Stock Selection in Emerging Markets: Portfolio Strategies for Malaysia, Mexico, and South Africa

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With very few exceptions, most of the research on the role of emerging markets in portfolio strategies has focused on country selection. Indeed, the conventional wisdom is that transactions costs are too high in emerging markets to consider active stock selection strategies.

In addition, there are powerful information asymmetries between local traders and foreign investors that add extra costs to active strategies. For example, Bhattacharya et al. [1998] argue that there is no apparent reaction of individual stock returns in Mexico to important corporate news announcements. They show that most of the news is incorporated into the price before it is released, suggesting information leakage. They further show that class A shares (traded by local investors) tend to lead class B shares (traded by foreigners), which strengthens the case for widespread information leakage. These extra costs make individual stock selection strategies less attractive.

We present a comprehensive, market-by-market analysis of the information in firm attributes for portfolio strategies. Our study is comprehensive because it is the first to combine historical data from the International Finance Corporation (IFC), Morgan Stanley Capital International (MSCI), Worldscope, and IBES.

While there is a substantial body of literature that examines the information in firm attributes for investment in developed markets,[1] there is relatively little research on emerging markets. Hence, these markets present an ideal testing ground for the efficacy of asset selection approaches that are commonplace in developed markets.

Indeed, there are a number of reasons why an attribute-based stock selection methodology may fail when applied to emerging markets. First, many of these markets experience structural breaks that result from the opening up of their capital markets.[2] These breaks are often associated with increased foreign presence in the equity markets. Research indicates that the type of information that impacts expected asset returns shifts from purely local information to more global information. That is, a market that is completely closed in terms of capital and goods may have little sensitivity to a U.S. interest rate hike. After it is open and connected to the U.S., in terms of trade and capital flows, the local asset market is likely to become more sensitive to the U.S. interest rate environment.

Of course, capital market liberalizations are not the only "breaks" in emerging equity markets. In many of these markets, there are frequent upheavals: political, economic, and financial. Erb, Harvey, and Viskanta [1995] detail the impact of inflation in these markets. Henry [1998] investigates the impact of inflation stabilization programs. Erb, Harvey, and Viskanta [1996]

trace the impact of changes in political risk on expected asset returns, and Erb, Harvey, and Viskanta [1997] analyze the interaction between population demographics and performance in emerging markets. Erb, Harvey, and Viskanta [1998] analyze the contagion effects of the crises in Latin America in 1994-1995 and Asia in 1997-1998.

At the very least, we expect the types of attributes that contribute to successful stock selection to vary across the emerging markets. In developed markets, some have argued that we can successfully identify "global indicators," for example, ratios like price-to-book value, which is considered a "universal" measure of potential value in a stock. It is very difficult to argue that such global indicators should exist for such a widely heterogeneous group of economies as the emerging markets.

Most of the work on emerging markets and attributes has been focused on country selection. For example, Bekaert et al. [1997] investigate the information in ten country characteristics on portfolio strategies. For example, average attributes across twenty emerging markets were calculated and portfolios were constructed based on the country attribute. Claessens, Dasgupta, and Glen [1997], Patel [1997], Barry et al. [1997], and Rouwenhorst [1998b] are the only papers that investigate individual stock selection. However, they look at a narrow range of attributes.[3]

Our strategy is to significantly expand the scope of examination in forming country portfolios. We examine a number of standard attributes like book value-to-price, cash flow-to-price, earnings-to-price, dividends-to-price, earnings growth, revenue growth, debt/equity ratios, return on equity, and market capitalization. In addition to these essentially historical measures, we examine prospective earnings-to-price ratios measured over different horizons, IBES revisions, prospective earnings growth, and a number of momentum measures.

Our results are striking. Significant value can be added by the same stock selection mechanisms that are employed in developed markets. While special issues arise in particular markets, the strength of our results challenges the conventional wisdom that country selection is more important than stock selection in emerging markets. Our out-of-sample results show that our buy list significantly outperforms the standard benchmarks. The margin is large enough to absorb the transactions costs in these markets.

Our article is organized as follows. In the second section, we detail the methodological approach that we use to screen the universe of equities in each market. The third section details the data availability and the definitions of the attributes that we examine. We have decided that the best way to present these results is in a country-by-country format. The results are presented in the fourth section. The final section gives some directions for future research.

METHOD

Sorting versus Regression

There are two basic approaches to stock selection: regression and sorting. The regression method involves the cross-sectional prediction of stock returns in period t based on attributes available in the previous period. This imposes a rigid structure on the data in that every firm has an equal response to a given change in the attribute within a country. Furthermore, as is the case in developed market regression selection methodologies, the response coefficients are unstable and often flip signs. Finally, many of our markets have insufficient data for reliable estimation of unrestricted cross-sectional regression models.

We choose to focus on the sorting method. At the end of the month, securities are sorted into three or five portfolios (depending on the number of securities in the market) based on the value of the attribute. This portfolio is held for one month ("the holding period") and then rebalanced. We also investigate quarterly and semiannual holding periods to reduce the turnover and subsequent transactions costs, as well as to give some indication of the persistence of the predictive powers of the model. We present results based on equally weighted portfolios as well as market capitalization weights.

