful tests of the size effect.

In Section 6 of the paper, we also report results using absolute size, or size not adjusted by the average size in the local market. The choice of relative size vs. absolute size is ultimately a question of the degree to which emerging capital markets are integrated globally. In a perfectly integrated global capital market in which investors freely select from among all securities in global markets, absolute size would be the preferred measure of size. If, alternatively, global capital markets were completely segmented, relative size would be the appropriate measure to employ in testing for the existence of a size effect. We provide results based on both measures.[11]

Portfolios are constructed as follows. First, for each month, the size of each stock is computed as the product of stock price and number of shares outstanding.[12] Second, the relative size of each stock is computed as the ratio of the stock's size to the average size of all stocks (in the EMDB) in that stock's local market. Third, relative size quintiles are formed across all 35 markets. That is, the first size quintile consists of the 20% of all firms in the database that rank smallest in relative size as measured in US dollars. We refer to the first portfolio as the small firm portfolio.

We also create relative BE/ME portfolios. Similar to the relative size calculation, for each firm and for each month, we calculate the relative BE/ME as the ratio of the firm's BE/ME to the average BE/ME in the firm's local market. For each month all stocks in the database are ranked by their relative BE/ME ratios and assigned to BE/ME quintiles. The lowest BE/ME portfolios are referred to as 'growth' portfolios, and the highest are referred to as 'value' portfolios.

[11] Solnik (2000, p. 172) concludes on the basis of recent research in international finance that the assets of developed securities markets are priced in an integrated global capital market but that constraints in emerging markets are still serious and limit the degree of integration of these markets.

[12] If a firm has multiple classes of stock, we sum the market capitalizations of all classes to arrive at the overall firm size.

In addition to univariate tests, we present results based on portfolios that are formed using both relative size and relative BE/ME rankings. In these results, BE/ME effects can be examined controlling for size and vice versa. Each holding period, firms within each size quintile are ranked on BE/ME and assigned to BE/ME quintiles. This process is repeated for each size quintile. Thus, 25 portfolios are produced per year: Five size categories are established, and then five BE/ME quintiles are constructed within each size quintile.[13] Returns are equally weighted across firms within each portfolio. Differences in returns across the size BE/ME portfolios are used to infer the independent effects of firm size and book-to-market on equity returns.

Results are presented for portfolios rebalanced once per year. For portfolios formed on firm size, stocks are classified in May of year t, and the portfolios are held for the next 12 months through May of year $t+1$. This process is repeated every year. We use May rather than December to classify stocks on firm size to avoid possible year end firm size bias when forming portfolios. To avoid conflicts with reporting lags in accounting data, we use a 7-month lag for all BE/ME tests to assure that the book value data were available to market participants.[14] Thus, all BE/ME portfolios are formed using 7-month-old relative BE/ME values and they are then held for the subsequent 12-month holding period.

Table 1 presents descriptive data for 35 emerging markets. Fifteen of the markets have data available starting in or after 1993; only four markets have data all the way back to 1985. The number of firms with data available varied widely both within and across markets. For example, data were available for only one stock at the start of China's data period, but by the end of 1996, China had more stocks in the EMDB (180) than any other market. Thus, over time a great deal more information has become available. Our results generally treat each month's data equally, i.e. we do not weigh the returns across time in any way to account for differences in number of portfolio firms at different points in time. Of course, since return variances will be lower on more diversified portfolios, there is an implicit time weighting effect. Unfortunately, the effect may be the reverse of what we would hope. In earlier periods, when there is less information, portfolio returns tend to be more extreme and, hence, can affect the final results more than would later, lower risk and less extreme portfolio returns.

Firm sizes are reported in millions of US dollars. Sizes vary widely. For seven markets, the average market capitalization is less than \$100 million, while for South Africa the average firm size is slightly more than \$2 billion. Taiwan and

[13] To illustrate, consider a month in which 1000 stocks are in the database and have all necessary data. We first form size portfolios of 200 stocks each based on size, and then within each size category we form BE/ME portfolios of 40 stocks each. Of course, in most cases the number of stocks is not conveniently divisible by 25, so there will be minor differences in numbers of stocks in the different portfolios.

[14] Fama and French (1992) also use a similar lag for identical reasons in their examination of US markets.

Table 1
Descriptive statistics for 35 emerging markets, 1985–2000

Market	Start date	Mean BE/ME	Mean size ($US)	Median size ($US)	S.D. BE/ME	S.D. size ($US)	Min BE/ME	Min size ($US)	Max BE/ME	Max size ($US)
Europe										
Czech Rep.	Jul 94	2.14	198.24	54.41	2.96	490.70	(0.26)	0.38	33.33	5111.53
Greece	Apr 87	0.53	530.03	179.45	0.47	1320.76	0.00	6.04	6.25	15 162.81
Hungary	Jun 93	0.85	387.51	76.61	0.77	1023.58	0.08	2.54	5.56	9643.34
Poland	Jun 93	0.70	310.22	125.27	0.53	866.40	0.04	5.04	7.69	12 815.11
Portugal	Jul 86	0.76	526.70	169.72	0.65	1145.86	0.00	5.57	8.33	15 785.15
Russia	Jul 96	7.23	1481.01	271.78	14.37	3417.56	0.01	2.92	100.00	35 307.54
Slovakia	Jul 96	3.88	60.01	21.24	6.79	95.71	(33.33)	0.47	50.00	552.39
Turkey	Mar 89	0.40	559.21	172.46	0.43	1074.71	(0.11)	1.55	5.88	15 392.49
Latin America										
Argentina	Oct 86	2.26	535.68	138.63	5.20	1117.19	(5.56)	0.16	100.00	13 240.53
Brazil	Oct 86	2.33	1766.98	330.72	3.18	4111.78	(10.00)	0.72	50.00	48 723.55
Chile	Jul 86	0.91	836.16	356.28	0.87	1228.10	0.04	4.69	16.67	8324.52
Colombia	Jul 85	1.97	228.99	80.92	4.13	332.19	0.01	1.77	100.00	2957.22
Mexico	Oct 86	1.01	1509.17	441.08	2.40	3141.09	(50.00)	3.68	50.00	35 490.64
Peru	Jun 93	0.93	304.97	48.37	1.41	530.29	0.05	0.65	20.00	3921.88
Venezuela	Sep 86	1.53	274.45	122.27	3.31	389.17	0.00	1.80	50.00	3278.92
Middle East										
Bahrain	Jul 99	1.82	361.84	167.01	3.78	475.99	0.07	13.93	20.00	1671.09
Israel	Jul 97	0.85	726.00	417.12	0.44	828.37	0.08	27.34	3.45	6942.05
Jordan	Jan 87	0.82	82.22	21.92	0.60	255.54	(2.63)	0.79	4.35	2762.36
Oman	Jul 99	1.00	95.15	40.09	0.58	116.21	0.24	3.93	4.00	555.20
Saudi Arabia	Jun 98	0.89	1817.09	749.00	0.61	2572.66	0.21	26.00	5.56	12 478.34
Egypt	Jul 96	0.49	177.23	78.84	0.48	233.97	0.02	4.23	8.33	4096.03

Table 1 (*Continued*)

