Stock selection strategies in emerging markets

Jaap van der Hart[a], Erica Slagter[b], Dick van Dijk[c],*

[a] *Emerging Markets Team, Robeco Group, P.O. Box 973, 3000 AZ Rotterdam, The Netherlands*
[b] *Department of Quantitative Research, Robeco Group, P.O. Box 973, 3000 AZ, Rotterdam, The Netherlands*
[c] *Econometric Institute, Erasmus University Rotterdam, P.O. Box 1738, NL-3000 DR Rotterdam, The Netherlands*

Abstract

We examine the profitability of a broad range of stock selection strategies in 32 emerging markets over the period 1985–1999. Value, momentum and earnings revisions strategies are most successful and generate significant excess returns, in contrast to strategies based on size, liquidity and mean reversion. The performance of the strategies can be enhanced by selecting stocks on multiple characteristics and by incorporating country selection, although the latter bears the cost of increased risk. We do not find a pronounced effect of financial market liberalization on the performance of the strategies. There is no evidence that global risk factors can account for the excess returns of selection strategies. Finally, we document that the strategies can be implemented successfully in practice by a large institutional investor, facing a lack of liquidity and substantial transaction costs.
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1. Introduction

The success of quantitative stock selection strategies in developed markets is well documented. Portfolios formed on the basis of earnings-to-price (E/P), book-to-market (B/M), price momentum or earnings revisions have been found to earn significant excess returns across developed markets.[1] For emerging markets, however, only few studies that

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[1] Most research in this area has concentrated on US stocks. A nonexhaustive list of studies that consider data from international developed equity markets includes Capaul et al. (1993), Haugen and Baker (1996), Arshanapalli et al. (1998), Bauman et al. (1998, 1999), Fama and French (1998), Rouwenhorst (1998) and Baytas and Cakici (1999).

investigate individual stock selection exist, which, moreover, have rendered conflicting results. For example, whereas Claessens et al. (1998) find evidence for a premium for large firms and growth stocks, Fama and French (1998), Patel (1998), Rouwenhorst (1999) and Barry et al. (2002) report a premium for small firms and value stocks. Claessens et al. (1998) also document a premium for beta and turnover, but Rouwenhorst (1999) finds no evidence for either of those. Whereas the aforementioned studies consider only a limited number of strategies, Achour et al. (1998, 1999a,b,c) examine a much broader range of trading strategies based on firm characteristics, but their sample includes stocks from only three emerging markets (Malaysia, Mexico and South Africa). They find that several strategies earn significant excess returns, including strategies based on analysts' earnings revisions.

In this paper, we further examine the performance of stock selection strategies in emerging markets. Compared to the above-mentioned studies, we consider an extensive set of strategies across a broader range of countries. Besides value and momentum strategies, we also include strategies based on short-term and long-term mean reversion, analysts' earnings revisions, size and liquidity. In addition, we consider multivariate strategies, which rank stocks according to indicators of value, momentum and earnings revisions jointly. Finally, we compare local and global selection strategies, and thus contrast the profits that arise from stock selection within countries with those that arise from country selection. Our research can be regarded as complementary to Harvey (1995), who, using countrywide indices, documents that emerging equity market returns appear to be predictable in the time-series dimension. Here we will investigate whether this also holds in the cross-sectional dimension, using a broad sample of individual firms from all emerging markets.

Our results can be summarized as follows. Using internationally diversified (but country-neutral) portfolios, we find that high E/P and B/M (value) stocks outperform low E/P and B/M (growth) stocks, and stocks with positive analysts' earnings revisions outperform stocks with negative revisions. The success of momentum strategies depends on the type of investment strategy that is used. A conventional "zero-cost" strategy, consisting of a long position in the winners portfolio and an offsetting short position in the losers portfolio, generates significant excess returns. The average return from a strategy consisting of a long position in the winners portfolio only, however, is not significantly different from the return on an equally weighted portfolio of all stocks. We find no evidence for short-term or long-term mean reversion, nor do we find that returns are systematically related to size or liquidity. Combining value, momentum and earnings revisions indicators into a multivariate strategy improves the overall performance. The results for individual countries are much less significant than for internationally diversified portfolios. The benefits of geographical diversification, due to the low correlations between the stock selection strategies across countries, are already noticeable at the regional level, but it is best to apply the strategies globally. Finally, stock selection and country selection contribute about equally to the returns from global strategies.

Many emerging countries experienced financial market liberalizations during the late 1980s and early 1990s, opening up their stock markets to foreign investors. Recent studies[2]

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[2] See Bekaert and Harvey (2000b), Henry (2000), Kim and Singal (2000), Bekaert et al. (2001, 2002), Chari and Henry (2001), and Kaminsky and Schmukler (2001), among others.

suggest that these liberalizations have had pronounced macroeconomic and financial effects. For example, liberalizations are associated with decreases in the cost of capital and increases in economic growth. We examine whether financial market liberalizations also have affected the performance of our stock selection strategies, but find that generally this is not the case.

To study whether the excess returns of the selection strategies in emerging markets can be interpreted as compensation for risk, we use a four-factor model including global market, book-to-market, size and momentum factors. We find, however, that the return premiums cannot be explained by exposures to these risk factors.

A natural question to ask is whether the stock selection strategies are profitable if applied in practice by a large investor. Relevant factors in emerging markets that may prevent successful implementation are a lack of liquidity, outliers in stock returns, an implementation delay, and transaction costs. To address this issue, we evaluate the selection strategies under different circumstances, accounting for each of these aspects in turn. We find that the excess returns of the best-performing strategies remain significant when the sample is restricted to stocks with the largest market capitalizations, after correcting for outliers, after allowing for a 1-month implementation delay, and after taking into account transaction costs. In addition, we find that the multivariate strategies have no tendency to select stocks with a high emerging market risk or with low liquidity.

The plan of the paper is as follows. Section 2 describes the data and stock selection strategies, while Section 3 documents their profitability. Section 4 examines the effect of market liberalizations on the performance of the stock selection strategies. Section 5 explores whether the excess returns of the strategies can be attributed to exposure to global risk factors. Section 6 examines how the performance of the trading strategies is affected when taking into account various implementation issues. Finally, Section 7 concludes.

2. Methodology

2.1. Data

Stock prices and relevant firm characteristics are taken from the Emerging Markets Database (EMDB) of the International Finance Corporation (IFC). Monthly total returns in US dollars are calculated using stock prices, dividends and capital adjustment factors (cf. Rouwenhorst, 1999). Some apparent data errors due to wrongly calculated stock split ratios were corrected. The firm characteristics that we use are earnings-to-price and book-to-market ratios, dividends, number of shares traded and number of shares outstanding. The sample period runs from January 1982 until May 1999, although the earnings and book value data are available from January 1985 onwards only. We therefore consider portfolios formed every month starting at the beginning of January 1985 for all selection strategies.

The data from the IFC EMDB are supplemented with data on analysts' earnings forecasts from the Institutional Brokers Estimate System (IBES). This database contains data on firms in emerging markets starting in January 1987. The earnings forecasts are used to calculate "forward" earnings-to-price ratios as the ratio of the median earnings forecast
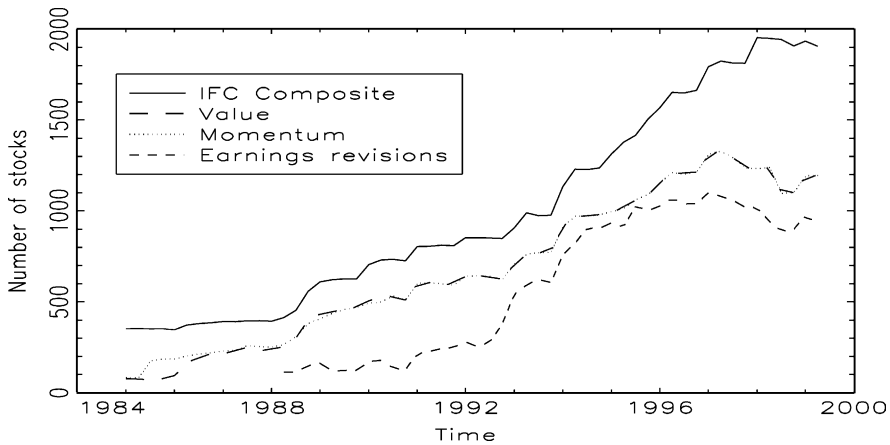
Fig. 1. Quarterly average number of securities in the universe of stocks from countries that are included in the IFC Composite index and in the samples for value, momentum and earnings revisions strategies.

and the current stock price, and earnings revisions. Following Achour et al. (1998), we define earnings revisions as the number of analysts with upward revisions minus the number of analysts with downward revisions divided by the total number of analysts providing an earnings forecast in a particular month. As analyst coverage was rather low initially, we consider portfolios formed on the basis of forward E/P ratios and earnings revisions from May 1988 onwards only.

At the end of our sample period, the EMDB contains data on 2851 firms from 32 emerging markets. Not all of these are included in our sample, however, for several reasons. First, the IFC database contains survivorship bias, as data (returns in particular) are backfilled when IFC starts constructing data for a particular country. We avoid this survivorship bias by using at any time only stocks from countries that are included in the IFC Composite index (cf. Fama and French, 1998; Rouwenhorst, 1999). See Harvey (1995) for a detailed discussion of this feature of the EMDB. Second, at each month during the sample period, we include only stocks with market capitalization in excess of a minimum level, which is set equal to US$100 million in December 1998 and deflated by 10% annually.[3] This eliminates stocks that are too small for large institutional investors and alleviates potential problems due to low-priced stocks. Note that, as this selection is made afresh at the beginning of each month, it does not create survivorship bias. Finally, we omit countries with less than four stocks and countries for which the data necessary for the particular selection strategy is available for less than 30% of the stocks. We omit these "small" countries because the selection strategies construct local return factor portfolios from the top and bottom 15% stocks in each country separately.