Screening Process

At the start of each holding period, firms are sorted by the observable characteristics defined below and assigned in equal numbers to a predefined number of portfolios (fractiles) on the basis of their rank. For example, if all available stocks for a given characteristic are ranked in order of expected return, then the top one-third become the top "fractile" and the bottom (lowest-scoring) third become the bottom "fractile." If there is a

tie around the portfolio breakpoints, stocks are assigned to lower portfolios. The number of fractiles that we choose depends on the number of securities available. With fewer securities, we focus on three fractiles. In countries with more securities, we use five fractiles. We calculate both equal- and value-weighted returns for each portfolio. For this article, we focus most of our attention on the top and bottom portfolio performance. Stocks for which no ranking information exists are placed in an "NA" category, or "not ranked" portfolio, and analyzed separately.

Our article focuses on what we have termed "univariate" sorts, i.e., portfolio formations based on a single attribute. However, for many attributes we also examine "bivariate" sorts simultaneously based on two criteria. Given space constraints, it is not possible to report the results of bivariate sorts.

Our method involves performance screening in an "in-sample" period that ends in December 1995. We then assign weights to each characteristic and develop a final selected portfolio. We call this the "scoring screen." This scoring screen is then tested in the "out-of-sample" period from 1996 through May 1998. Our exhibits show performance statistics over the full sample, i.e., both in-sample and out-of-sample. However, we combine these periods only for the purposes of presentation here. In our research, the in-sample and out-of-sample periods were clearly separated. Further, the reader can see the year-by-year performance in the in-sample and out-of-sample periods. Top to bottom spread returns are reported as well as calculated premiums over a selected investment benchmark.

Returns are calculated after adjusting for splits, dividends, and rights offerings, and denominated in U.S. dollars using exchange rates supplied in the IFC's Emerging Market Database (EMDB). Value-weighted portfolio returns are constructed using relevant IFC adjustment factors to replicate the index-level returns on a bottom-up calculation. These adjustment factors are made for corporate actions and for government and cross-ownership (from November 1996). Firms with more than one share class, which the IFC has included to achieve the desired index-level weighting structure, are aggregated together to form a single basket of outstanding shares in our screens. Where different classes of shares are priced differently, the fundamental data used in the analysis are linked to the most liquid class of shares available to international investors. The market capitalization has been adjusted to take all class-es of shares together.

There were periods when missing data are deemed to have a significant effect on factor performance, such as in the instance of South Africa in 1997, when the IFC substantially redefined its index. When this occurred, without the provision of firm-specific fundamental data and histories, we use data from alternative sources.

Diagnostics

A battery of diagnostic criteria are presented to assist the evaluation of each screening factor. Each diagnostic is carefully defined in the performance report template presented in Exhibit 1.

In addition to the diagnostics, what we are really looking for is consistency. Quantitative measures such as the longest strings of negative and positive absolute and relative returns, performances in up and down markets, and the historical probabilities of losing money add further dimensions to traditional statistical risk and expected return measures. These measures are further complemented by the simple relative performance scoring algorithm diagnostic that assigns a weight to the portfolio in each year of the observation period based on its cumulative annual return performance rank relative to its peers. Average scores across the observed periods will deliver information regarding performance consistency.

One notable absence from the table is the analysis of transaction costs. In measuring the performance of portfolios, we adopt rudimentary assumptions for turnover costs because of the well-documented difficulties of capturing costs associated with different instruments traded, bid-ask spreads, market impact, and opportunity costs on execution time durations. To address the effects of implementing a trading strategy, our models are run with longer holding periods to check for robustness and to identify factors with return premiums that persist on longer holding periods.

Factor Selection

There are many elements that enter our algorithm for factor selection. Given the number of factor screening candidates, we need to greatly reduce the dimensionality (isolate a small number of factors) for our final portfolio selection, which we call the final scoring screen. The factor report cards detailed in Exhibit 1 yield twenty-eight different diagnostic pieces of information.