Market	Start date	Mean BE/ME	Mean size ($US)	Median size ($US)	S.D. BE/ME	S.D. size ($US)	Min BE/ME	Min size ($US)	Max BE/ME	Max size ($US)
Asia										
China	Jul 93	0.61	539.07	232.36	2.15	2753.57	(0.21)	8.72	100.00	125 918.66
Sri Lanka	Jul 93	1.11	30.85	18.50	1.63	35.36	(1.19)	0.38	33.33	309.17
Taiwan	Jul 85	0.46	1575.12	593.09	0.34	2853.18	(0.07)	3.95	7.69	50 910.85
India	Oct 86	0.74	475.49	191.96	1.17	904.94	(11.11)	2.07	16.67	14 802.86
Indonesia	Jun 90	0.84	430.76	110.22	2.32	1084.45	(100.00)	0.94	33.33	16 691.21
Korea	Jul 86	1.49	747.12	271.58	2.79	2078.30	(50.00)	0.42	100.00	49 938.38
Malaysia	Jul 85	0.68	814.87	356.63	0.82	1665.87	(7.14)	2.66	11.11	21 500.19
Pakistan	Jul 86	0.89	69.88	24.31	1.15	169.20	(4.55)	0.22	16.67	3645.39
Philippines	Apr 88	0.99	718.90	157.24	1.49	1188.19	(2.13)	1.71	25.00	6813.49
Thailand	Jul 86	0.93	715.12	279.58	2.31	1202.21	(20.00)	0.83	100.00	13 368.76
Africa										
Morocco	Jul 96	0.33	590.28	503.15	0.16	473.97	0.09	27.87	0.97	2295.01
Nigeria	Jul 85	0.75	55.84	40.03	0.81	55.27	0.02	0.52	9.09	344.04
South Africa	Jun 93	0.61	2018.57	1299.86	0.75	2331.37	0.00	14.97	7.69	22 841.75
Zimbabwe	Jul 86	1.78	58.83	25.13	3.01	111.66	0.06	0.96	50.00	1482.30

This table presents descriptive statistics for monthly book-to-market values and firm sizes for 35 emerging markets over January 1985–June 2000. The start date is the first month for which valid return, size and lagged book-to-market values are available on individual firms within the local market. 'Mean BE/ME' and 'mean size ($US)' are the average book-to-market value and average firm size computed across all firms and months included in tests for the local market. Firm size is in $US millions. 'S.D. BE/ME' and 'S.D. size' are standard deviations of book-to-market values and firm sizes computed over all firms and months within the local market. 'Min BE/ME' and 'max BE/ME' are local market low and high values for book-to-market for all sampled firms. Similarly, 'min size' and 'max size' are local market low and high values for firm size for all sampled firms.

Mexico, two of the more established emerging markets, have average firm sizes of \$1.58 and \$1.51 billion, respectively.

Book-to-market ratios also vary widely across markets, consistent with differences in accounting conventions. The average BE/ME ratios vary from a low of 0.33 for Morocco to a high of 7.23 for Russia.

3. Univariate tests

In this section we report results based on relative size without controlling for relative BE/ME and on BE/ME without controlling for size. Table 2 presents the results of the univariate tests for five portfolios formed on firm size (Panel A) and for five portfolios formed on BE/ME (Panel B). The number of firms in each portfolio averaged over the entire sample period equals 197 and for the last month of the sample period equals 373. Fig. 1 plots the returns for each of the size and BE/ME portfolios. Fig. 1 shows that average returns for the full data set conform to empirical results reported for developed markets. Mean returns decline across size categories (from 0.0294 for small firms to 0.0074 for large firms) and rise across BE/ME categories (from 0.0104 for low BE/ME, or growth firms, to 0.0368 for high BE/ME, or value firms).

Table 2 presents *t*-tests that compare the mean returns for the smallest vs. largest firm size portfolios and for value vs. growth portfolios. We perform *t*-tests on the mean difference of the returns. Therefore, the tests are performed on the return difference between small and big firms, SMB, and between high and low BE/ME firms, HML. These tests explicitly account for cross-correlation in the returns. The results presented in the line called 'all data' of Panel A of Table 2 show that the size effect is statistically significant at the 1% level using all data included the EMDB (*t*-statistic = 4.42). In light of the non-normality of emerging market returns, we also report results on the percentage of months for which the returns of small stock portfolio exceeded those of the large stock portfolio. Small stocks outperformed large stocks in over 63% of the months, a result that is significant at the 1% level. The annualized SMB return is approximately 30%.

Similar results for the BE/ME portfolios are shown in the 'all data' line in Panel B of Table 2. The *t*-test of mean difference in returns between the highest and lowest BE/ME portfolios (value vs. growth) is significant at the 1% level for both parametric and non-parametric tests using all data. Value stocks outperformed growth stocks in more than 74% of the months in our sample. The annualized HML return is approximately 36%. These annual excess returns are considerably higher than those reported by Fama and French (1998) for developed markets for their 1974–1995 sample period. These results demonstrate the importance of investment style analysis for emerging markets (see Sharpe, 1992). Our univariate tests are consistent with Claessens et al. (1993) who also document a strong BE/ME effect for emerging markets.

We re-examine the results after controlling for January effects. Davis (1994), Loughran (1997) and Chan et al. (1998) show that firm size and book-to-market

Table 2
Univariate tests of market capitalization and book-to-market effects

	Small 1	2	3	4	Large 5	t-Statistic	% Small > large
Panel A. Mean monthly returns by firm size quintile							
All data	0.02942	0.02185	0.01792	0.01363	0.00741	4.42[a]	63.43%[a]
Removing extremes	0.01446	0.01607	0.01416	0.01343	0.00914	1.80	56.47%
Panel B. Mean monthly returns by book-to-market quintile							
	Low 1 (growth)	2	3	4	High 5 (value)	t-Statistic	% Value > growth
All data	0.01041	0.01305	0.01566	0.02372	0.03628	5.71[a]	74.19%[a]
Removing extremes	0.00790	0.01157	0.01290	0.01609	0.02312	4.69[a]	61.77%[a]

This table reports mean monthly returns for the emerging market sample for various market value equity (size) and book-to-market (BE/ME) equity quintiles. Portfolios are rebalanced once per year. Panel A presents mean monthly returns for each market capitalization quintile. Stocks are ranked on the basis of relative size defined as the firm's market capitalization divided by the average market capitalization for the firm's local market. Firms are assigned to one of five quintiles (from smallest to largest). Group 1 (small) consists of the smallest relative size firms and group 5 (large) consists of the largest relative size firms. Panel B presents mean monthly returns for each relative BE/ME quintile. A relative BE/ME ratio is calculated by dividing the firm's BE/ME ratio by the average BE/ME ratio in the firm's local market for that month. Then firms are ranked and portfolios are formed on the basis of these relative BE/ME ratios. The stocks are then placed into five relative BE/ME quintiles from lowest relative BE/ME (or 'growth' firms) through highest relative BE/ME (or 'value' firms). Portfolios are formed on the basis of relative size or relative BE/ME are rebalanced once per year. Mean returns are presented for each portfolio. The t-statistics in Panel A test for differences between the smallest and largest relative size portfolios. The last column reports the percentage of months for which the return on the small size portfolio exceeded that of the large size portfolio. Similarly, the t-statistics in Panel B test for differences between the value (high BE/ME) and growth (low BE/ME) portfolios. The last column reports the percentage of months for which the return on the value stock portfolio exceeded that of the growth stock portfolio. Tests of significance on the difference between the observed percentage and 50% are also performed.

[a] Significant at the 0.01 level.

effects in US markets are especially strong during January but are weak during the remainder of the year. In contrast, we find that the HML and SMB returns rise when Januaries are deleted. For example, we find that the mean monthly non-January HML return is 0.0155 vs. 0.0124 for the January return. Moreover, the SMB return is negative during Januaries (-0.0331) vs. 0.0129 during non-Januaries. These findings indicate that the effects we document for emerging markets are not driven by January effects.[15]

[15] We do find a January effect for emerging market stock returns when no sorts are performed. In particular, the mean monthly emerging market composite return during January is more than triple the non-January return using market value weighting and is nearly twice the non-January return using equal weighting.