The impact of each of the data screens on the size of the sample or "universe" of stocks can be seen from Fig. 1, which shows the quarterly average number of stocks

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[3] The EMDB itself already contains a selection bias towards larger stocks, as market capitalization is one of the criteria used by the IFC to select stocks for its indices.

from countries that are included in the IFC Composite index, and the number of stocks in the samples available for the value, momentum and earnings revisions strategies (details of which are discussed below). The original IFC Composite universe consists of about 350 stocks in 10 countries in January 1985, gradually expanding to approximately 1900 stocks in 32 countries in May 1999. These numbers are reduced to 200 and 1200, respectively, by applying the market capitalization selection. Omitting countries with less than four stocks and countries for which the data on the ranking variable is available for less than 30% of the stocks mainly affects the strategies based on earnings revisions, for which the numbers of securities at the beginning and end of the sample period are equal to approximately 100 and 1000, respectively.

2.2. Stock selection strategies

We test several stock selection strategies based on indicators of value, momentum, earnings revisions, size and liquidity. As measures of value, we use the earnings-to-price ratio, the book-to-market ratio, the dividend yield (D/P) and the forward E/P ratios for the current fiscal year (E/P FY1) and for the next fiscal year (E/P FY2). For the momentum strategies, we use the average return over the previous 1, 3, 6, 9, 12 and 36 months (denoted as kMR, with k the number of months). Earnings revisions are measured by the past 3-month average earnings revisions for the current fiscal year (ER FY1) and for the next fiscal year (ER FY2). Size is taken to be the market capitalization of the stock at the end of the previous month. Finally, we follow Rouwenhorst (1999) in measuring liquidity by the turnover ratio, defined as the number of shares traded during the previous month divided by the total number of shares outstanding at the beginning of the month.

All strategies are applied without a delay between the ranking period and the moment of portfolio formation. As the IFC and IBES databases contain data as published, all sorting characteristics would have been available to investors at the time of ranking, and, hence, the selection strategies do not use any forward information. Apart from worries about the timely availability of the sorting variables, another reason to implement momentum strategies with a delay (usually 1 month) is to attenuate the effects of bid-ask bounce (see Achour et al., 1998; Rouwenhorst, 1999, among others). Because of the minimum capitalization requirement that we impose, the smallest, and probably least liquid, stocks are not included in our sample, and, hence, bid-ask bounce is less important at the monthly frequency. Therefore, we also implement the momentum strategies without delay, such that, for example, the 6-month momentum factor that is used to rank the stocks at the beginning of month t is based on the average return from the beginning of month $t - 6$ to the end of month $t - 1$. As a robustness test, we test all selection strategies with a 1-month implementation lag in Section 6.

At the beginning of each month, we rank the stocks by country on each of the above characteristics or "return factors" in descending order. The rankings based on the past 1- and 36-month return variables are in ascending order, such that we effectively test short-term and long-term mean reversion (cf. Jegadeesh, 1990; Lehmann, 1990; and De Bondt and Thaler, 1985, 1987, respectively). The rankings based on size and liquidity also are in ascending order, such that the smallest stocks and

stocks with the lowest turnover ratio, respectively, are the top ranked ones. For each country in the sample, an equally weighted portfolio is formed from the top 15% ranked stocks or "winners". These country portfolios are, in turn, combined into an internationally diversified portfolio, in which each stock receives an equal weight. The stocks are selected in each country separately to avoid any implicit country allocation, but we return to this point in Section 3.4. Each month, a new portfolio is constructed, which is held for a period of 6 months. After formation, the portfolio is not rebalanced, except for stocks that leave the IFC index. These stocks exit the portfolio and the weights of the remaining stocks are adjusted proportionally. Using the same procedure, an equally weighted portfolio of "losers" is constructed from the bottom 15% ranked stocks in each country. As we construct new portfolios every month and use a 6-month holding period, at any point in time, the strategies effectively hold six portfolios of, for example, the top 15% stocks, each formed 1 month apart. To handle the problems concerned with overlapping returns, we calculate monthly returns as the average of the six similar portfolios (cf. Jegadeesh and Titman, 1993, 2001; Rouwenhorst, 1998).

The performance of stock selection strategies is usually measured as the return on a "zero-investment" strategy, involving a long position in the winners portfolio and an offsetting short position in the losers portfolio, as in the work of Fama and French (1998) and Rouwenhorst (1999), among many others. However, it might be questioned whether these returns can actually be realized in practice, as short-selling constraints may prevent implementation of such a zero-investment strategy (see Alexander, 2000 for discussion). Short-selling restrictions are particularly relevant for emerging markets (see Bekaert and Urias, 1996, 1999; De Roon et al., 2001). For this reason, we primarily compare the average return of the winners portfolio with an equally weighted index (EWI) consisting of all stocks in the relevant universe. To facilitate comparison of our results with those of Fama and French (1998) and Rouwenhorst (1999), we also provide some results on a zero-cost strategy, by computing the excess return of the winners portfolio over the losers portfolio. As noted by Achour et al. (1998), even if the losers portfolio cannot be used in a trading strategy, it still provides important information regarding which stocks are to be avoided. Furthermore, as pointed out by the referee, the excess return of the winners portfolio over the losers portfolio can alternatively be interpreted as the excess return generated by a strategy where winners are overweighted and losers are underweighted versus their benchmark weights.

3. Profitability of stock selection strategies

In this section, we evaluate the performance of the various stock selection strategies. We consider results for "univariate" strategies, which rank stocks according to a single return factor, and for "multivariate" strategies, which combine measures of value, momentum and/or earnings revisions to produce the stock ranking. We also present results for individual countries and geographical regions to explore whether the strategies are successful on smaller samples of stocks. Finally, we examine the benefits from using the strategies for country selection in addition to stock selection.

3.1. Univariate strategies

Table 1 summarizes the average monthly returns during the 6-month holding period for the winners portfolio, the equally weighted index and the losers portfolio formed on the basis of a single return factor. Of the different value strategies considered, the earnings-to-price strategy generates the highest average excess return. This holds irrespective of whether excess returns are measured relative to the equally weighted index (TMI, Top-Minus-Index) or relative to the losers portfolio (TMB, Top-Minus-Bottom). The return on the E/P winners portfolio exceeds the return on the EWI benchmark by 0.53% per month on average, whereas high E/P stocks have outperformed low E/P stocks by 1.02% per month. These excess returns are strongly statistically significant, with t statistics of 4.45 and 5.46, respectively. Excess returns from the B/M strategy are only slightly lower, and close to the average excess returns reported by Rouwenhorst (1999). Selecting stocks based on their dividend yields in the previous month does not generate significant excess

Table 1
Returns of univariate stock selection strategies

Factor	No. of Stocks	Top	EWI	Bottom	TMI	t (TMI)	TMB	t (TMB)
E/P	685	1.89	1.35	0.88	0.53	4.45	1.02	5.46
B/M	684	1.83	1.33	1.00	0.49	2.99	0.83	3.18
D/P	625	1.76	1.67	1.34	0.09	0.81	0.42	2.52
E/P FY1	593	0.87	0.69	0.63	0.18	1.42	0.25	1.06
E/P FY2	579	0.72	0.58	0.49	0.14	0.90	0.24	0.91
1MR	696	1.41	1.52	1.45	− 0.11	− 1.32	0.00	0.01
3MR	694	1.63	1.54	1.29	0.09	0.96	0.37	2.26
6MR	692	1.69	1.55	1.24	0.14	1.41	0.48	2.63
9MR	689	1.77	1.59	1.27	0.18	1.68	0.52	2.67
12MR	685	1.81	1.62	1.45	0.19	1.55	0.38	1.84
36MR	625	1.72	1.64	1.52	0.08	0.49	0.20	0.93
ER FY1	584	0.76	0.45	0.22	0.31	3.43	0.56	4.22
ER FY2	543	0.94	0.62	0.31	0.32	3.28	0.65	4.51
Size	697	1.41	1.52	1.60	− 0.11	− 0.85	− 0.19	− 0.88
Liquidity	684	1.06	1.25	1.24	− 0.18	− 1.04	− 0.19	− 0.75

At the beginning of each month between January 1985 and May 1999, all stocks for which the necessary information is available are ranked by country in descending order according to the value of the factor indicated in the first column. E/P is the earnings-to-price ratio; B/M is the book-to-market ratio; D/P is the dividend yield; E/P FY1 and E/P FY2 are the forward E/P ratios for the current and next fiscal year, respectively; kMR, with $k = 1, 3, 6, 9, 12$ and 36, is the average return over the previous k months; ER FY1 and ER FY2 are the past 3-month average earnings revisions for the current and next fiscal year, respectively; size is the market capitalization of the stock at the beginning of the month; and liquidity is equal to the number of shares traded during the previous month divided by the total number of outstanding shares at the beginning of the month. The rankings according to 1MR, 36MR, size and liquidity are in ascending order. For each country, equally weighted portfolios are formed from the top and bottom 15% of stocks, which are combined into equally weighted internationally diversified portfolios (Top and Bottom). EWI is the equally weighted portfolio of all stocks in the sample. Positions are held for six months and are not rebalanced. Monthly, nonoverlapping returns are computed as the average return of the six similar portfolios that are held during each month. Column 2 reports the average number of stocks in the different samples. Columns 3–5 report the average returns of the Top, EWI and Bottom portfolios, expressed as percentage per month. Columns 6–7 and 8–9 report the average excess returns and the corresponding t statistics of the TMI portfolio and the TMB portfolio, respectively.

returns relative to the EWI. However, because the average return of the portfolio of stocks with very low dividend yields is much smaller than the average benchmark return, the return of the TMB portfolio is significant, albeit it is only half as large as the excess returns on the E/P and B/M strategies. The strategies based on forward E/P ratios also generate modest excess returns, but these are not significantly different from zero.