EXHIBIT 1
Performance Diagnostics

Note	Performance Measure/ Summary Statistic	Definition[a]
1	Annualized Average Return[b]	*Stock Level* — The annualized geometric average of post-rank portfolio U.S. dollar total returns over all observation periods. Total return is calculated by adding the last twelve months of gross cash dividend at the ex-dividend date, adjusted for the length of the return period, to the closing monthly USD market price. Returns are value-weighted by the market capitalization as at the observation date. *Index Level* — Similar to the market portfolio, although the index return levels are as sourced from database providers using the value-weighted index returns.[c]
2	Cumulative Return (indexed at 100 – start)	The value of $100 if invested at the first observation date and compounded over intervening periods.
3	Standard Deviation of Returns	The annualized standard deviation of post-rank portfolio returns over all observation periods.
4	Average Annual Excess Return — Rm	The annualized geometric average of post-rank portfolio excess returns above the market portfolio over all observation periods.
5	Average Annual Excess Return — Rf	The annualized geometric average of post-rank portfolio excess returns above the annualized U.S. ninety-day T-bill rate over all observation periods.
6	Standard Deviation of Excess Returns — Rm	The annualized standard deviation of post-rank portfolio excess returns above market portfolio over all observation periods.
7	Standard Deviation of Excess Returns — Rf	The annualized standard deviation of post-rank portfolio excess returns above the annualized U.S. ninety-day T-bill rate (as at the observation date) over all observation periods.
8	T-Stat	The test of whether the average excess return is significantly different from zero.
9	Systematic Risk (beta)	The slope of the regression line estimated by regressing the average post-rank portfolio returns on the relevant market portfolio return over all observation periods. No lags are incorporated in the market portfolio return to allow for non-synchronous trading.
10	Alpha	The annualized intercept of the regression line estimation per systematic risk (beta) above.
11	Coefficient of Determination	The coefficient of determination (R-square) of the average post-rank portfolio returns versus the market portfolio return over all observation periods.
12	Average Market Cap	The sum of all constituent market capitalizations in local currency divided by the total number of portfolio constituents over all observation periods.
13	% Periods > Market Portfolio	The percentage of total observations that the average post-rank portfolio return was greater than the market portfolio return over the holding period.
14	% Periods > Bench Up Market	The percentage of total observations that the average post-rank portfolio return was greater than the market portfolio return when the market portfolio return was greater than zero.
15	% Periods > Bench Down Market	The percentage of total observations that the average post-rank portfolio return was greater than the market portfolio return when the market portfolio return was less than zero.
16	Maximum Number of Consecutive Benchmark Outperformance	The longest string of consecutive observations where the average post-rank portfolio return was greater than the market portfolio return.

EXHIBIT 1
Continued

Note	Performance Measure/ Summary Statistic	Definition[a]
17	Maximum Positive Excess Return	The highest single post-rank portfolio excess positive return above the market portfolio over all observation periods.
18	Maximum Negative Excess Return	The lowest single post-rank portfolio excess negative return above the market portfolio over all observation periods.
19	% Periods Positive Returns to Negative	The ratio of portfolio post-rank average returns greater than zero to post-rank returns less than zero over all observation periods.
20	% Periods Negative Returns	The percentage of observations that portfolio post-rank returns were less than zero over all observation periods, indicative of the historical probability of losing money.
21	Maximum Number of Consecutive Negative Periods	The longest string of consecutive observations where the average post-rank portfolio return was less than zero.
22	Maximum Number of Consecutive Positive Periods	The longest string of consecutive observations where the average post-rank portfolio return was greater than zero.
23	Cumulative Annual Returns	The value of $100 if invested on January 1 of each year of the observation period and compounded over the intervening observation to December 31. Cumulative returns for 1998 would represent a year to the last observation date return.
24	Relative Performance	The average relative performance of a portfolio generated on the simple scoring algorithm that assigns a weight to the portfolio in each year of the observation period based on its cumulative annual return performance rank relative to its peers. Therefore, the minimum score a portfolio could obtain would be 1, the maximum r, and average $[n + (n + 1) + (n + 2)+ ... (n + r)]/r$, where n is the number of years in the observation period and r is the number of portfolios.
25	Cumulative Annual Returns — Last Two and Five Years	The value of $100 if invested two or five years preceding the most recent observation and compounded over intervening periods.
26	Factor Average	The arithmetic average of constituent ranking factors over all observation periods.
27	Factor Median	The median value of constituent ranking factors over all observation periods.
28	Factor Standard Deviation	The standard deviation of constituent ranking factors over all observation periods.

[a]Definition applicable to equal- and value-weighted fractiles and benchmark performance measures.
[b]See the body of text on return calculations.
[c]Although the value-weighted index returns will obviously impart a known size bias on the comparative benchmark returns (that will vary from market to market depending on the distribution of size), this is unavoidable due to the non-availability of an equal-weighted benchmark in many markets.

It is also important to understand the interrelationships between the various factors, which must be supplemented by correlation analysis to eliminate potentially redundant screening factors.

We calculate correlations between the portfolio returns derived from each factor screen. We do this separately for the top fractile and the bottom fractile portfolio. For this analysis, we use value-weighted portfolios. As we assign weights to both top and bottom factor portfolios in arriving at a composite factor score for firms in the universe, we present matrix correlation coefficients for both. Factor returns that are highly correlated in the top portfolio may exhibit weak or negative correlations in the bottom. Some of the variation may

be attributed to the collection of heterogeneous groups of stocks in certain bottom portfolios due to the nature of the sort — lumping high earnings multiple and loss-making firms together in an earnings yield sort, for example. This is illustrated by the high correlation coefficients obtained in top portfolios between earnings yield and book-to-price ratios in Malaysia and the lower observed values in the bottom portfolio.