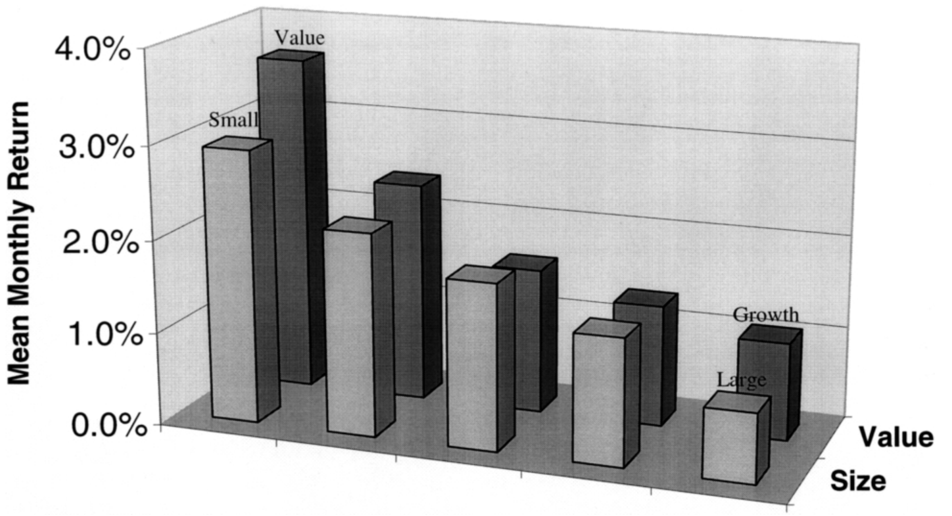

Fig. 1. Mean monthly returns by size or value portfolios. This figure illustrates the change in mean monthly returns for equities in 35 emerging markets across five portfolios formed on the basis of relative size and five portfolios formed on the basis of book equity to market equity (BE/ME) ratios. Means are computed over June 1986–July 2000. Portfolios are rebalanced annually. The figure show that equity returns in emerging markets fall as firm size increases and returns fall as BE/ME ratios falls.

We examine the degree to which size and value effects are due to extreme returns. We repeat the tests discussed above from Table 2 after deleting returns falling in the lower and upper 1% tails of the returns distributions over all sampled months. The results after removing extreme returns (outliers) are presented in Panel A for size portfolios and in Panel B for BE/ME portfolios in the lines labeled 'removing extremes.' We find that outliers make up approximately 26% of the average returns of the equally weighted composite portfolio of EMDB stocks during the 1985–2000 sample period. After removing outliers, the size effect is not significant (t-statistic = 1.80). The BE/ME effect remains significant (t-statistic = 4.69). The difference in returns between small and large firms drops more than 75% from 220 basis points per month (0.02942–0.00741) to 53 basis points per month (0.01446–0.00914) or to an annualized 6.6%, after removing extreme returns. The difference in returns between value and growth stocks drops 41% from 259 basis points per month to 152 basis points per month, or to approximately 20% annually. These results show that the size effect in emerging markets is driven by a small set of returns comprising the upper 1% tail of the returns distribution. The BE/ME effect, however, remains highly significant after removing the extreme returns. The lack of size effects after deleting outliers is similar to the results documented by Knez and Ready (1997) for US markets. Therefore, our results indicate that for investors to have realized return enhancements by overweighing small EM firms, they would have had to follow a strict portfolio policy of buying every small stock so as to include those that led to extremely high returns.

Earlier work has shown that size, value and other factors may have effects that are associated with each other. For example, Loughran (1997) reports a combined effect wherein higher returns were achieved by investments in small firms that were value stocks. Therefore, in the following section, we form portfolios accounting for size and BE/ME simultaneously, thus controlling in part for the effects of the one variable while examining the effects of the other.

4. Results based on portfolios formed on both size and BE / ME

For the results in this section (shown in Table 3), portfolios are first formed on the basis of relative firm size. Then, within size categories, portfolios are formed on the basis of relative BE/ME. This approach permits us to examine value effects among small firms and among large firms and provides a different sample in which to test the claims in Loughran (1997). To be sure that the results are not driven by the order of portfolio formations, we also conducted tests (not reported here) in which the reverse procedure was applied.[16] The results were qualitatively the same as those presented here.

The *t*-statistics reported in the last column of Table 3 test the significance of the mean difference between high and low BE/ME portfolio returns within each size quintile. The *t*-statistics reported in the bottom row test the significance of the mean difference between the smallest and largest firm portfolio returns within each BE/ME quintile. The percentages shown are the fractions of months for which the high BE/ME portfolio outperformed the low BE/ME portfolio and for which the small size portfolio outperformed the large size portfolio. The number of firms in each of the 25 portfolios equals 40 when averaged over the entire sample period and equals 75 for the last month of the sample period.[17] The findings reported in the table indicate significant BE/ME effects within each size quintile. The *t*-statistics for the mean differences range from 2.34 to 3.99. These results contrast with the findings of Loughran (1997) for the US, that value effects do not appear to apply to large firms. Panel B shows that BE/ME effects remain

[16] See Berk and Jonathan (2000) for consequences of sorting procedures for tests of asset pricing models.

[17] We also compare the sizes of our portfolios against those used in Fama and French (1992). Their portfolio sizes ranged from 70 to 177 for the 10 size-beta portfolios in their smallest size decile. We also compare the sizes of our portfolios against those used in Fama and French (1992). Their portfolio sizes ranged from: 70–177 for the 10 size-beta portfolios in their smallest size decile; 15–41 for the 20 size-beta portfolios in their 2nd and 3rd smallest size deciles; and 11–22 for the 10 size-beta portfolios in their largest firm size decile. Fama and French (1992) formed their size breakpoints using NYSE firms only, which is the reason for the non-uniformity of number of firms in their portfolios: 15–41 for the 20 size-beta portfolios in their 2nd and 3rd smallest size deciles; and 11–22 for the 10 size-beta portfolios in their largest firm size decile. Fama and French (1992) formed their size breakpoints using NYSE firms only, which is the reason for the non-uniformity of number of firms in their portfolios.

Table 3
Mean monthly returns for size BE/ME portfolios

Size quintiles	Book-to-market quintiles					t-Statistic (%)
	Low 1 (growth)	2	3	4	High 5 (value)	
Panel A. All data						
Small 1	0.02267	0.02543	0.03614	0.03426	0.05164	3.59[a] 59.41%[b]
2	0.01575	0.01772	0.02303	0.02170	0.03162	2.34[b] 61.18%[a]
3	0.01036	0.01294	0.01689	0.01365	0.03569	4.18[a] 63.12%[a]
4	0.008102	0.00660	0.01256	0.01587	0.02467	3.07[a] 55.19%
Large 5	−0.00206	0.00195	0.00627	0.00937	0.02118	3.99[a] 68.82%[a]
t-Statistic (%)	3.85[a] 67.07%[a]	2.82[a] 57.65%[b]	3.94[a] 55.29%	3.94[a] 55.29%	3.62[a] 55.29%	5.82[a] 66.47%[a]
Panel B. Deleting extreme returns						
Small 1	0.01209	0.01388	0.01741	0.01960	0.02305	2.28[b] 55.29%
2	0.01121	0.01219	0.01928	0.01513	0.02314	2.43[b] 57.06%
3	0.01071	0.01038	0.01718	0.01053	0.02199	2.41[b] 62.35%[a]
4	0.00756	0.00879	0.01005	0.01869	0.02195	3.19[a] 60.00%[a]
Large 5	0.00026	0.00445	0.00879	0.01121	0.02091	4.32[a] 65.29%[a]
t-Statistic (%)	2.49[b] 62.35%[a]	1.85 51.77%	2.07[b] 54.12%	1.87 52.35%	0.45 48.82%	4.03[a] 62.35%[a]