The results from the momentum strategies based on past 3-, 6-, 9-and 12-month returns are very similar. Excess returns for the TMB portfolios are between 0.4% and 0.5% per month and statistically significant. As the winners portfolios have (statistically insignificant) excess returns versus the EWI between 0.1% and 0.2% per month only, the profitability of the TMB portfolios is, however, mainly due to underperformance of the losers portfolios. Consequently, the profits from a zero-investment strategy based on the TMB portfolio would mostly come from the sell side. Because of short sales restrictions in emerging markets, the momentum strategy is in practice mostly relevant for avoiding low momentum stocks. The average excess return of the TMB portfolio based on prior 6-month returns is similar to the excess return reported by Rouwenhorst (1999), even though his winners and losers portfolios include stocks from the top and bottom 30% of the prior return distribution.[4]

The momentum returns in emerging markets found here are notably smaller than returns of comparable momentum portfolios for developed markets reported by Jegadeesh and Titman (1993) and Rouwenhorst (1998), which average approximately 1% per month. Admittedly, in these studies, the winners and losers portfolios contain only stocks from the top and bottom 10% of the prior return distributions compared to 15% in our strategies, but it is difficult to imagine that this small methodological difference can explain the large difference in excess returns completely. Also note that the excess returns of the TMB portfolios increase gradually as the length of the formation period increases from 3 to 9 months, but is slightly lower for the 12-month strategy. This pattern corresponds to the findings of Jegadeesh and Titman (1993), Rouwenhorst (1998) and Lee and Swaminathan (2000) for developed markets, albeit the differences between excess returns for different formation periods found in those studies are more pronounced.

The excess returns of strategies based on short-term and long-term mean reversion (1MR and 36MR, respectively), size and liquidity do not differ substantially from zero. In fact, the returns of smaller and less liquid stocks are somewhat lower than the returns of larger and more liquid stocks, although the differences are not significant. Our findings for the liquidity strategy are similar to Rouwenhorst (1999), but the results for the size strategy are quite different from Fama and French (1998), Patel (1998) and Rouwenhorst (1999), who report evidence for a premium for small firms in emerging markets. This contradictory result can be attributed to differences in methodology, in particular, the minimum capitalization requirement that we impose. When we examine the performance of the size strategy on the sample of stocks that results without imposing this requirement, we do find a premium for small stocks, in accordance with previous studies.[5] This corresponds with

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[4] The fact that excess returns nevertheless are of similar magnitude might (partly) be due to the fact that the cross-sectional return distributions in emerging markets are far from normal and in particular have much fatter tails, as documented by Bekaert et al. (1998).

[5] The excess return of small caps versus the complete universe is 0.48% with a *t* statistic of 2.04, while the excess return versus large caps equals 0.60% with a *t* statistic of 1.77.

the findings of Barry et al. (2002), who report that the size premium is not robust to the removal of extreme returns (which generally occur for the smallest stocks).

The strategies based on analysts' earnings revisions prove to be quite successful. Relative to the EWI, the top portfolios generate statistically significant excess returns of 0.3% per month, irrespective of whether revisions for the current or for the next fiscal year are used. Excess returns for the TMB portfolios also are strongly significant and equal about 0.6% per month. Our results concerning the usefulness of earnings revisions for emerging markets confirm the findings of Achour et al. (1998) for the much larger set of countries considered here.
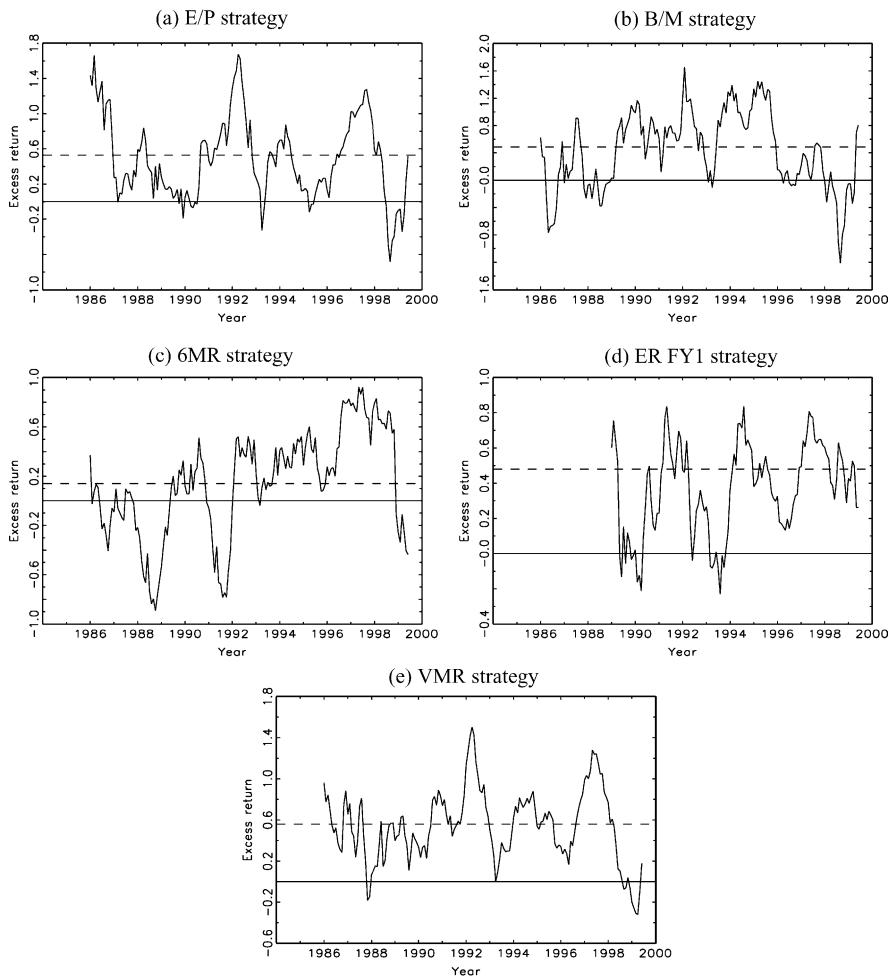

Fig. 2. Twelve-month moving average excess returns of the top portfolio relative to the equally weighted index for strategies based on E/P, B/M, 6MR, ER FY1 and the total score on measures of VMR. The dashed line indicates the mean monthly excess return.

The performance of the strategies based on E/P, B/M, 6-month momentum (6MR) and earnings revisions for the current fiscal year (ER FY1) over time is shown in Figs. 2 and 3, which plot 12-month moving average excess returns and cumulative excess returns, respectively, of the winners portfolios relative to the EWI. For three of these four strategies, the performance improves considerably over time. Over the period from January 1985 until December 1990, the average monthly excess returns from the B/M, 6MR, and ER FY1 strategies are equal to 0.41%, − 0.03% and 0.02 11.%, respectively, which increase to 0.55%, 0.27% and 0.40% over the period January 1991–May 1999. Notably, this is not the case for the E/P strategy, for which the monthly excess return is equal to 0.53% in both subperiods. Finally, the E/P and B/M strategies were clearly affected by the Asia crisis in 1997–1998 during which they underperformed relative to the EWI, although by 1999, the cumulative returns from these strategies had rebounded to precrisis level. By contrast, the performance of the earnings revisions strategy did not deteriorate during this period.

3.2. Multivariate strategies

Ranking firms on a single indicator can easily lead to misclassification of stocks. For example, value stocks with temporarily depressed earnings that might be expected to recover quickly can nevertheless drop out of the winners portfolio or even be assigned to the losers portfolio if firms are ranked on E/P only. Following Lakonishok et al. (1994) and Chan et al. (1996), among others, we therefore consider multivariate strategies that rank stocks on multiple indicators. However, our methodology differs slightly from these studies, which combine independent rankings based on two or more factors.

We consider multivariate strategies based on value, momentum and earnings revisions indicators, in particular E/P and B/M (value), past 6- and 12-month returns (momentum) and earnings revisions for the current and next fiscal year (revisions). These variables are selected because they have been found to be the most successful strategies in developed
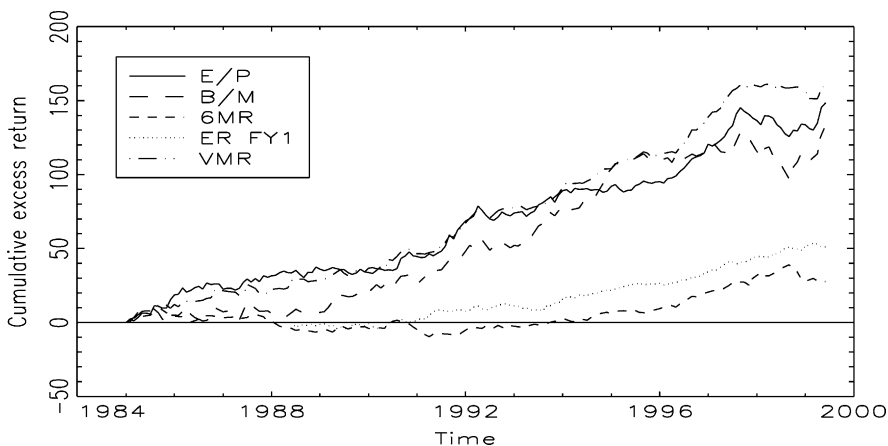

Fig. 3. Cumulative excess return of the top portfolio relative to the equally weighted index for strategies based on E/P, B/M, 6MR, ER FY1 and the total score on measures of VMR.