We find high correlations among value strategies, which is due in part to price appearing in the denominator of these ratios. Unlike value screens, correlations and factor performances among growth proxies differ visibly. Estimate revision screens (change in consensus FY1 estimates and consensus forecast earnings estimate revision ratios) have higher relative correlation coefficients with growth proxies, as these types of screens generally behave better in growth-oriented environments where premiums are paid for additional amounts of nominal earnings.[4]

Final Portfolio Selection and Diagnostics

Our final portfolio selection is based on a combination of:

1. Assessment of the factor based on the twenty-seven diagnostics presented in Exhibit 1.
2. Bivariate screens that combine information in two factors (not reported).
3. Correlation analysis.
4. Success ratios.
5. Quadratic optimization (not reported).
6. Quantitative adjustments for high transaction costs inducing factors (not reported).
7. A final "knockout" list.

Steps 1 through 6 are what we characterize as the "scoring screen." This screen uses information in both the top- and bottom-performing fractiles. That is, our buy list is not a simple combination of the top fractiles. While it might not be possible to short stocks in the bottom fractiles, membership in this fractile is useful for penalization of a particular security or for its removal from a buy list through time.

The seventh step, the "knockout" criteria, eliminates firms that are too small for meaningful portfolio investment. It also isolates firms that have unreasonable leverage. It should be emphasized that the inputs for the scoring screen include information, such as bivariate

sorting and some additional univariate screens, that has not been included in this text.

The success ratio analysis is another diagnostic measure that gives insight into performance differentials. The success rate measures the percentage of stocks in the top portfolio that outperform the benchmark market portfolio at a particular observation and the percentage that underperform in the bottom portfolio. The average of these rates through time will reveal the depth of portfolio performance and the proportion of firms driving performance. We examine this measure for each of the screening factors. The definitions for this analysis are contained in Exhibit 2.

The success ratio analysis is a particularly useful tool in helping us assess the probabilities of Type I error (incorrectly classifying a winner to the bottom fractile) and Type II error (incorrectly assigning a loser to the top fractile). Indeed, no matter how favorable a screen might look, there is still a chance that losers will be assigned to a buy list. However, if one is able to do independent fundamental research on the individual firms, it may be possible to more accurately identify winners in the top fractile. Of course, our final portfolio is evaluated using a number of criteria, only one of which is the success ratio.

DATA

Primary Sources

Our data are drawn from a number of sources all contained within the FACTSET database system. We use constituent data from the International Finance Corporation (IFC), Worldscope, and the Institutional Brokers Estimate System (IBES). In some of our analysis, we also use data from Morgan Stanley Capital International (MSCI). Our analysis uses returns and data on twenty-one firm characteristics.

A substantial portion of research on the cross-sectional patterns of equity returns has focused on U.S. equity returns. The quality of the fundamental data from Compustat as well as the returns data from the Center for Research in Security Prices at the University of Chicago (CRSP) is well documented by more than three decades of research. Unfortunately, the same cannot be said of the emerging market data sources and this has often deterred research on these markets. Data histories, survivorship biases, data mining, and data errors

EXHIBIT 2
Success Rate Definitions

Performance Factor	Definition
Success Rate	Calculated individually for both top and bottom portfolios as the percentage of stocks in the top portfolio at a particular observation that *outperform* the market portfolio, and the percentage of stocks that *underperform* in the bottom portfolio. For example, if ten stocks are sorted into a top factor portfolio and eight of those stocks have returns *greater* than the market, the success ratio is 80%. In the same strategy at the same observation date, if six of the ten stocks collected in the bottom portfolio have returns *less* than the market, the success ratio for the bottom portfolio would be 60%.
Average Success Rate	The arithmetic average of the observed success rates over all observations.
Standard Deviation of Average Success Rate	The standard deviation of the observed success rates from the average success rate over all observations.
Average Success Rate Consistency Ratio	The percentage of observations that the success rate was greater than 50%.
Success Rate — Most Successful	The highest observed single success rate over all observations.
Success Rate — Least Successful	The lowest observed single success rate over all observations.
Universe	The constituents of the selected index (market portfolio) for which relevant ranking information exists at a particular observation date.

all contribute to the difficulties in formulating and analyzing valid backtests of emerging equity markets. To this end, extensive data cleaning exercises were undertaken to ensure the integrity of the data sets incorporated into the project. For example, we often conducted corroborative parallel alternative data source runs (MSCI or Worldscope versus IFC). We found a number of data errors, such as improper adjustments to splits, that were subsequently corrected in the host databases.

The universe of stocks for all markets as well as benchmark returns are sourced from the IFC global indexes through time. The IFC is widely regarded as having the most complete emerging market data set and has been widely used in recent academic studies, such as Harvey [1995] and Rouwenhorst [1998]. The IFC's Emerging Market Database (EMDB) generally has the longest histories and highest-quality data sets for emerging markets. The selection of IFC facilitates the backtesting of the chosen factors. It also has the advantage of being a "snap shot" database, which eliminates most survivorship biases. That is, for our sample, no data have been backfilled by the IFC.