This table presents mean returns for 25 size BE/ME portfolios of all EMDB firms. A two-pass classification is used to create the portfolios. First, stocks are classified by relative market value of equity (size), into one of five portfolios. Second, stocks within each relative market capitalization group are further subdivided into five book-to-market relatives. Portfolios are rebalanced once per year. Mean monthly mean returns are presented for each of the 25 portfolios. The last column presents t-statistics, within each size group, for tests of significance of the mean difference in returns between high BE/ME (value) portfolio and low BE/ME (growth) portfolio. The percent of months (%) in which returns are greater for the high BE/ME portfolio vs. the low BE/ME portfolio is also reported in the last column. Similarly, the last row presents t-statistics, within each size group, for tests of significance of the mean difference in returns between small (1) portfolios and large (5) portfolios. The last row also reports the percent of months in which returns are higher for small (1) portfolios vs. large (5) portfolios within each BE/ME group. Significance for the percentage is indicated if the observed percentage differs significantly from 50%. Panel A presents results using all data. Panel B presents results after deleting returns falling in the upper and lower 1% tails of the returns distribution formed over all sampled months.

[a]Significant at the 0.01 level.

[b]Significant at the 0.05 level.

significant after removing the tails of the returns distribution. The *t*-statistics range from 2.28 to 4.32. Thus, BE/ME effects persist both after controlling for size and after removing extreme returns.

Table 3 also shows that the size effect is positive in all BE/ME quintiles. Panel A (for all data) shows a significant size effect for each BE/ME quintile using parametric tests. The non-parametric statistics show mixed results for the size effect. Panel B shows that the size effect is diminished materially after removing outliers.

Speidell and Stone (1997) assert that four major portfolio management 'style' categories have emerged in the US market: small value, small growth, large value and large growth. They argue that it is often difficult to distinguish value vs. growth firms in emerging markets, and they emphasize the opportunities in small stocks. Fig. 2 shows the mean returns for all data, over the months of our study for each of the size–value style combinations mentioned by Speidell and Stone (1997). These are the 'corner' portfolios in our analysis of five-by-five portfolio formation based on size and BE/ME quintiles. The figure emphasizes that average returns for the emerging markets were highest in the small value category and lowest in the large growth category. Tests of the portfolio of high BE/ME stocks within the small size category (value portfolio within small size) against the portfolio of low BE/ME stocks within the large size category (growth portfolio within large size) show that the difference in returns was highly significant. The value of the *t*-statistic for the mean difference in returns between the small value and the large growth portfolio was 5.82. The annualized return spread between the small firm, high BE portfolio and the large firm, low BE portfolio was 87% using all data and was 31% after removing the extreme returns.[18]

Fig. 3 shows that the results based on arithmetic mean returns are consistent with compound returns. The mean differences are not merely an artifact of the calculation of arithmetic means. Substantial differences in compound returns are also earned in the four style portfolios that are based on extreme values of size and BE/ME. Again, the portfolio consisting of value (high BE/ME) stocks within small firms outperforms the other combinations. Our results indicate that the

[18] The inclusion of transactions costs might affect the return spreads if the turnover is significantly different across portfolios. Since our portfolios are rebalanced only once per year, transactions costs will be controlled to some extent. As shown by Willoughby (1997), transactions costs (the sum of commissions, fees and market impact) averaged approximately 100 basis points for emerging market stocks (using 1996 trades), which was double the transactions costs of US. OTC stocks for the same time period. Bekaert et al. (1997) provide estimates of transactions costs using trades during 1995 for 21 emerging markets. The transactions costs averaged 110 basis points across the 21 markets. We also replicated our portfolios using quarterly rebalancing (which would involve higher transactions costs). The annualized return spread for the quarterly rebalanced portfolios was approximately 1.4 times the spread derived for the annually rebalanced portfolios, after removing extreme returns. Thus, a strategy to lessen transactions costs by postponing trades from quarterly to annual would have entailed a substantial loss of gross return spread in exchange for an also substantial reduction in transactions costs.

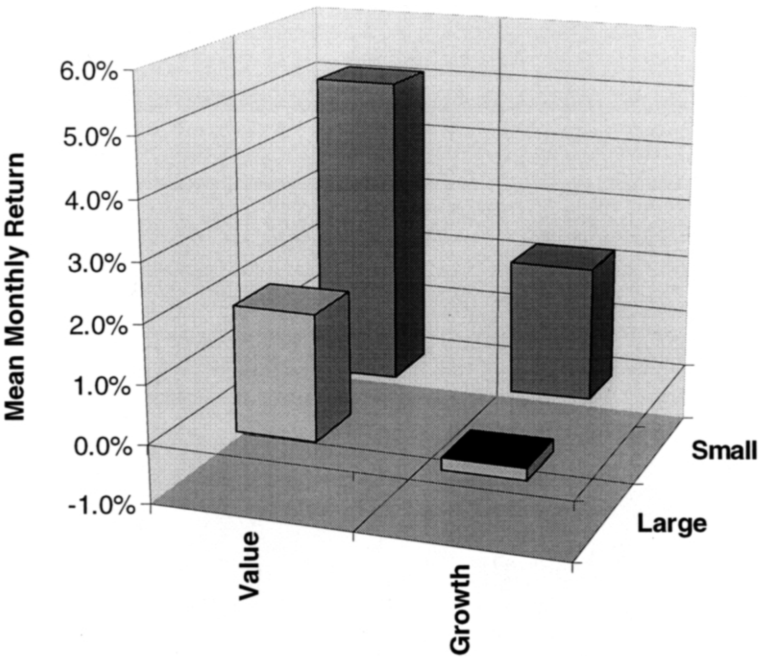

Fig. 2. Mean monthly returns for 'corner' portfolios with annual rebalancing. This figure illustrates the differences in mean monthly returns for equities in 35 emerging markets across small-cap value, small-cap growth, large-cap value and large-cap growth portfolios. The portfolios are rebalanced annually. The four portfolios are the corner portfolios from the five-by-five contingency table presented in Table 3, Panel A.

spread between small value and large growth stocks in emerging markets has grown systematically through our sample period.[19]

5. Cross-sectional regression tests

As Fama and French (1998) point out, the results of tests of alternative factors can be sensitive to the methodology used. In this section, we provide tests of the

[19] We also re-ran the multivariate tests separately for two subperiods. The first subperiod ends December 1992 and the second subperiod starts January 1993. Results using all data for both time periods show statistically significant value effects within many of the size quintiles. Similarly for relative size, using all data, we find significant size effects in most of the BE/ME quintiles in both periods. The mean monthly difference between the corner portfolios equals 6.6% (t-statistic = 4.40) for the first subperiod and equals 4.3% (t-statistic = 3.83) for the second subperiod. These findings further support the robustness of the findings derived over the entire sample period using all data. After removing extreme returns, we find significant size effects in the first time subperiod (within four of the five BE/ME quintiles), but no significant size effects in the second subperiod. After removing extreme returns, we find significant BE/ME effects in both subperiods.