Table 2
Returns of multivariate stock selection strategies

Strategy	Top	EWI	Bottom	TMI	t (TMI)	TMB	t (TMB)
Value	1.99	1.37	0.77	0.60	4.45	1.22	4.97
Momentum	1.72	1.55	1.29	0.17	1.60	0.44	2.23
Revisions	0.78	0.48	0.19	0.30	3.14	0.61	4.40
VM	2.02	1.50	0.92	0.51	5.04	1.11	5.87
VR	1.97	1.35	0.67	0.62	4.76	1.31	5.86
MR	1.81	1.55	1.28	0.26	2.64	0.54	3.02
VMR	2.07	1.50	0.88	0.56	5.79	1.19	6.85

At the beginning of each month between January 1985 and May 1999, normalized values of E/P and B/M (value), past 6- and 12-month returns (momentum), and earnings revisions for the current and next fiscal year (revisions) are computed by subtracting the cross-sectional median and dividing by the median absolute deviation, and trimming the normalized values at ± 3. The sum of the normalized values of the relevant variables gives the score for the different multivariate strategies: VM denotes the value and momentum strategy, VR value and revisions, MR momentum and revisions, and VMR value, momentum and revisions. All stocks for which the relevant score is available are ranked by country in descending order. Equally weighted portfolios are formed from the top and bottom 15% of stocks, which are combined into equally weighted internationally diversified portfolios (Top and Bottom). EWI is the equally weighted portfolio of all stocks in the sample. Positions are held for 6 months and are not rebalanced. Monthly, nonoverlapping returns are computed as the average return of the six similar portfolios that are held during each month. Columns 2–4 report the average returns of the Top, EWI and Bottom portfolios, expressed as percentage per month. Columns 5–6 and 7–8 report the average excess returns and the corresponding t statistics of the TMI portfolio and the TMB portfolio, respectively.

markets. Note that these strategies also are among the best-performing univariate strategies in emerging markets, as shown in Table 1.

All six variables are normalized by subtracting the cross-sectional median and dividing by the median absolute deviation. We use the median and median absolute deviation instead of the mean and standard deviation to limit the influence of outliers. The effect of outliers is further reduced by trimming the normalized variables at values of ± 3. The "score" for the multivariate strategy then is obtained as the sum of the relevant normalized variables. For example, to obtain the score of a stock for the "value and momentum" strategy, we add the normalized values for E/P, B/M and 6- and 12-month returns. Based on the ranking according to this overall score, the top and bottom 15% of stocks are combined into equally weighted winners and losers portfolios, as in the univariate strategies.

Table 2 summarizes the results of the multivariate strategies. It is seen that combining different characteristics leads to higher (excess) returns in all cases. The winners portfolio of the strategy based on value and revisions (VR) generates the highest average excess returns, equal to 0.62% and 1.31% relative to the EWI and the losers portfolio, respectively. Adding momentum to this strategy lowers these excess returns slightly to 0.56% and 1.19%. However, because the volatility of the excess returns decreases more than proportionally, the corresponding t statistics are actually higher than for the VR strategy. A possible explanation for this effect is the negative correlation between the excess returns of the momentum strategy and the excess returns of the value and earnings revisions strategies, which are equal to -0.32 and -0.20, respectively.[6]

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[6] The correlation between the excess returns of the value and revisions strategies is equal to 0.22.

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Table 3
Excess returns of stock selection strategies by country

Country	Starting date	Average no. of stocks	E/P		B/M		6MR		ER FY1		VMR	
			$\bar{r}$	$t(\bar{r})$	$\bar{r}$	$t(\bar{r})$	$\bar{r}$	$t(\bar{r})$	$\bar{r}$	$t(\bar{r})$	$\bar{r}$	$t(\bar{r})$
Argentina	1985–01	19	0.66	1.59*	− 0.09	− 0.18	− 0.15	− 0.35	0.90	1.85**	0.39	0.88
Brazil	1985–06	36	0.78	1.04	1.29	1.63*	− 0.29	− 0.41	− 0.58	− 1.32	0.22	0.28
Chile	1985–01	31	0.37	1.37*	0.68	2.16**	0.65	2.45***	0.47	1.49*	0.69	2.58***
China	1995–10	140	0.37	0.36	0.12	0.10	0.27	0.51	–	–	0.49	0.76
Colombia	1986–09	14	− 0.06	− 0.12	− 1.02	− 1.70	− 0.31	− 0.85	0.43	0.69	− 0.05	− 0.11
Czech Rep.	1996–01	20	− 0.13	− 0.14	− 1.05	− 1.05	0.42	0.47	1.69	2.78***	0.67	0.92
Egypt	1997–01	27	0.36	0.40	0.10	0.17	0.15	0.24	–	–	0.19	0.27
Greece	1986–12	23	0.34	0.96	0.63	1.05	0.91	2.30**	0.94	2.92***	0.73	2.28**
Hungary	1994–04	8	0.50	0.58	1.14	1.20	0.91	1.44*	1.17	1.59*	2.48	4.31***
India	1985–01	65	− 0.40	− 1.30	− 0.38	− 0.98	0.67	2.83***	0.62	2.80***	0.21	0.80
Indonesia	1989–12	32	− 0.05	− 0.10	− 0.01	− 0.02	− 0.15	− 0.38	0.72	1.48*	0.20	0.50
Israel	1997–11	44	0.15	0.20	0.70	1.14	− 0.19	− 0.27	− 0.09	− 0.19	0.41	0.86
Jordan	1985–01	6	− 0.27	− 0.80	− 0.72	− 1.54	0.29	0.94	–	–	− 0.21	− 0.66
Korea	1985–01	82	0.67	2.26**	0.81	2.65***	− 0.30	− 0.95	0.52	2.76***	0.57	1.84**
Malaysia	1985–01	70	0.50	1.76**	0.68	1.84**	− 0.09	− 0.27	0.10	0.43	0.45	2.09**
Mexico	1985–01	49	0.42	1.09	− 0.05	− 0.10	0.28	0.96	0.42	1.71**	0.35	0.97
Morocco	1997–01	13	0.12	0.26	− 0.81	− 1.43	0.43	0.74	–	–	− 0.30	− 0.70

Country	Period	n											
Nigeria	1985–01	8	0.70	2.40***	− 0.13	− 0.26	1.01	3.23***	–	–	1.85	5.12***
Pakistan	1985–06	14	− 0.49	− 1.35	− 0.55	− 1.11	0.07	0.20	0.17	0.39	0.13	0.40
Peru	1994–01	15	0.07	0.12	− 1.40	− 1.74	0.16	0.27	− 0.39	− 0.90	− 0.46	− 1.12
Philippines	1986–01	22	− 0.11	− 0.25	− 0.48	− 0.89	− 0.12	− 0.30	0.69	1.70**	0.13	0.35
Poland	1994–04	14	1.77	2.36***	1.43	1.63**	0.15	0.17	− 0.31	− 0.50	0.90	0.87
Portugal	1986–06	21	− 0.19	− 0.45	− 1.06	− 1.85	0.40	1.10	− 0.09	− 0.37	− 0.22	− 0.51
Russia	1997–01	22	2.75	1.45*	0.30	0.20	− 0.43	− 0.24	2.67	0.76	− 1.67	− 0.94
Slovakia	1997–11	5	− 1.19	− 0.42	− 1.87	− 0.36	4.23	1.32*	–	–	1.54	0.44
South Africa	1995–05	65	0.67	1.19	0.32	0.40	− 0.18	− 0.32	0.44	1.08	0.18	0.37
Sri Lanka	1994–01	8	− 0.64	− 0.85	1.00	1.14	0.64	0.90	1.04	1.73**	− 0.37	− 0.59
Taiwan	1985–01	66	0.34	1.29*	0.25	0.66	− 0.71	− 2.46	− 0.02	− 0.08	− 0.04	− 0.13
Thailand	1985–01	38	− 0.09	− 0.22	− 0.37	− 0.61	0.25	0.53	0.36	0.83	0.00	− 0.01
Turkey	1987–01	26	1.63	2.26**	2.42	2.60***	− 0.73	− 0.96	0.79	1.37*	1.95	2.97***
Venezuela	1985–06	10	1.93	3.02***	0.05	0.08	− 0.23	− 0.41	− 1.62	− 2.11	1.12	1.70**
Zimbabwe	1988–08	6	0.63	0.82	1.18	1.64*	− 0.17	− 0.27	–	–	1.19	1.62*

Portfolios are formed on E/P, B/M, 6MR, ER FY1 and the total score on measures of VMR as described in Tables 1 and 2. The table reports the average excess returns ($\bar{r}$) of the equally weighted country portfolios consisting of the top 15% ranked stocks relative to the equally weighted portfolio of all stocks for the particular country, expressed as percentage per month, and the corresponding t statistics ($t(\bar{r})$). Column 2 reports the earliest date at which one of the strategies is implemented, column 3 reports the average number of stocks in the samples used for the different strategies.

* Significantly positive at the 10% level (one-sided).
** Significantly positive at the 5% level (one-sided).
*** Significantly positive at the 1% level (one-sided).

The (cumulative) outperformance of the value, momentum and revisions (VMR) strategy is shown in Figs. 2 and 3. The excess return is approximately constant over time (equal to 0.55% and 0.57% per month during the pre- and post-1991 periods), which obviously is due to the inclusion of E/P as one of the characteristics. Note that the cumulative profits remained roughly stable during the last 2 years of the sample period. Apparently, the negative performance of the value strategies canceled out against the positive performance of the earnings revisions strategy during the Asia crisis.

3.3. Profitability by country and region

The results presented so far concern internationally diversified (but country-neutral) portfolios. Table 3 summarizes the excess returns of the winners portfolios in the E/P, B/M, 6MR, ER FY1 and VMR strategies for the individual countries in our sample. Excess returns in this case are measured relative to the local equally weighted index. We concentrate on these strategies in the following as they were the most successful ones for the international portfolio.

For the univariate strategies, only few countries have significantly positive excess returns. In fact, for the B/M and 6MR strategies, excess returns actually are negative for almost half of the countries. The results do not improve notably for the multivariate VMR strategy. Our findings again correspond with Rouwenhorst (1999), who finds very few significant excess returns of winners minus losers portfolios for individual countries for different value and momentum strategies.

The combined results in Tables 1–3 clearly demonstrate the benefits from international diversification for investing in emerging markets. The small number of stocks in most countries, together with the high volatility of returns, prevents successful implementation of the stock selection strategies in individual markets. Because of the (unreported) low correlations between the returns in different countries, applying the trading strategies globally reduces portfolio risk considerably, such that significant excess returns can be gained. This corresponds with the findings of Serra (2000), who documents that country effects are important factors in the behavior of emerging markets' returns.