As the principal focus of this article is on the predictive power of local factors through time and not on the impact of investment restrictions, we use the broader global indexes that do not include adjustments

made for investability. Hence, we focus on the IFC "global" indexes rather than the IFC "investable" indexes. The "investable" stocks are those available to foreign institutional investors that have passed screens for minimum size and liquidity. Exhibit 3 presents the markets reported on here, the first and last observations, and the numbers of index constituents. The sample periods are for the factor with the greatest number of observation periods. Start dates for dividend and cash earnings per share data as well as expectation data from IBES are contingent on availability. These details are reported in individual screen headers.

The number of firms with data available vary widely both within and across markets, ranging from 43 in Mexico to 157 in Malaysia. In addition, the histories

EXHIBIT 3
Market Characteristics

	IFC Index Number of Stocks		IBES Data Number of Stocks	
	Start Date	End Date	Start Date	End Date
Malaysia	62	157	36	104
South Africa	62	77	55	70
Mexico	43	56	35	52

of the factors may vary within the country. For example, the IBES expectations data are available on a widespread basis later in our samples. In addition, Exhibit 1 shows that IBES covers fewer firms than are available in the IFC universe. If a screen is done based on only a small sample of stocks that have this expectations data, our portfolios could have considerable idiosyncratic noise.

Further, one of the countries that we study, South Africa, has an inordinately short sample window, as IFC only commenced coverage at the beginning of 1993. Alternative data sources are not easily implemented (MSCI has an even briefer fundamental history). For example, a longer window is possible using the Johannesburg Stock Exchange constituent universe merged with Worldscope. However, the highest- and lowest-fractile portfolios collect many illiquid second-tier stocks that are atypical of a normal investment portfolio.

Over time, the quantity and quality of firm-level data has improved. There are two effects. First, this additional information should sharpen the screening functions. That is, the additional information may lead to better discrimination between high- and low-characteristic portfolios. Second, the additional quantity of stocks screened should lead to a diversification effect in the fractile portfolios (more securities in the portfolio should reduce volatility). Our analysis includes a battery of diagnostic measures that trace performance through time.

Screening Factors

It was our prior belief — later borne out by the model development — that different screening factors would be important for different markets. This is because the emerging market economies are inherently different; countries are at different stages of maturity for both their capital markets and economies, and a number of countries have experienced liberalizations that may alter the importance of various types of information. As a result, we have a very broad range of factors that provide the basis for our screening.

We classify our screening factors into three groups: historical accounting characteristics (fundamental factors); expectations (expectation factors); past returns (technical factors); and size (size factors). Fundamental, technical, and size factors are from IFC where available or from Worldscope, while the expec-

tation factors are from IBES. Each of our screening factors is detailed in Exhibit 2.

Fundamental Factors. Most of the factors we use have been identified in earlier empirical studies on developed country equity returns.[5] While there was considerable data-snooping in selecting these factors in developed markets, the application of the same screening factors in emerging markets provides a unique opportunity for an out-of-sample test. That is, given that emerging market returns have very low correlations with developed market returns, the emerging market universe is like a holdout sample to test the efficacy of the fundamental characteristics to predict the cross-section of expected returns. We extend this list of factors by introducing a number of variables constructed on fundamental and expectation data.

Expectation Factors. Relatively few academic studies have used expectation data sources to select equities. These attributes are dynamic in that they directly capture the effects of a firm's changing opportunities. These measures have the advantage of using non-current historical data. The most common measure is the average EPS estimate.[6] Known as a consensus forecast, it is calculated by adding current EPS estimate data for the specified periods from all contributing IBES firms and dividing by the number of EPS estimates that enter into the calculation. Importantly, for historical earnings information, the IFC's EMDB collects data in many of these markets on an annual basis — even though a number of firms report on a quarterly or semiannual basis for regulation purposes. It is likely that stock prices and related multiples will adjust on public data not captured in screens constructed on the historical earnings information. The expectation data from IBES deliver more timely information for portfolio rebalancing.

Technical Factors. There is a considerable literature that looks at momentum and reversal strategies in developed market stock returns.[7] There are two main dangers in examining these indicators. First, any predictability from past returns might be a function of infrequent trading of the constituent stocks. This effect is mitigated by our focus on monthly portfolio returns. Second, short-term historical return indicators tend to induce considerable portfolio turnover and subsequent transactions costs. Of course, our final stock selection strategy will be a function of a number of attributes. Our scoring screen takes the potential "costs" associated with certain factors into account.

Size Factors. The size effect has been well docu-

mented in U.S. and international stock returns.[8] Claessens et al. [1998] observe some size effects in certain emerging markets, although they conclude that it does not prevail in a systematic fashion — a finding confirmed by Barry and Goldreyer [1997] based on univariate screens on size alone. Fama and French, in their analysis of sixteen markets for 1987 to 1995, find that small-stock portfolios achieve 14.9% higher returns than large-stock portfolios on an annualized basis. Size also permeates other screens. For example, it has also been shown that small-capitalization stocks tend to migrate to high book-to-price portfolios. This has obvious implications for portfolio liquidity, and implementing stock selection strategies with high exposures to these local factors may prove difficult.