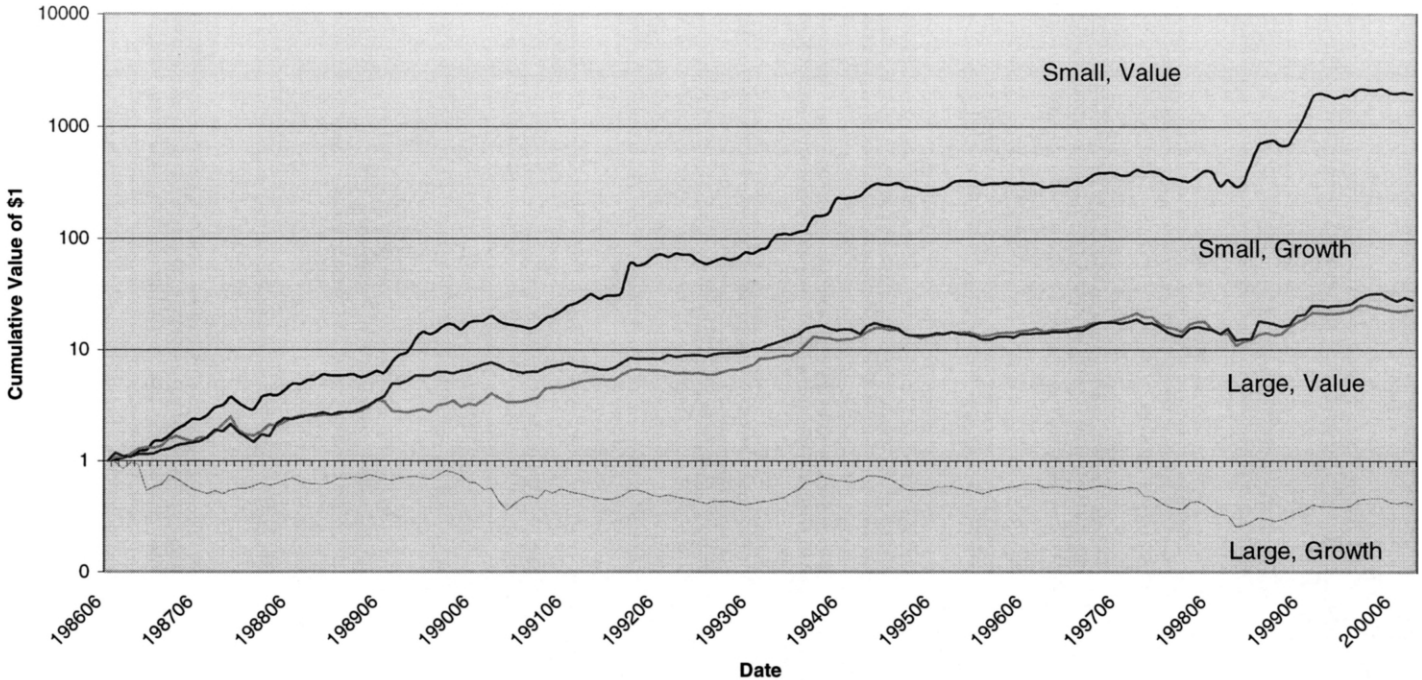

Fig. 3. Portfolio performance based on relative size and relative book-to-market with annual rebalancing. The lines plot the compound values from investing one dollar in June 1986 in small-cap value, large-cap value, small-cap growth and large-cap growth portfolios aggregated over 35 emerging markets. Portfolios are rebalanced annually.

effects of size and BE/ME via cross-sectional regressions that simultaneously account for the effects of both factors. The tests are similar to the Fama and MacBeth (1973) procedures commonly used in examining multiple factors in asset pricing. Such tests examine the ability of each hypothesized factor to 'explain' returns while 'controlling' for the others to some degree.

We conduct cross-sectional tests on annually rebalanced portfolios. Initially, we include only size and BE/ME as explanatory variables. Then, we introduce local betas and global betas. These latter tests examine effects after accounting for the firm's systematic risk. For each stock, the local beta is estimated by regressing the stock's returns against the local market index returns, using all months for which returns are available for the stock. For each stock, the global beta is estimated by regressing all the stock's returns against the Morgan Stanley Capital International (MSCI) World index returns, using all months for which returns are available for the stock. In cross-sectional regressions that include both the local and global betas, first we orthogonalize the world index returns against returns for each local index separately. Next, we regress the stock returns against the orthogonalized world index returns and corresponding local market index returns to derive the global and local betas, respectively. We required at least 30 observations to calculate betas. Therefore, for the cross-sectional regression tests, we exclude stocks with less than 30 months of return data.[20]

Our dual beta specification is motivated by Bekaert and Harvey (1995), who contend that standard assumptions that capital markets are, and always were, fully integrated or fully segmented are of very limited applicability. They develop a framework that allows for time varying conditional market integration, and they test their methodology on market indexes from both developed countries and emerging markets. Their results provide evidence of time varying integration for a number of countries. During our sample period, a number of emerging market countries in our sample liberalized their economies, including the increased opening of their securities markets to global investors. As more foreign investors began to invest directly in securities in those markets, or in securities from those markets that became listed on global exchanges, it is likely that the world beta would become increasingly important.[21]

There are various criticisms of cross-sectional regression tests. One is that the tests assume that the relationship between the dependent variable and indepen-

[20] Duarte and Mendes (1997) demonstrate the potential effects of outlier returns on beta estimates for Emerging Market stocks. Moreover, infrequent trading causes known biases for individual stock beta estimation (see Scholes and Williams, 1977 and Dimson, 1979). Our portfolio approach (averaging the individual betas) should diminish these effects.

[21] A weakness of our regression is that it forces the same cross-sectional slope coefficient on the characteristics across the 25 portfolios. For example, for the more integrated countries, we would expect the world beta to be important. But our portfolio formation and regression approach will not distinguish among the country effects. The smoothing methods may obscure the differential effects of the betas across countries.

dent variables is of a specific functional form (in this case, linear). If the relationship is not of that form, then the tests will lose power to establish factor effects. A second criticism is that outliers can drive regression tests, i.e. extreme observations will tend to have a large effect on the outcomes of the tests. Knez and Ready (1997) suggest robust regression procedures for observing the effects of such outliers. Extreme returns are more prevalent in emerging markets than in developed markets and, therefore, may have a greater effect on the findings.

The regression tests proceed as follows. For each month, we run a cross-sectional regression using various versions of the following model:

$$R_{\mathrm{pt}} = \lambda_{0\mathrm{t}} + \lambda_{1\mathrm{t}}\ \mathrm{REL}(\mathrm{SIZE}_{\mathrm{p1}}) + \lambda_{2\mathrm{t}}\mathrm{REL}(\mathrm{BE}/\mathrm{ME}_{\mathrm{p7}}) + \lambda_{3\mathrm{t}}\mathrm{Local}\ \beta_{\mathrm{p}} + \lambda_{4\mathrm{t}}\mathrm{Global}\ \beta_{\mathrm{p}} + \varepsilon_{\mathrm{pt}} \tag{2}$$

where R_{pt} is the return to portfolio p in month t. $\lambda_{1\mathrm{t}}$ is the slope associated with firm size, $\lambda_{2\mathrm{t}}$ is the slope associated with book-to-market value, $\lambda_{3\mathrm{t}}$ is the slope associated with local beta and $\lambda_{4\mathrm{t}}$ is the slope associated with global beta. The time subscripts on SIZE and BE/ME correspond to the lagged month (1 for size and 7 for BE/ME) relative to the beginning month in the 12-month holding period. We run each cross-sectional regression using the following explanatory variables: (1) size and BE/ME; (2) size, BE/ME and local beta; and (3) size, BE/ME, local beta and global beta. For these tests we define BE/ME and size for each firm relative (REL) to each firm's local market. For each version, a total of 170 regressions are performed (one regression for each month, June 1986–July 2000). Each regression (for any month t) has 25 observations, representing the returns (for month t) for each of the 25 portfolios. The monthly estimates of lambda values are averaged over the 170 months, and *t*-statistics are used to test for significance. The *t*-statistics are calculated from the means and standard deviations across the 170 lambda values for a given factor.