Panel (a) of Table 4 shows that aggregating to a regional level is sufficient in principle, although not all strategies work equally well in all regions. The E/P and B/M value strategies earn significant excess returns in all regions, the 6-month momentum strategy outperforms the EWI in Europe/Middle East/Asia (EMEA) and Latin America but not in Asia, whereas the excess return of the ER FY1 revisions strategy is significant in Asia but not in EMEA and Latin America. The combined value, momentum and revisions strategy generates outperformance against the EWI in all three regions.

3.4. Stock selection versus country selection

The strategies considered above are country-neutral, in the sense that by selecting the top and bottom 15% ranked stocks by country, the resulting international portfolios do not take a net position in any country (relative to the EWI). The excess returns of these strategies thus purely derive from stock selection. By contrast, most research on trading strategies in emerging markets has focused on country selection and, in fact, the same

Table 4

Excess returns of country-neutral stock selection strategies by region, of global selection strategies and of stock selection strategies for nonliberalized and liberalized countries

Region	E/P		B/M		6MR		ER FY1		VMR	
	$\bar{r}$	$t(\bar{r})$	$\bar{r}$	$t(\bar{r})$	$\bar{r}$	$t(\bar{r})$	$\bar{r}$	$t(\bar{r})$	$\bar{r}$	$t(\bar{r})$
Base case	0.53	4.45	0.49	2.99	0.14	1.41	0.31	3.43	0.56	5.79
Panel (a): excess returns by region										
Asia	0.38	1.99	0.32	2.08	0.065	0.48	0.35	2.38	0.40	3.29
EMEA	1.08	3.64	0.59	2.13	0.44	1.68	0.23	0.83	0.99	3.77
Latin America	0.77	2.79	0.65	2.72	0.32	1.57	0.41	1.02	0.64	2.86
Panel (b): excess returns of global selection strategies										
Global	1.12	3.52	0.96	3.37	0.61	1.67	0.58	2.36	1.45	4.67
Country selection	0.49	1.88	0.46	1.79	0.57	1.74	0.31	1.33	0.95	3.61
Stock selection	0.63	5.16	0.50	5.12	0.042	0.36	0.27	2.87	0.50	4.69
Panel (c): excess returns for liberalized and nonliberalized countries										
Nonliberalized (BH)	0.54	2.09	− 0.25	− 0.73	0.15	0.88	0.43	2.19	0.51	2.54
Liberalized (BH)	0.47	3.62	0.51	2.43	0.25	1.61	0.23	1.90	0.43	3.59
Nonliberalized (BEW)	0.29	1.86	0.49	2.45	0.23	1.61	0.22	1.81	0.39	3.57
Liberalized (BEW)	0.55	4.19	0.62	3.40	0.25	2.01	0.38	3.99	0.59	5.31
Noninvestables	0.63	2.96	0.45	1.77	0.45	2.73	0.66	2.72	0.68	3.91
Investables	0.37	2.54	0.62	3.58	0.23	1.54	0.26	2.09	0.55	4.93

Portfolios are formed on E/P, B/M, 6MR, ER FY1 and the total score on measures of VMR as described in Tables 1 and 2. The row labelled "Base case" repeats the results from Tables 1 and 2 for equally weighted country-neutral portfolios. Panel (a) reports results from applying country-neutral selection strategies per region. Asia includes China, India, Indonesia, Korea, Malaysia, Pakistan, Philippines, Sri Lanka, Taiwan and Thailand; EMEA includes Czech Republic, Egypt, Greece, Hungary, Israel, Jordan, Morocco, Nigeria, Poland, Portugal, Russia, Slovakia, South Africa, Turkey and Zimbabwe; Latin America includes Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela. Panel (b) reports results for portfolios for global selection strategies, which are formed by ranking stocks globally. The table reports the average excess returns ($\bar{r}$) of the equally weighted portfolios consisting of the top 15% ranked stocks relative to the equally weighted portfolio of all stocks in the region or size segment, expressed as percentage per month, and the corresponding t statistics ($t(\bar{r})$). The final two rows of panel (b) show the decomposition of the total excess return of the global strategies into parts due to country selection and stock selection. Panel (c) reports results from applying country-neutral selection strategies to liberalized and nonliberalized countries separately. Rows labelled (BH) use the official liberalization dates reported by Bekaert and Harvey (2000a,b) to determine when an emerging country liberalized its financial market. Rows labelled (BEW) use the measure for the level of foreign ownership restrictions from Bekaert (1995) and Edison and Warnock (2001) to determine the degree of liberalization. For the final two rows, the universe consists of stocks which are included in the IFC Investable index or not.

return factors that are found useful for individual stock selection here have been found useful for country selection (see Harvey, 1995; Bekaert et al., 1997, among others).[7]

We investigate whether country selection can add to the profitability of the stock selection strategies by ranking stocks globally and forming an equally weighted portfolio consisting of the top 15% stocks in this alternative ranking. This procedure implicitly

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[7] The same appears to be true for developed equity markets (see Asness et al., 1997; Richards, 1997; Chan et al., 2000, among others).

allows the winners and losers portfolios to take net positions in the different emerging market countries (relative to the EWI). Panel (b) of Table 4 shows the monthly excess returns of global strategies. It is seen that including country selection doubles the excess returns of the E/P, B/M and E/R FY1 strategies and even quadruples the excess return of the 6-month momentum strategy. However, at the same time, the volatility of the excess returns increases proportionally, such that the t statistics of the global strategies are of comparable magnitude or even smaller than for the country-neutral strategies.

We decompose the excess returns of the global selection strategies into parts that are due to country selection and due to stock selection. The second and third rows of panel (b) of Table 4 show that for the E/P, B/M and ER FY1 strategies, country and stock selection contribute roughly equally to the total excess returns. The excess returns due to country selection are, however, much more volatile than the excess returns due to stock selection. Finally, it is noteworthy that the outperformance of the global 6-month momentum strategy is almost entirely due to country selection.

4. Stock selection and financial market liberalization

The analysis presented in the previous section implicitly assumes that all stocks in the IFC Emerging Markets Database were accessible to foreign investors historically. This, however, generally is not the case. Many emerging countries reformed their financial systems only during the late 1980s and early 1990s, where to a large extent these reforms were aimed at opening the stock market to foreign investors. Bekaert (1995) and Bekaert and Harvey (2000a,b) provide detailed chronologies of these financial market liberalizations. As noted in Section 1, several recent studies document that these liberalizations have had substantial effects on key macroeconomic and financial variables, such as economic growth and the cost of capital. Financial market liberalizations may also have affected the profitability of stock selection strategies, although the impact is not known a priori. On the one hand,[8] liberalization may lead to more openness and efficiency of asset prices, hence reducing the scope for selection strategies such as the ones considered here. On the other hand, it sometimes is argued that imperfections are more prevalent in international (and integrated) capital markets than in domestic (and segmented) markets, due to more severe asymmetric information problems. In this case, stock selection strategies may become more profitable following financial market liberalization.

We explore this issue in several different ways. First, we form universes of stocks from nonliberalized and liberalized countries using the official liberalization dates from Bekaert and Harvey (2000a,b) to decide upon the status of each emerging market at each point in

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[8] If w_i^p and w_i^b denote the weights of country i in the portfolio and the (equally weighted index) benchmark, respectively, and r_i^p and r_i^b denote the corresponding country returns, the total excess return of the global portfolio is given by $\sum_i (w_i^p r_i^p - w_i^b r_i^b)$. This can be written as $\sum_i (w_i^p r_i^p - w_i^b r_i^b) = \sum_i (w_i^p w_i^b) r_i^b + \sum_i (r_i^p r_i^b) w_i^p$. The first term on the right-hand side then measures the contribution of country selection to the total excess return, and the second term measures the contribution of stock selection. Note that the stock selection contribution is not exactly equal to the country-neutral results due to variations in the country weights and in the percentage of stocks selected in each country.

time.[9] The "liberalized" universe is empty until July 1986 (which is the official liberalization date for Portugal) and gradually expands over time. The "nonliberalized" universe, initially consisting of all countries in our data set, shrinks over time until it becomes empty in August 1995.[10] We apply the country-neutral stock selection strategies to these two universes separately, constructing winners and losers portfolios as before. The first two lines in panel (c) of Table 4 show that the effect of liberalization on the profitability of the selection strategies is ambiguous: For the strategies based on E/P and earnings revisions and the multivariate strategy, the average return is somewhat lower when applied to stocks from liberalized countries, but for the B/M and 6MR strategies, it is higher. In fact, for none of the strategies, we can reject the null hypothesis that the average excess returns in liberalized and nonliberalized countries are equal. Also note that, even though the average returns of the E/P and VMR strategies are lower in liberalized countries, the corresponding t statistics actually increase, suggesting that the risk of these strategies is reduced more than proportionally.

Using official liberalization (or any other) dates to determine the accessibility of emerging stock markets implies a rather rigorous view on financial market liberalization as a one-time event constituting an instantaneous and complete opening to foreign investors. However, it is widely recognized that most emerging market liberalizations have been gradual processes, with restrictions on foreign investment being removed in several rounds of liberalization measures (see Henry, 2000; Edison and Warnock, 2001, among others). Hence, designating a specific point in time as the moment of financial liberalization may be problematic (see also Bekaert et al., 2002). Therefore, as a second test of the effects of liberalization on the performance of stock selection strategies, we follow Bekaert (1995) and Edison and Warnock (2001) in using their measure of the intensity of capital controls as an indicator of the "degree of liberalization" of a particular emerging market. This measure, denoted as $FOR_{i,t}$, is defined as one minus the ratio of the market capitalizations of the IFC Investables and IFC Global indices of country i at time t.[11] As the name suggests, stocks that are included in the IFC Investables index are "investable", in the sense that they can be bought and sold by foreign investors. On the other hand, the IFC Global index is intended to represent the stock market as a whole. Hence, $FOR_{i,t}$ being

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[9] We assume that those countries in our data set for which Bekaert and Harvey (2000a,b) do not provide an official liberalization date were liberalized for the complete sample period. The results are not sensitive to this assumption.