The size effect is perhaps more prevalent in emerging markets than in their developed counterparts when considering the higher relative expected costs associated with pursuing a strategy that differentiates on size. Any discussion of performance differentials between size attributes, however, must take into account the method IFC employs to select stocks for their global indexes. Constituents are selected based on liquidity, track record, institutional interest, and industry representation, not on a random basis. Track record criteria might preclude the inclusion of small-capitalization emerging growth stocks, therefore small capitalizations would probably show significant value characteristics.

Importantly, we use size as a diagnostic tool — rather than as a selection metric. Indeed, selecting small-capitalization firms in emerging markets is probably a strategy that bears high risk and high illiquidity. For twenty of the twenty-one screening factors (the first being size), we examine bivariate sorts of the screening attribute and capitalization. In selecting the final screening factors, we test whether the screening factor is just proxying for some size effect. A premium is put on screening factors that work over all size fractiles.

RESULTS

Market Settings

Our approach is to completely focus on the stock selection decision within the country. As a result, we do not explicitly consider either domestic or external macroeconomic factors that would lead to favoring one particular country over another (the so-called top-down asset allocation). Nevertheless, it is important to consider the securities within the prevailing domestic and international economic and market environments.

The wide divergence between economic conditions and market development within the emerging market universe may help interpret why some factors do well in certain regions and have little information in others. The fact that in each of the countries analyzed we find a different set of variables having strong explanatory power is partly a reflection of different economic conditions and the different stages of market development.

A country from each of the three emerging market regions has been chosen to provide examples of some of the key themes and problems. However, it is recognized, and our screens prove, that the heterogeneity of emerging markets hinders a common approach to all the markets in one region. Nevertheless, over the last ten years, all the markets analyzed have undergone a rapid transformation in terms of transparency, liquidity, liberalization, depth, and diversity. Below we summarize some important events that will likely impact our stock selection exercise. For a detailed chronology of events in each of these emerging markets, see http://www.duke.edu/~charvey/Country_risk/chronology/chronology_index.htm.

Mexico. At the beginning of 1988, the Mexican IFC universe had a market capitalization of U.S. $4.5 billion, or 4% of GDP, and listed only twenty-seven stocks. The economy was rebounding from a period of adjustment with inflation falling from 114% in 1987 to 20%. In 1988, real GDP growth was a minimal 1.3%. Between 1988 and 1991, the economy accelerated to an average growth of 4.5% per year on the high expectations surrounding the creation of NAFTA.

Huge capital inflows to Mexico (primarily from the U.S.) contributed to the increased share prices, with market capitalization peaking at U.S. $154 billion or about 30% GDP in 1994. The unprecedented inflow of U.S. dollars led to an increasingly overvalued peso and enabled the authorities to paper over serious deteriorations on the external and fiscal accounts.

By the end of 1994, the country was in the midst of a short-term payments crisis and was forced to devalue the peso. Capital flight ensued, with the peso weakening by over 50% and the stock index falling over 70% to a market capitalization of only U.S. $58 billion in April 1995. The IMF provided a massive financial package to Mexico in return for tight monetary and fiscal policies, structural reform, and liberalization mea-

EXHIBIT 4
Details of Screening Factors

Factor, Hypothesis, and Ranking Strategy	Data Source	Formula and Definitions[a]	Interpretation
1 Market Capitalization Small-Cap Effect Persists Through Time Top Portfolio: Small-Capitalization Stocks Bottom Portfolio: Large-Capitalization Stocks Code:[b] CAP	IFC	Number of shares outstanding for index purposes * closing monthly market price Note 1: Number of shares outstanding as at the balance sheet date, adjusted for corporate actions and reduced by government and cross-ownership (from November 1996) per capital adjustment factor. For firms with more than one share class, such as in Mexico, we use whenever possible the aggregate Worldscope weights for that firm. Where the Worldscope weights are missing, we use the constituent IFC weights. Therefore, the weighting in the benchmark that we use, the IFC index, could differ from the weighting that we use in our value-weighted portfolios. Note 2: Market price as at date of observation in local currency (consistent across all factors).	• Diagnostic screen to investigate performance differential between large- and small-capitalization stocks. (Certain screens in the study were not considered for incorporation into the selection model but were constructed to give insight into the behavior of specific market segments through time.) • Size is widely regarded as a proxy for trading liquidity. • Small-capitalization stocks tend to have higher transaction costs. (There are well-documented difficulties of capturing costs associated with different instruments traded, bid-ask spreads, market impact, and opportunity costs on execution time durations.) • Risk, as defined by volatility of historical returns, tends to increase as size decreases.[c] • If there is no risk premium associated with investing in small-capitalization stocks, investors are expected to migrate toward larger-capitalization stocks that have lower perceived risks. • IFC selects constituents for their indexes based on liquidity, track record, institutional interest, and industry representation, that is, their selection is not random. The track record may preclude the selection of small-capitalization emerging growth stocks, therefore, small-capitalization stocks may show significant value characteristics (emerging "growth" stocks probably enter the universe as more mature mid-caps). • Smaller stocks tend to be regarded as lower-"quality" stocks (smaller stocks due to the inherent variability in earnings and exposures to the local economy are generally regarded as being of lower "quality"). • Small-stock effects may pervade the results of other factors described below. To this end, we examine the impact of size on all the factors below. We construct bivariate screens to test whether a candidate factor discriminates between high and low expected return stocks across all size categories.