Table 4 presents the mean lambdas. The values in parentheses are *t*-statistics. The last two columns present the percent of months in which the size or BE/ME lambda estimates were positive.

Consistent with our earlier multivariate results using all data (Panel A), the monthly size and BE/ME premiums are significant at the 0.01 level (*t*-statistics = −2.68 for size and 6.10 for BE/ME). However, the percentage of positive monthly size premiums (λ_1) is not significantly different from 50% at the 0.05 level (percentage = 56.47%, *t*-statistic = 1.69). In contrast, the percentage of positive BE/ME premiums is significantly different from 50% (percentage = 71.76%, *t*-statistic = 5.67). Thus, from the cross-sectional tests, the BE/ME effect is more persistent over time vs. the size effect for emerging markets.

The signs and significance of the size and BE/ME slope coefficients remain unchanged in the three and four factor regressions that control for local and global systematic risk. Furthermore, the magnitudes of the size and BE/ME coefficients

Table 4
Risk premiums from cross-sectional regressions

Intercept	REL (size)	REL (BE/ME)	Local β	Global β	% Pos. size premiums	% Pos. BE/ME premiums
Panel A. All data						
$R_{pt} = \lambda_{0t} + \lambda_{1t}$ REL(Size$_p$) + λ_{2t} REL(BE/ME$_p$) + λ_{3t}Local β + λ_{4t}Global β + ε_{pt}						
0.0121	−0.0063	0.0109			43.53%	71.76%[a]
(2.76[a])	(−2.68[a])	(6.10[a])				
0.0106	−0.0065	0.0107	0.0148		45.29%	70.59%[a]
(2.20[b])	(−2.48[b])	(5.90[a])	(0.91)			
0.0048	−0.0062	0.0107	0.0243	0.0079	44.12%	69.41%[a]
(1.05)	(−2.65[a])	(5.96[a])	(1.36)	(1.15)		
Panel B. Extreme returns deleted						
$R_{pt} = \lambda_0 + \lambda_1$ REL(Size$_p$) + λ_2REL(BE / ME$_p$) + λ_3Local β + λ_4Global β + ε_p						
0.0103	−0.00266	0.0059			46.47%	62.94%[a]
(2.82[a])	(−1.51)	(3.37[a])				
0.01045	−0.0029	0.0054	0.0041		47.65%	61.76%[a]
(2.66[a])	(−1.41)	(3.98[a])	(0.49)			
0.0043	−0.0035	0.0055	0.0040	0.0117	46.47%	61.76%[a]
(1.25)	(−1.71)	(4.17[a])	(0.41)	(2.03[b])		

This table reports risk premiums estimated from versions of the cross-sectional regression: $R_{pt} = \lambda_{0t} + \lambda_{1t}$ REL(Size$_p$) + λ_{2t}REL(BE / ME$_p$) + λ_{3t}Local β_p + λ_{4t}Global β_p + ε_{pt}. Panel A presents results using all data for portfolios rebalanced annually. Panel B presents results after deleting returns falling in the upper and lower 1% tails of the returns distribution formed over all sampled months. Portfolios are formed on the basis of relative size and relative BE/ME and are rebalanced once per year. This process is repeated every year. Thus, 12 (monthly) cross-sectional regressions are run before stocks are reclassified and before the portfolio characteristics are recalculated. The dependent variable in each regression is the vector of monthly returns for the 25 portfolios. A total of 170 monthly cross-sectional regressions are run (June 1986–July 2000). The Local β_p is the mean local market beta for stocks included in portfolio p. Each stock's local beta is calculated as the slope from the regression of the stock's returns against the local market returns, using all available months for the firm. The Global β_p is the mean global beta for stocks included in portfolio. In cross-sectional regressions that include both the local and global betas, first we orthogonalize the world index returns against returns for each local index separately. Next, we regress the stock returns against the orthogonalized world index returns and corresponding local market index returns to derive the local and global betas, respectively. Stocks are included that had at least 30 months reported returns in the EMDB. The table presents the lambda estimates averaged over all months. *t*-Statistics are reported in parentheses. The last two columns present the percent of months in which the lambda estimate for size and for BE/ME were positive, respectively. Significance for the percentage is indicated if the observed percentage differs significantly from 50%.

[b]Significant at the 0.01 level.

[a]Significant at the 0.05 level.

are similar across regressions. Significant size and BE/ME effects are found in each regression, suggesting that size and BE/ME effects are not captured by beta. Neither local nor global beta are priced at the 0.05 level of significance. These findings are consistent with Heston et al. (1999) who find global size effects for the aggregate of 12 European stock markets during 1980–1995. They find that small firms outperform large firms while controlling for global beta effects. Our findings are also consistent with Rouwenhorst (1999) who documents value and size effects, but finds no local beta effects for emerging markets. Rouwenhorst's results are based on univariate single-factor tests similar to our tests reported in our Table 2. In contrast, our multivariate methodology used in Tables 3 and 4 is based on 25 portfolios formed on the basis of both size and BE/ME. As we explained earlier, the multivariate approach provides a cleaner test of the independent effects of firm size and BE/ME.

We replicated all tests for individual markets. From the cross-sectional tests using all data, we found that 72% of the individual markets had a positive BE/ME effect (i.e. higher returns for larger values of BE/ME), and 56% had a negative size effect (i.e. had higher returns for smaller firms). The percentage is significantly different from 50% for BE/ME, but it is not statistically significant for size. There is a lot of noise present in the returns, which will greatly affect country-specific returns and observed factors. A major limitation of country-by-country tests is that there are not a sufficient number of stocks in the separate markets with which to reliably form the 25 portfolios used in the cross-sectional regression tests. This limitation is especially acute during the earlier years in the sample. Consequently, the country-by-country results should be interpreted with caution.

We replicated the cross-sectional regression tests from Eq. (2) after deleting returns falling in the upper and lower 1% of the returns distribution formed over all sampled months. Results are presented in Panel B of Table 4. The monthly size premium (λ_1) falls dramatically (from 0.0063 to -0.0027) and is no longer statistically significant (t-statistic $= -1.51$). These findings are consistent with our earlier results suggesting that the size effect was driven by extreme returns. Although the sign remains negative, none of the size premiums in the cross-sectional regressions are statistically significant at the 0.05 level after removing outliers. In contrast, all the BE/ME premiums (λ_2) remain positive and statistically significant at the 0.01 level. The global beta premium becomes significant at the 0.05 level in the four-factor regression. Apparently, the removal of the extreme returns reduced the standard deviation of the beta premium estimates, causing the t-statistic for the global beta premium to rise. These global beta findings are consistent with Heston et al. (1999) who also find significant global beta effects. The non-parametric sign tests reported in the last two columns confirm that the size effect is not significant but that the BE/ME effect is significant.

Overall, the cross-sectional tests in Table 4 are consistent with the results presented in Table 3. Furthermore, the cross-sectional tests show the BE/ME effects persist after accounting for size and local and global beta effects. These findings are consistent with Arshanapalli et al. (1998) who show that superior performance within 18 developed global equity markets for value stocks is not due to their greater sensitivity to market movements compared with growth stocks. They also find value effects independent of size effects.[22] Moreover, we also find significant BE/ME effects in tests both with and without extreme returns.