[10] Because the liberalized universe contains a very small number of stocks during the first few years of the sample period and because the IFC Investables index (to be discussed below) is available from December 1988 onwards only, all results reported in this section relate to the period January 1989–May 1999.

[11] To remove the effects of asymmetric price shocks, we smooth the measure by dividing the market capitalizations by the respective price indices (cf. Edison and Warnock, 2001), that is, the measure of the level of country i's foreign ownership restrictions at time t is given by

$$FOR_{i,t} = 1 - \frac{MC_{i,t}^{IFCI}/P_{i,t}^{IFCI}}{MC_{i,t}^{IFCG}/P_{i,t}^{IFCG}},$$

where $MC_{i,t}$ and $P_{i,t}$ are the market capitalization and level, respectively, of country i's IFC Investable (IFCI) or Global (IFCG) price indices at time t.

equal to 0 (1) implies that a market is fully open (closed) to foreign investors. From the country-neutral selection strategies applied to the universe consisting of all stocks, we coin a fraction $FOR_{i,t}$ of the returns for the portfolios of country i at time t as "nonliberalized" return, whereas the remainder is regarded as "liberalized" return. These returns are aggregated across countries to obtain returns on internationally diversified portfolios. The results from this exercise are shown in the third and fourth rows of panel (c) in Table 4. We now find that liberalization actually enhances the performance not only for the B/M and momentum strategies, but also for the E/P, ER FY1 and VMR strategies, although, again, we cannot reject equality of the average excess returns in the two universes for all strategies.

The previous analysis only gives a rough indication of the profitability of the stock selection strategies when accounting for restrictions on foreign ownership, as we do not explicitly incorporate information on which individual stocks are available to foreign investors. To perform such a test more directly, we consider the performance of the selection strategies on universes consisting of stocks that are included in the IFC Investables index and of stocks that are not. The final two rows of panel (c) in Table 4 show that all strategies except the one based on B/M perform slightly better when applied to noninvestable stocks. Note, however, that the outperformance of all strategies except 6MR is still statistically significant when selection is restricted to investable stocks only. Furthermore, the null hypothesis that the average excess returns for investable and noninvestable stocks are equal cannot be rejected for any of the strategies.

In sum, the results in this section convincingly suggest that financial market liberalization has not affected the performance of the stock selection strategies. Irrespective of the way in which liberalization is measured, the selection strategies earn significant excess returns in both liberalized and nonliberalized markets.

5. Stock selection and global risk factors

There is an ongoing debate concerning the appropriate interpretation of the profitability of value, momentum and revisions strategies. Roughly speaking, the competing explanations can be grouped under the headings "compensation for risk" on the one hand and "market inefficiency", due to under- or overreaction of investors to newly arriving information, on the other.[12] Here, we test whether the success of the selection strategies in emerging markets can be attributed to exposure to global risk factors by using the four-factor regression model developed by Fama and French (1993, 1996) and Carhart (1997). This model explains portfolio returns in excess of the risk-free rate ($R_{p,t} - R_{f,t}$) by sensitivities to the excess return on the market portfolio ($R_{M,t} - R_{f,t}$) and the difference between the returns on portfolios of stocks with high and low book-to-market values ($R_{HML,t}$, High-Minus-Low), on portfolios of stocks with small and large market capital-

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[12] See Barberis and Thaler (in press) for a recent survey of this literature on "behavioral finance" and Fama (1998) for a critical evaluation.

ization ($R_{\text{SMB},t}$, Small-Minus-Big), and on portfolios of stocks with high and low momentum ($R_{\text{UMD},t}$, Up-Minus-Down). That is, the model is given by

$$R_{\text{p},t} - R_{\text{f},t} = \alpha + \beta_{\text{M}}(R_{\text{M},t} - R_{\text{f},t}) + \beta_{\text{HML}}R_{\text{HML},t} + \beta_{\text{SMB}}R_{\text{SMB},t} + \beta_{\text{UMD}}R_{\text{UMD},t} + \varepsilon_t. \tag{1}$$

The returns on the (equally weighted)[13] global market index and global HML, SMB and UMD factors are constructed using the methodology described in detail by Fama and French (1998).[14] The four-factor model is estimated with $R_{\text{p},t}$ being the returns on the top and bottom portfolios in the different strategies, the corresponding universes of emerging market stocks, and the TMI and TMB excess returns. As these excess returns can be interpreted as the returns on zero-investment strategies, the risk-free interest rate is not included on the left-hand side of Eq. (1) in those cases.

The estimation results in Table 5 show a number of interesting features. First, the estimates of β_{M} are significantly less than 1 for all top and bottom portfolios and universes of emerging market stocks, except for the earnings revisions strategy. This finding can probably be attributed to the fact that the emerging markets were not completely liberalized and integrated with global equity markets during the first part of our sample period. This is also suggested by the estimates of betas for portfolios in the E/R strategy, for which the sample starts only in 1988.[15] Note that for all selection strategies, the betas for the top portfolio are not significantly higher than the betas for the corresponding universe and bottom portfolio. The resulting estimates of beta when the excess returns of the winners portfolio relative to the universe or losers portfolio are used as dependent variable therefore are close to zero for all selection strategies considered. Second, the emerging market portfolios are virtually insensitive to the global HML, SMB and UMD factors. For the top and bottom portfolios and universes, the estimates of β_{SMB} and β_{UMD} are never significant, while the estimates of β_{HML} are significant only for a few cases in the E/P, B/M and VMR strategies. Furthermore, the sensitivities of the TMI and TMB excess returns are never significantly different from zero, except for the HML and UMD factors in case of the E/P and momentum strategies, respectively. Third, and most important, the estimated intercepts α for the TMI and TMB excess returns are significantly different from zero for all strategies, and they are very close to the raw excess returns reported in Tables 1

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[13] Using a value-weighted global market index and risk factors based on value-weighted portfolios leads to similar conclusions. Detailed results are available on request.

[14] The SMB and HML factor returns are constructed as follows. Using a database of global stocks (which is constructed using the same data screens as applied to the universe of emerging market stocks, see Section 2.1 for details) we form two portfolios based on monthly rankings according to size (measured by market capitalization) and three portfolios based on monthly rankings according to book-to-market by country. The size break-point is the (local) median market capitalization, while the B/M break-points are the (local) 30th and 70th percentiles. Taking the intersection of these independent rankings, we obtain six portfolios for each country, which, in turn, are combined into equally weighted global portfolios. The SMB factor return is the average return (in US dollars) on the three "small" portfolios minus the average return on the three "big" portfolios. The HML factor return is the average return on the two value portfolios minus the average return on the two growth portfolios. The UMD factor is constructed using a similar procedure, but using the prior 6-month return instead of B/M.

[15] Estimating Eq. (1) with a 5-year rolling sample confirms this explanation, in the sense that the estimates of β_{M} show a tendency to increase over time.

Table 5
Four-factor regressions for winners and losers portfolios in stock selection strategies using global factor portfolios

Portfolio		α	$t(\alpha)$	β_M	$t(\beta_M[-1])$	β_{HML}	$t(\beta_{HML})$	β_{SMB}	$t(\beta_{SMB})$	β_{UMD}	$t(\beta_{UMD})$	$\bar{R}^2$
E/P	Top	0.99	2.33	0.72	−3.02	0.83	2.47	0.30	0.80	0.06	0.25	0.29
	EWI	0.52	1.28	0.71	−3.21	0.59	1.84	0.32	0.89	0.03	0.11	0.29
	Bottom	0.13	0.29	0.67	−3.35	0.54	1.54	0.27	0.69	−0.02	−0.09	0.23
	TMI	0.47	3.59	0.01	0.19	0.24	2.33	−0.02	−0.15	0.04	0.46	0.02
	TMB	0.86	4.20	0.05	1.04	0.29	1.79	0.03	0.16	0.09	0.71	0.00
B/M	Top	1.05	2.24	0.76	−2.33	0.61	1.65	0.38	0.92	−0.15	−0.51	0.27
	EWI	0.51	1.26	0.71	−3.26	0.57	1.76	0.32	0.90	0.03	0.11	0.29
	Bottom	0.15	0.34	0.70	−3.16	0.68	1.99	0.19	0.51	0.14	0.52	0.26
	TMI	0.54	2.96	0.05	1.27	0.05	0.32	0.06	0.36	−0.18	−1.57	0.03
	TMB	0.90	3.07	0.06	0.90	−0.06	−0.27	0.19	0.72	−0.28	−1.58	0.01
6MR	Top	0.90	2.31	0.72	−3.22	0.33	1.09	0.42	1.22	0.04	0.17	0.30
	EWI	0.77	2.04	0.72	−3.33	0.38	1.28	0.49	1.48	−0.07	−0.32	0.33
	Bottom	0.48	1.18	0.73	−3.00	0.43	1.35	0.52	1.45	−0.24	−0.95	0.32
	TMI	0.12	1.13	0.00	0.11	−0.05	−0.58	−0.08	−0.81	0.11	1.70	0.03
	TMB	0.42	2.14	−0.01	−0.18	−0.10	−0.63	−0.10	−0.58	0.28	2.30	0.06
ER FY1	Top	0.13	0.28	0.96	−0.35	0.42	1.13	−0.10	−0.25	−0.22	−0.80	0.43
	EWI	−0.16	−0.35	0.95	−0.44	0.47	1.24	−0.02	−0.05	−0.30	−1.04	0.42
	Bottom	−0.35	−0.72	0.94	−0.48	0.43	1.09	0.04	0.08	−0.32	−1.10	0.40
	TMI	0.29	2.76	0.01	0.44	−0.05	−0.61	−0.08	−0.85	0.08	1.19	0.02
	TMB	0.47	3.08	0.02	0.48	−0.01	−0.08	−0.14	−0.98	0.10	1.11	−0.00
VMR	Top	1.22	3.09	0.74	−3.00	0.49	1.57	0.35	1.00	−0.02	−0.10	0.32
	EWI	0.69	1.84	0.72	−3.32	0.49	1.63	0.45	1.37	−0.04	−0.17	0.34
	Bottom	0.11	0.29	0.70	−3.64	0.55	1.81	0.37	1.11	−0.12	−0.52	0.33
	TMI	0.53	4.90	0.01	0.54	0.01	0.09	−0.10	−1.08	0.02	0.24	−0.01
	TMB	1.11	5.86	0.04	1.01	−0.05	−0.35	−0.02	−0.12	0.10	0.83	−0.01