EXHIBIT 4
Details of Screening Factors (continued)

	Factor, Hypothesis, and Ranking Strategy	Data Source	Formula and Definitions[a]	Interpretation
2	Change in Return on Equity Stocks with Improving Returns on Equity and Thus "Quality" Should Outperform Through Time Top Portfolio: High Change Bottom Portfolio: Low Change Code: CH_ROE	IFC	Return on equity (current year) – Return on equity (previous year)	• To capture changes in the levels of a company's return on common equity, as compared with a more traditional "quality" rank. • Our objective is to identify companies that investors believe are higher "quality" before subsequent shifts in valuation multiples occur. For example, a company that improves its return on equity from 10% to 15% might be very attractive, although this stock might not necessarily be ranked in the top portfolio of a simple return on equity sort. • This screening factor might be improved by combining it with IBES expectation data and a bivariate sort.
3	Debt-to-Common Equity Ratio Highly Leveraged Stocks Expected to Outperform to Compensate for the Higher Implied Risks Top Portfolio: High Debt to Equity Bottom Portfolio: Low Debt to Equity Code: DE	Worldscope	(Total Debt/Common Equity)100 (Long-Term Debt + Short-Term Debt + Current Portion of Long-Term Debt/Common Equity × 100	• Diagnostic screen constructed to give insight into performance differential between leveraged and unleveraged stocks. (Not considered for incorporation into the selection model.) Debt/equity ratios can be used as proxies for "quality" and perceived risk[d] and screens on "good" and "bad" companies. Formed portfolio returns are expected to have a high correlation with certain value return screens (see earnings yield below, for example). • Data assimilated from the most recent fiscal year-end. • Lag incorporated on assimilation of data to ensure data item is available for out-of-sample portfolio formations. • Rank comparisons across some constituent sectors are difficult. This is the case in the banking sector, for example, since taking deposits is analogous to borrowing, and we exclude this sector from the screen for this reason.
4	Dividend Yield Higher-Yielding Stocks Should Exhibit Superior Performance Through Time	IFC	Last Twelve Months of Cash Dividends/Closing Monthly Market Price)100 Note: On a per share basis at the ex-dividend date, using gross cash	• High correlation with other "value" factors as these tend to be shorter-duration strategies. (Duration refers to interest rate sensitivity and is defined by the relative change in an instrument's return to a defined change in the level of interest rates.) • Smaller-capitalization stocks tend to have higher yields. • All dividends expressed in local currency terms.[e]

EXHIBIT 4
Details of Screening Factors (continued)

Factor, Hypothesis, and Ranking Strategy	Data Source	Formula and Definitions[a]	Interpretation
Top Portfolio: High-Dividend Yield Bottom Portfolio: Low Dividend Yield Code: DY		dividends. Adjustment made by data-base provider to ensure all shares issued and outstanding for index purposes receive the same dividend.	
5 One-Year Historical Earnings Growth/Momentum High Earnings Momentum Stocks Should Outperform Through Time Top Portfolio: High Earnings Momentum Bottom Portfolio: Low Earnings Momentum Code: HEGR_1Y	IFC	(Last Twelve Months' Trailing Earnings per Share − Previous Last Twelve Months' Trailing Earnings per Share)/(Absolute Previous Last Twelve Months' Trailing Earnings per Share)100 Note 1: In hyperinflationary economies, the IFC uses adjusted earnings and book values, inflating trailing earnings and historical book values by the intervening period's inflation. Consistent across all factors with earnings and book value per share in formulas. Reported as opposed to operating earnings are used through due partly to the availability and quality of the reported data, but also to capture the effect of any asset write-offs that may occur during periods of falling inflation. Note 2: The use of absolute numbers in the rate of change calculation permits the capture of any turnaround effect in earnings, although stocks reducing losses will be perceived as being short-term (expected) momentum companies. The relative performance of this group, though, may be investigated by repeating the analysis and excluding this group.	• Earnings momentum indicator frequently used as the best growth proxy due to information deficiencies in certain emerging markets. • Assumes that analyzing the past has value for subsequent forecasts. • Useful indicator to identify stocks with rising expectations among investors prior to their establishment of a track record. • We conduct the analysis excluding negative historical previous earnings for comparison purposes. • Can be screened with estimate revision ratios (see consensus forecast earnings estimate revision ratio below for definitions) to identify future earnings surprises and recovery situations. This directly introduces market expectations of earnings growth rather than relying on changes in historical earnings.