6. Tests based on absolute size

Results based on relative size are appropriate if capital markets are segmented. If global capital markets are fully integrated, however, there is no basis for adjusting size for the average size in a market. Thus, as a further test of the robustness of the earlier results we have reported, in this section we report the results of tests that employ absolute size and relative BE/ME. The use of relative BE/ME is dictated by differences in accounting measurement of book values across markets and not on the degree of segmentation or integration across markets. However, the use of absolute size vs. relative size is not mandated by any measurement concerns. Since we do not know the extent of capital market integration globally, especially for emerging markets, we include tests here based on absolute size.

The results are presented in Tables 5–7 and correspond to the previous results based on relative size that were presented in Tables 2–4, respectively. The results are markedly different for absolute size than they were for relative size. For example, consider the univariate results for size presented in Panel A of Table 5. There is no significant size effect for the parametric test using all data (although the difference between small and large stock portfolios is 90.8 basis points on a monthly basis, which annualizes to approx. 11%). The t-statistic is 1.81, which is just short of statistical significance at the 0.05 level. However, the non-parametric results are significant: small stocks had higher returns in 59.41% of the observation months. Deleting extreme returns, there was no size effect. In fact, the sign of small stock average returns minus large stock average returns became negative after removing extreme returns.

Table 6 presents the results for size portfolios within BE/ME portfolios and vice versa. In Panel A, showing results for all data, we observe significant size effects based on t-tests (and in the expected direction) within two BE/ME quintiles, specifically the extreme value portfolios and extreme growth portfolios, but not for the more blended BE/ME portfolios. Results deleting extreme observations are shown in Panel B: There, we observe no significant size effects among any of the BE/ME categories except for the sign test within the fourth BE/ME category, and in that case the sign is negative, i.e. large stocks outperformed small stocks. Thus, the evidence of a size effect based on absolute size is weak at best in tests using average returns from size portfolios. In contrast, significant value effects are present within every size category based on t-tests and sign tests.

Table 7 presents the results of cross-sectional regressions when size is measured

[22] Bauman et al. (1998) find value effects in all but the smallest firm size category for a sample of developed markets.

Table 5
Univariate tests of market capitalization and book-to-market effects

	Small 1	2	3	4	Large 5	t-Statistic	% Small > large
Panel A. Mean monthly returns by firm size quintile							
All data	0.02509	0.01883	0.01811	0.01433	0.01601	1.81	59.41%[b]
Removing extremes	0.01287	0.01227	0.01373	0.01334	0.01600	−0.82	51.18%
Panel B. Mean monthly returns by book-to-market quintile							
	Low 1 (growth)	2	3	4	High 5 (value)	t-Statistic	% Value > growth
All data	0.01041	0.013053	0.01566	0.02372	0.03628	5.71[a]	74.19%[a]
Removing extremes	0.00790	0.011567	0.01290	0.01609	0.02312	4.69[a]	61.77%[a]

This table reports mean monthly returns for the emerging market sample for various market value equity (size) and book-to-market (BE/ME) equity quintiles. Portfolios are rebalanced once per year. Panel A presents mean monthly returns for each market value of equity (size) quintile. Group 1 consists of the smallest size firms and group 5 consists of the largest size firms. Panel B presents mean monthly returns for each relative BE/ME quintile. The t-statistics in Panel A test for differences between the smallest and largest size portfolios. The last column reports the percentage of months for which the return on the small portfolio exceeded that of the large portfolio. Similarly, the t-statistics in Panel B test for differences between the value (high BE/ME) and growth (low BE/ME) portfolios. The last column reports the percentage of months for which the return on the value stock portfolio exceeded that of the growth stock portfolio. Tests of significance on the difference between the observed percentage and 50% are also performed.

[a] Significant at the 0.01 level.

[b] Significant at the 0.05 level.

by absolute size. Panel A shows results for all data, and Panel B shows the results with extreme observations omitted. In the results with all data, size is not significant in any of the regressions. BE/ME effects continue to be highly significant in all of the regressions (t-statistics are −0.89, −0.60 and −0.03 in the three cross-sectional regressions). Panel B provides results with extreme observations omitted. Again, size effects are not significant in any of the regressions, and BE/ME effects are significant in every regression. The sign tests confirm the results of the regression t-tests.

We can contrast the results in this section using absolute size against results in the previous two sections based on relative size. When size is measured relative to other securities in the same market, size effects appear to be present (when all data are used). When size is measured in absolute terms, there do not appear to be significant size effects. The results suggest (but do not show) that the relative lack of integration of emerging markets with global capital markets may limit access of global investors to the smaller securities of the emerging markets. This is consistent with the observation that it is generally the larger and more visible securities of emerging markets that issue American or Global Depositary Receipts (ADRs or GDRs), thus easily providing foreign investors with access to those securities and to information regarding those securities. To the extent that it is more difficult or

Table 6
Mean monthly returns for size BE/ME portfolios

Size quintiles	Book-to-market quintiles					t-Statistic %
	Low 1 (growth)	2	3	4	High 5 (value)	
Panel A. All data						
Small 1	0.01965	0.01335	0.02177	0.03332	0.05479	4.33[a] 57.06%
2	0.00800	0.01220	0.02081	0.02462	0.02794	3.31[b] 60.59%[a]
3	0.00737	0.01493	0.01580	0.02084	0.03122	4.04[a] 62.94%[a]
4	0.00193	0.00960	0.01426	0.01831	0.02733	3.20[a] 57.65%[b]
Large 5	0.00738	0.01315	0.00119	0.02077	0.02735	2.96[a] 61.18%[a]
t-Statistic	2.08[b]	0.03	1.27	1.60	2.82[a]	5.21[a]
%	58.82%[b]	52.94%	51.18%	52.94%	54.71%	64.12%[a]
Panel B. Deleting extreme returns						
Small 1	0.01188	0.00937	0.01136	0.01488	0.02706	3.18[a] 61.12%[a]
2	0.00533	0.01056	0.01203	0.01542	0.01756	2.75[a] 58.24%[b]
3	0.00637	0.01102	0.01593	0.01391	0.02180	3.54[a] 64.12%[a]
4	0.00286	0.01112	0.01570	0.01604	0.02140	3.15[a] 56.47%
Large 5	0.00746	0.01519	0.01075	0.02074	0.02628	3.24[a] 61.12%[a]
t-Statistic	0.85	−1.09	0.11	−1.05	013	3.23[a]
%	51.77%	50.00%	51.77%	42.35%[b]	47.65%	60.59%[a]

This table presents mean returns for 25 size BE/ME portfolios of all EMDB firms. A two-pass classification is used to create the portfolios. First, stocks are classified by market value of equity (size), into one of five portfolios. Second, stocks within each market capitalization group are further subdivided into five book-to-market relatives. Portfolios are rebalanced once per year. Monthly mean returns are presented for each of the 25 portfolios. The last column presents t-statistics, within each size group, for tests of significance of the mean difference in returns between high BE/ME (value) portfolio and low BE/ME (growth) portfolio. The percent of months (%) in which returns are greater for the high BE/ME portfolio vs. the low BE/ME portfolio is also reported in the last column. Similarly, the last row presents t-statistics, within each size group, for tests of significance of the mean difference in returns between small (1) portfolios and large (5) portfolios. The last row also reports the percent of months in which returns are higher for portfolio (1) vs. (5) within each BE/ME group. Significance for the percentage is indicated if the observed percentage differs significantly from 50%. Panel A presents results using all data. Panel B presents results after deleting returns falling in the upper and lower 1% tails of the returns distribution formed over all sampled months.