The table presents coefficient estimates and t statistics from the four-factor model

$$R_{p,t} - R_{f,t} = \alpha + \beta_M(R_{M,t} - R_{f,t}) + \beta_{HML}R_{HML,t} + \beta_{SMB}R_{SMB,t} + \beta_{UMD}R_{UMD,t} + \varepsilon_t,$$

where $R_{f,t}$ is the 1-month US T-bill return, $R_{M,t}$ is the global market return and $R_{HML,t}$ (High-Minus-Low), $R_{SMB,t}$ (Small-Minus-Big) and $R_{UMD,t}$ (Up-Minus-Down) are returns on global book-to-market, size and momentum factor portfolios. See Footnote 14 for details on the construction of these factors. $R_{p,t}$ is the return on the winners or losers portfolio in a particular strategy (rows labelled "Top" and "Bottom", respectively), the corresponding universe of emerging market stocks (EWI), or the excess return on the top portfolio relative to the equally weighted index (TMI) or bottom portfolio (TMB). The risk-free interest rate is not included on the left-hand side in regressions involving the TMI and TMB excess returns. $t(.)$ is the t statistic for the regression coefficients. $t(\beta_M[-1])$ is the t statistic of β_M minus 1 for the regressions with $R_{p,t}$ being the return on the winners or losers portfolio or the equally weighted index; $t(\beta_M[-1])$ is the t statistic of β_M for the regressions involving the TMI and TMB excess returns. The regression $\bar{R}^2$ is adjusted for degrees of freedom.

and 2. Hence, global book-to-market, size and momentum risk factors cannot explain the outperformance of stock selection strategies in emerging markets. This corroborates the results obtained by Rouwenhorst (1999) using a two-factor model with only the HML factor included next to the market portfolio return.

A few qualifications regarding the above results are in order. First, we have assumed that the factor loadings in Eq. (1) are constant. As shown by Ferson and Harvey (1999), this assumption is unrealistic even for portfolios of stocks from developed markets. Indeed, in the rolling sample regressions mentioned in Footnote 15, not only did we find that β_M tends to increase over time, but also that the exposures to the other factors in the model, as well as the intercept α, show substantial variation. However, there are no easily discernible patterns. For example, it generally is not the case that α gradually declines over time or becomes insignificant.

Second, the use of global risk factors in Eq. (1) implicitly assumes that emerging markets were fully integrated with world capital markets during the complete sample period. As argued in Section 4, this surely has not been not the case. Estimating the four-factor model for returns on portfolios consisting of stocks from liberalized or non-liberalized countries only, however, we do not find significant differences for these two sets of portfolios.[16] A more thorough investigation of these issues, using models that allow the factor loadings to vary with conditioning variables, as in the work of Ferson and Harvey (1999), or that allow for time-varying integration, as in the study by Bekaert and Harvey (1995, 1997), is left for future research. The same holds for behavioral explanations of the excess returns of the selection strategies in terms of investors' under- or overreaction.

6. Profitability in practice

The results presented in Section 3 suggest that various stock selection strategies generate significant excess returns in emerging markets. A natural question to ask is whether these strategies are still profitable if applied in practice by a large investor. Apart from restrictions on foreign ownership as discussed in Section 4, factors that may prevent successful implementation are lack of liquidity, occurrence of outliers, implementation lag and presence of substantial transaction costs. We address this issue by evaluating the selection strategies under different circumstances, which account for each of these aspects in turn.

For a large investor, it is important that the stocks in the strategy portfolio have sufficient size and liquidity. Even though from the outset, we have excluded the very smallest stocks, with market capitalization below an equivalent of 100 million in December 1998 US dollars (see Section 2.2), this might still be a cause for concern if the excess returns of the strategies were mainly due to the smallest stocks that are included in our universe or if the strategies tend to select the smallest or least liquid stocks. We examine the role of size and liquidity in two different ways. First, we examine the performance of the strategies for different size segments. All stocks in the sample are divided according to market capitalization into three equally sized segments, which we call small, mid and large caps. In addition, we also report results for the stocks that were excluded at the outset of our analysis (mini caps).

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[16] To conserve space, detailed estimation results are not shown here, but they are available on request.

Panel (a) of Table 6 shows that the E/P and B/M strategies generate the highest excess returns for the larger size segments, whereas the 6-month momentum strategy seems to work best for the excluded mini caps. The earnings revisions strategy attains the best results for the small and mid cap stocks, but it has a negative excess return for the excluded mini caps. The latter result can be explained by the low analyst coverage for the smallest stocks. For the multivariate strategy, the excess returns are significant for all size segments although they are negatively related to size. In sum, the profitability of the selection strategies is not limited to a certain size segment.

Second, we compare the median market capitalization and the median turnover ratio for the top and bottom portfolios and the equally weighted index of all stocks. Recall that the turnover ratio is defined as the number of shares traded each month divided by the number

Table 6
Excess returns of modified stock selection strategies

Test	E/P		B/M		6MR		ER FY1		VMR	
	$\bar{r}$	$t(\bar{r})$	$\bar{r}$	$t(\bar{r})$	$\bar{r}$	$t(\bar{r})$	$\bar{r}$	$t(\bar{r})$	$\bar{r}$	$t(\bar{r})$
Base case	0.53	4.45	0.49	2.99	0.14	1.41	0.31	3.43	0.56	5.79
Panel (a): excess returns and market capitalization										
Mini caps	0.33	1.54	0.61	2.38	0.48	2.43	− 0.17	− 0.53	0.43	2.39
Small caps	0.26	1.22	0.13	0.57	0.33	1.53	0.78	2.42	0.64	3.35
Mid caps	0.84	4.30	0.74	2.76	0.03	0.13	0.69	2.20	0.50	2.26
Large caps	0.48	2.64	0.60	2.04	0.07	0.34	0.20	1.81	0.43	2.60
Panel (b): excess returns, outliers and implementation delays										
Median returns	0.30	2.97	− 0.06	− 0.47	0.28	3.24	0.38	4.70	0.47	5.71
Implementation lag	0.42	3.36	0.42	2.45	0.16	1.60	0.28	3.31	0.47	4.66
Panel (c): excess returns and transaction costs										
Transaction costs 1%	0.35	2.93	0.34	2.08	− 0.13	− 1.31	0.05	0.59	0.35	3.55
Transaction costs 1.5%	0.26	2.16	0.27	1.62	− 0.27	− 2.64	− 0.08	− 0.87	0.24	2.45
Transaction costs 2%	0.17	1.41	0.19	1.16	− 0.41	− 3.97	− 0.22	− 2.29	0.13	1.35
Panel (d): excess returns and value-weighted portfolios										
Value weighted I	0.39	1.93	0.56	2.21	− 0.09	− 0.51	0.17	0.97	0.46	2.61
Value weighted II	0.67	4.48	0.65	3.70	0.33	2.81	0.48	3.07	0.66	5.27

Portfolios are formed on E/P, B/M, 6MR, ER FY1 and the total score on measures of VMR as described in Tables 1 and 2. The row labelled "Base case" repeats the results from Tables 1 and 2 for equally weighted country-neutral portfolios. Panel (a) shows results from applying the selection strategies in different size segments, where all stocks in the sample are divided according to market capitalization into three equally sized segments, denoted as Small, Mid and Large caps. Mini caps are stocks with market capitalization smaller than US$100 million in December 1998 (deflated at 10% annually). For the row labelled "Median returns", portfolio returns are measured as the median return of the stocks in the portfolio. The row labelled "Implementation lag" contains results when a 1-month delay between the ranking period and moment of portfolio formation is allowed. The row labelled "Transaction costs 1% (1.5%, 2%)" contains results when transaction costs of 1% (1.5%, 2%) for each sale or purchase of stocks are assumed. The row "Value weighted I" is based on value-weighted portfolios and value-weighted benchmarks. The row "Value weighted II" is based on portfolios with equal overweights compared to a value-weighted benchmark, as described in the text. The table reports the average excess returns ($\bar{r}$) of the portfolios consisting of the top 15% ranked stocks relative to the benchmark portfolio of all stocks in the sample, expressed as percentage per month, and the corresponding *t* statistics $t(\bar{r})$.

of outstanding shares. Table 7 shows that the B/M and, to a lesser extent, the E/P strategies tend to select smaller stocks, whereas the 6MR, ER FY1 and VMR strategies select larger stocks on average. The turnover ratio for all winners portfolios is equal to or higher than the turnover ratio for the complete sample of stocks. Concluding, liquidity may be lower for value stocks, but it is higher for stocks selected by the momentum, earnings revisions and multivariate strategies.

Related to the size and liquidity of the portfolios involved in the stock selection strategies is their riskiness. If the strategies tend to select stocks with high sensitivity to overall movements in emerging equity markets, their excess returns may only be a reward for this additional risk. To consider this possibility, we use the regression

$$R_{p,t} - R_{f,t} = \alpha + \beta_M(R_{M,t} - R_{f,t}) + \varepsilon_t, \tag{2}$$

where $R_{p,t}$ is the monthly return of the equally weighted winners or losers portfolio in a particular strategy, $R_{M,t}$ is the corresponding benchmark return on the equally weighted index consisting of all emerging market stocks in our universe, and $R_{f,t}$ is the 1-month US T-bill return.

The estimation results presented in Table 8 show that for all strategies, the betas of the winners and losers portfolios are close to 1. Only the winners portfolio of the B/M strategy appears to bear higher "emerging market risk", as its beta is significantly greater than 1. Note that the opposite is found for the top portfolio of the earnings revisions strategy. The excess returns after correcting for market risk, as measured by the intercept α, remain statistically significant for all portfolios except the winners portfolio in the momentum strategy and, in fact, are very close to the "raw" excess returns reported in Tables 1 and 2. Hence, the excess returns are not simply a reward for additional emerging market risk.

Outliers are often considered to be a serious problem in emerging markets data. Several measures can be taken to guard against the possible influence of such anomalous observations. For example, Rouwenhorst (1999) excludes the extreme 5% of the past 6-month return distribution when forming momentum portfolios, while Barry et al. (2002) omit observations with returns in the upper and lower 1% tails of the returns distribution. Our results so far are based on the entire sample of stocks, without accounting for the

Table 7
Liquidity of stock selection strategies

Strategy	Market capitalization			Turnover ratio		
	Top	EWI	Bottom	Top	EWI	Bottom
E/P	248	277	211	2.03	2.01	2.32
B/M	177	274	419	2.02	2.04	2.01
6MR	335	272	191	2.82	2.16	2.01
ER FY1	548	415	425	3.33	3.15	3.17
VMR	283	272	227	2.54	2.14	2.01

The table reports averages of monthly median values of the market capitalization (in millions of US$) and turnover ratio for stocks in the winners and losers portfolios and in the universe of stocks. Turnover ratio is defined as the number of shares traded in each month divided by the total number of outstanding shares, expressed as percentage.

Table 8
Emerging market risk of winners and losers portfolios in stock selection strategies

Strategy	Portfolio	α	$t(\alpha)$	β_M	$t(\beta_M[-1])$	$\bar{R}^2$
E/P	Top	0.54	4.39	1.01	0.38	0.93
	Bottom	−0.48	−3.91	1.02	0.94	0.93
B/M	Top	0.46	2.69	1.08	2.78	0.89
	Bottom	−0.31	−2.16	0.99	−0.55	0.91
6MR	Top	0.17	1.64	0.98	−1.26	0.94
	Bottom	−0.33	−2.81	1.03	1.46	0.94
ER FY1	Top	0.32	3.37	0.96	−2.46	0.97
	Bottom	−0.21	−2.44	1.01	0.51	0.98
VMR	Top	0.52	5.15	1.01	0.60	0.95
	Bottom	−0.54	−4.62	0.97	−1.68	0.93

The table presents coefficient estimates and t statistics from the regression

$$R_{p,t} - R_{f,t} = \alpha + \beta_M(R_{M,t} - R_{f,t}) + \varepsilon_t,$$

where $R_{p,t}$ is the monthly return of the equally weighted winners (top) or losers (bottom) portfolio, $R_{M,t}$ is the EWI benchmark return and $R_{f,t}$ is the 1-month US T-bill return. $t(\alpha)$ is the t statistic of (α), and $t(\beta_M[-1])$ is the t statistic of β_M minus 1. The regression $\bar{R}^2$ is adjusted for degrees of freedom.

presence of outliers in any way (except in the multivariate strategies, as discussed in Section 3.2). We examine to what extent our results are driven by aberrant observations in the stock returns by evaluating the profitability of the different strategies when portfolio returns are measured by the median return of the stocks in the portfolio (instead of the mean return). This drastically limits the influence of return outliers. The first row in panel (b) of Table 6 shows that, except for the B/M strategy, all strategies perform well for median returns. Hence, we conclude that the profitability of the selection strategies is not due to return outliers.

Institutional restrictions, such as delays in the decision-making process, may prevent a timely implementation of the stock selection strategies. Therefore, we test the strategies with a 1-month implementation delay, that is, winners and losers portfolios are formed 1 month after the stocks' ranking. The results of this robustness test are shown in the second row in panel (b) of Table 6. Although the magnitude and significance of the excess returns diminish somewhat, except for the momentum strategy, the results are largely similar to the results without an implementation lag.

Transaction costs in emerging equity markets can be substantial (see Bekaert et al., 1997) and may seriously erode profits from trade-intensive strategies such as the ones considered here. The first row in panel (c) in Table 6 shows excess returns from the selection strategies when transaction costs of 1% for each sale or purchase of stocks are taken into account.[17] As expected, the profitability of the strategies weakens considerably,

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[17] The estimates of actual transaction costs by Bekaert et al. (1997) show that transaction costs vary substantially among emerging markets. The assumption of identical transaction costs in all countries, thus, obviously, is an abstraction from reality. Note, however, that the assumed transaction costs of 1% is quite close to the mean of the estimates reported by Bekaert et al. (1997). Similarly, Domowitz et al. (in press) report that during the second half of the 1990s, one-way total (i.e. the sum of explicit and implicit costs) trading costs in emerging markets ranged between 100 and 150 basis points, on average.

such that the excess return of the momentum strategy becomes negative and the excess return of the earnings revisions strategy is no longer significant. However, the excess returns of the E/P and B/M strategies and the multivariate strategy remain positive and statistically significant. The fact that the momentum and revisions strategies suffer more from transaction costs than the E/P, B/M and multivariate strategies is caused by the fact that the former strategies are considerably more trade intensive and have very high turnover.[18] Also included in panel (c) of Table 6 are results with transaction costs equal to 1.5 and 2% per trade. Obviously, higher transaction costs further erode the strategies' profits. With 1.5% transaction costs, only the excess returns of the E/P and the multivariate strategies remain statistically significant, and when transaction costs are increased further to 2%, none of the strategies generates a significant outperformance.[19] Still, even with high transaction costs, the strategies have practical relevance in case an investor has to trade anyway, for example, due to cash in- or outflow.

The portfolios that we have constructed so far are equally weighted. In practice, an investor usually is evaluated against a value-weighted benchmark, with benchmark and portfolio weights for the included stocks proportional to their market capitalization. Furthermore, results of stock selection strategies for value-weighted and equally weighted portfolios are sometimes found to differ considerably (see Achour et al., 1998 for example). When implementing the strategies with value-weighted winners portfolios and benchmarks on our sample of emerging market stocks, the selection strategies appear to be somewhat less successful. The results in the first row in panel (d) of Table 6 show that the excess return for the revisions strategy is no longer significant, and the excess return for the momentum strategy even becomes negative. This finding is consistent with the results for size segments, as the momentum and revisions strategies have lower excess returns for large caps than for the other size segments. However, the B/M and VMR strategies retain their significant outperformance in the value-weighted test, although the *t* statistic corresponding to the excess return for the multivariate strategy declines substantially, from 5.79 to 2.61.

A caveat in the value-weighted test as implemented above is that it creates large stock-specific risk, which may heavily influence the results. The excess returns are strongly dependent on the returns of a few large caps, as the portfolio has large under- or overweights versus the benchmark for these stocks, while under- or overweights for small caps are relatively small. In practice, an investor may rather prefer equal relative weights versus the benchmark for stocks that are equally attractive. To examine the performance of the selection strategies under this alternative weighting scheme, we construct value-weighted portfolios as follows. First, all stocks outside the top 15% rankings with benchmark weights larger than 1% enter the portfolio with weights equal to their benchmark weights minus 1%. Stocks outside the top 15% with a benchmark weight less

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[18] For the 6-month holding period, the average turnover of the winners portfolios in the selection strategies based on E/P, B/M, momentum, earnings revisions is equal to 56.8%, 46.7%, 85.9% and 81.6%, respectively. Average turnover of the multivariate strategy is equal to 67.2%.

[19] With 2% transaction costs, the average excess returns of the univariate value strategies and the multivariate strategy are still positive, though. The break-even transactions for the E/P, B/M and VMR strategies are equal to 2.93%, 3.29% and 2.62%, respectively.

than 1% are not included in the portfolio. Second, all stocks within the top 15% rankings are equally overweighted compared to the benchmark.[20] The second row in panel (d) of Table 6 shows that in this case the results are very similar to the results involving equally weighted portfolios, indicating that the strategies can be translated successfully to value-weighted investments.

7. Conclusions

In this paper, we have confirmed the profitability of trading strategies based on value and momentum in emerging markets. In addition, a selection strategy based on analysts' earnings revisions was also found to outperform an equally weighted index of all stocks. The performance of the univariate strategies can be enhanced by combining value, momentum and revisions into a multivariate strategy. The benefits from geographical diversification are substantial due to the low correlations between returns in different countries, such that the strategies can best be applied simultaneously in all emerging markets. Using the strategies for country selection as well increases profitability considerably, but at the cost of higher risk.

We do not find evidence that financial market liberalizations in emerging countries have affected the performance of the strategies, as we find that all strategies generate significant excess returns in both liberalized and nonliberalized markets.

The apparent profitability of the selection strategies cannot be regarded as compensation for (time-invariant) exposures to global market, book-to-market, size and momentum risk factors. The excess returns remain significant after adjusting for these factors. A deeper investigation of the appropriate interpretation of the profitability of the selection strategies in emerging markets, using, for example, asset pricing models with time-varying exposures and behavioral models, is left for future research.

The results from various robustness tests show that the trading strategies can be implemented successfully in practice by a large investor. The profits of most strategies remain significant if applied to stocks with large market capitalization only, after allowing for an implementation delay, after correcting for outliers and after incorporating moderate transaction costs. We do not find evidence that the selection strategies have a tendency to trade stocks with lower liquidity or higher emerging market risk.

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[20] Hence, the portfolio weight for a stock in the top 15% rankings is equal to its benchmark weight plus an equal overweight, which is equal to (100% − total portfolio weight of all included stocks outside the top 15% − total benchmark weight of all top 15% stocks)/total number of stocks in the top 15% rankings.

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