[a]Significant at the 0.01 level.

[b]Significant at the 0.05 level.

Table 7
Risk premiums from cross-sectional regressions

Intercept	LN (size)	REL (BE/ME)	Local β	Global β	% Pos. size premiums	% Pos. BE/ME premiums
Panel A. All data						
$R_{pt} = \lambda_{0t} + \lambda_{1t}\text{LN}(\text{Size}_p) + \lambda_{2t}\ \text{REL}(\text{BE/ME}_p) + \lambda_{3t}\text{Local}\ \beta + \lambda_{4t}\text{Global}\ \beta + \varepsilon_{pt}$						
0.0139	−0.00109	0.0118			48.82%	67.65%[a]
(2.18[b])	(−0.89)	(6.07[a])				
0.0137	−0.00074	0.0115	−0.0102		48.83%	65.29%[a]
(1.86)	(−0.60)	(5.74[a])	(−0.55)			
0.0098	−0.00003	0.0109	0.0054	−0.0015	55.29%	67.06%[a]
(1.38)	(−0.03)	(5.57[a])	(0.25)	(−0.20)		
Panel B. Extreme returns deleted						
$R_{pt} = \lambda_0 + \lambda_1\ \text{LN}(\text{Size}_p) + \lambda_2\text{REL}(\text{BE / ME}_p) + \lambda_3\text{Local}\ \ \beta + \lambda_4\text{Global}\ \ \beta + \varepsilon_p$						
0.0034	0.0010	0.0071			51.76%	60.59%[a]
(0.73)	(1.02)	(5.10[a])				
0.0012	0.0011	0.0068	0.0137		52.94%	59.41%[b]
(0.24)	(1.17)	(4.74[a])	(1.45)			
0.0013	0.0006	0.0067	0.0230	0.0025	57.06%	62.35%[a]
(0.30)	(0.70)	(4.80[a])	(2.18[b])	(0.47)		

This table reports risk premiums estimated from versions of the cross-sectional regression: $R_{pt} = \lambda_{0t} + \lambda_{1t}\ \text{LN}(\text{Size}_p) + \lambda_{2t}\text{REL}(\text{BE / ME}_p) + \lambda_{3t}\text{Local}\ \ \beta_p + \lambda_{4t}\text{Global}\ \ \beta_p + \varepsilon_{pt}$. Panel A presents results using all data for portfolios rebalanced annually. Panel B presents results after deleting returns falling in the upper and lower 1% tails of the returns distribution formed over all sampled months. Portfolios are formed on the basis of size and relative BE/ME and are rebalanced once per year. Thus, 12 (monthly) cross-sectional regressions are run before stocks are reclassified and before the portfolio characteristics are recalculated. The dependent variable in each regression is the vector of monthly returns for the 25 portfolios. A total of 170 monthly cross-sectional regressions are run (June 1986 through July 2000). The Local β_p is the mean local market beta for stocks included in portfolio p. Each stock's local beta is calculated as the slope from the regression of the stock's returns against the local market returns, using all available months for the firm. The Global β_p is the mean global beta for stocks included in portfolio. In cross-sectional regressions that include both the local and global betas, first we orthogonalize the world index returns against returns for each local index separately. Next, we regress the stock returns against the orthogonalized world index returns and corresponding local market index returns to derive the local and global betas, respectively. Stocks are included that had at least 30 months reported returns in the EMDB. The table presents the lambda estimates averaged over all months. *t*-Statistics are reported in parentheses. The last two columns present the percent of months in which the lambda estimate for size and for BE/ME were positive, respectively. Significance for the percentage is indicated if the observed percentage differs significantly from 50%.

[a] Significant at the 0.01 level.

[b] Significant at the 0.05 level.

more costly for foreigners to access the smaller securities of emerging markets, it would not be surprising that the smaller emerging market securities would fail to provide excess returns at a global level. However, our results on this point are merely suggestive. It may be an interesting avenue for further investigation.

7. Summary and conclusions

This paper provides new and important evidence on size and book-to-market value (BE/ME) effects by examining data from emerging capital markets. Our tests offer an out-of-sample investigation of the importance of size and value factors as determinants of subsequent portfolio returns. Our approach differs from existing research by focusing on the robustness of the results. We examine US dollar-denominated stock returns over the 1985–2000 period for stocks listed in the 35 emerging equity markets for which data were available from the Standard and Poor's Emerging Markets Data Base. We provide various tests for the effects of the size and value factors. Earlier work has led to differences in results based on methodology. Earlier work has also shown that returns in emerging markets are non-normal and has suggested that results may be sensitive to extreme returns. Accordingly, we examine size and value effects using a variety of methods.

A difference between our work and that of earlier researchers is that we perform tests employing measures of size and BE/ME defined relative to each firm's local market average. The use of relative measures facilitates the aggregation of data across markets instead of being limited to examining data on a market-by-market basis. The use of relative BE/ME is motivated by the fact that accounting systems differ widely across emerging markets. For instance, accounting standards in some emerging markets specifically address inflation in the measurement of book values and some do not. Accordingly, a given BE/ME ratio may have a very different interpretation in one market than in another. The use of relative BE/ME addresses that concern.

The use of relative size is motivated by considerations of whether the emerging markets that we study are fully integrated with global capital markets. If not, and if there is nevertheless a size effect within markets, the use of absolute size could obscure the size effect. On the other hand, if emerging markets are fully integrated with global markets, then size is size and we would recommend the use of an absolute size measure.

Our results point to a robust BE/ME effect that is not driven by extreme returns in emerging markets. The size effect is not robust to removal of extreme returns for emerging market equities. BE/ME effects were pervasive through: parametric tests; non-parametric tests; and after controlling for size, outliers and local and global systematic risk. Additional tests indicate a lack of a size effect when absolute rather than relative size is used.

Size and value factors have generated a great deal of research interest in recent years. Emerging markets provide a distinct setting in which to develop new evidence about the factors. The results presented here add to the body of knowledge about these factors and their roles in security returns. These results weaken arguments that BE/ME effects may be due to data mining in the US market. But they do not resolve once and for all the issues that they address: They raise a number of issues that remain for future research. One of them is the extent to which size effects are associated with the degree of integration of emerging markets with developed markets.

Jensen et al. (1997) find that size and value effects depend heavily on the monetary policy stance of the Federal Reserve: e.g. small firm and high BE/ME effects are significant only in expansive monetary policy periods. Since emerging markets tend to have changes in direction of economic policy that are more extreme than in developed markets, these changes could presumably explain some of the extreme returns. This is particularly relevant for emerging markets in which extreme returns constitute over 25% of the total return. Are small, large, value, or growth stocks affected more or differently by these shifts than are other firms? To what extent are emerging market equity returns and investment style shifts predictable? To what extent can multi-factor models be used to enhance emerging market portfolio returns?

Relatively little is known about the effects that portfolio flows have upon extreme returns in emerging markets. There is a tendency for foreign investors to prefer holding the stocks of larger firms in emerging markets since information is usually more readily available and they have greater liquidity. Do those factors interact in affecting the extreme returns? Do they perform in a systematic way, i.e. do they tend to cause unusually positive or negative outcomes for particular classes of securities?

This paper has examined an important database of emerging market equities to determine whether size and book-to-market effects are present in those markets. The evidence strongly supports the presence of a book-to-market effect of the same kind as in other markets (i.e. the so-called 'value' stocks tend to outperform 'growth' stocks), but the evidence is considerably weaker regarding a size effect. We look forward to subsequent research that sheds light on the economic forces that underlie our findings and implications.

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