EXHIBIT 4

Details of Screening Factors (continued)

	Factor, Hypothesis, and Ranking Strategy	Data Source	Formula and Definitions[a]	Interpretation
6	Three-Year Historical Earnings Growth Rate The Stock Exhibiting the Best Long-Term Track Record Should Continue to Provide Superior Growth Rates and Return Premiums Top Portfolio: High Earnings Growth Bottom Portfolio: Low Earnings Growth Code: HEGR_3Y	IFC	The rate of change in the reported last twelve-month earnings per share over the three-year time interval terminating on the date of the last interim period for which earnings were announced. Note: Annual growth rate is computed by fitting a least squares growth line to the logarithms of the reported or prospective (where applicable) earnings data over the specified period. The following rules hold for factor rank: Rates will only be generated if first and last time periods are greater than zero, and non-available or negative data in the interim period are discarded.	• A traditional growth proxy highlighting a stock's historical track record and stability. • Stocks that pass factor criteria have a visible track record, a perceived rarity in the volatile emerging markets and should therefore trade at high premiums even though it is generally accepted that naive extrapolations in these volatile markets are futile. • Does not incorporate the element of expectation but rather known growth, which is effective for identification of a "quality" universe of stocks. • In order to include a larger number of stocks in the analysis, when less than three years of data were available, we include stocks with a full two-year data history.
7	Earnings Yield High-Yield "Value" Companies Should Provide Superior Future Returns Through Time Top Portfolio: High Earnings Yield Bottom Portfolio: Low Earnings Yield Code: EY	IFC	(Last Twelve Months' Trailing Earnings per Share/Closing Market Price)100 Per share data — aggregate reported earnings divided by the total number shares outstanding (all classes) as of the balance sheet date, adjusted for corporate actions and reduced by government and cross-ownership (from November 1996) per capital adjustment factor. This is consistent across all factors constructed using IFC per share data.	• Traditional "value"/"growth" proxy used by investors. • Value stocks are generally riskier, as they are usually firms under distress, have high financial leverages, and face substantial uncertainty in future earnings. • Much has been written about the shortcomings of the incorporation of traditional measures such as earnings yield. One can argue that these measures may be influenced by accounting practices, may not incorporate risk or the time value of money, and may be seen as a function of value and not a determinant of value. • On the other hand, for many common stocks, the average relation between price and reported may reflect the views of investors as to the quality and growth of the issue. It may give information about, inter alia, the quality of management, the firm's individual prospects, the competitive position, the stability and growth of past earnings, and its financial strengths. • Although there are benefits in using yield and value ratios,

EXHIBIT 4
Details of Screening Factors (continued)

Factor, Hypothesis, and Ranking Strategy	Data Source	Formula and Definitions[a]	Interpretation
			data quality and history often preclude their effective implementation. • The use of earnings yield as a factor can result in sorting on incorrectly identified "value" companies. Anticipatory stock price movements could induce a migration into "value" territory before the next round of reported financial information alters the multiple. Combining the historical factor (earnings yield) with an expectational factor (such as a revision ratio sort, for example) in a bivariate sorting model could partially alleviate this problem (this will also apply to other "value" screens below). • Inverting the traditional price-to-earnings ratio will result in the collection of loss-making stocks in the bottom ranked portfolio. The relative performance of this group may be investigated by exclusion through time. • Without some form of relative attribution adjustment, sectoral influences could appear in ranks through time.
8 Change in Consensus FY1 Estimate — Last Three Months Change in Consensus FY1 Estimate — Last Six Months Stocks with Rising Earnings Expectations Should Outperform Through Time Top Portfolio: High Change in Estimate Bottom Portfolio: Low Change in Estimate	IBES Estimates	[(Consensus Forecast Earnings per Share Fiscal Year 1 (FY1) at Date of Observation/Consensus Forecast Earnings per Share FY1 Three Months' Preceding Date of Observation) − 1]100 [(Consensus Forecast Earnings per Share Fiscal Year 1 (FY1) at Date of Observation/Consensus Forecast Earnings per Share FY1 Six Months' Preceding Date of Observation) − 1]100 Note: Average EPS estimate known as consensus forecast is calculated by adding the current EPS estimate data for the specified periods from all the contributing IBES firms and dividing	• Factor indicates the magnitude of change in fiscal year 1 consensus forecast earnings estimates over the preceding three- and six-month period from the observation date. • Good indicator to isolate companies with changing earnings expectations and those that have provided interim earnings surprises. (The screen's design will discriminate between stocks with both rising and falling earnings expectations.) • Should have a high correlation with growth proxies, as revision screens generally behave better in growth-oriented environments. • Generates insight into behavioral aspects of estimates revisions as estimation precision increases with approaching fiscal year-end. • The frequency of estimate revisions and the magnitude of variation from mean estimates will increase in volatile macro environments. • Similar to the consensus forecast earnings estimate revision ratio below, but captures the magnitude of change in the revisions over the preceding period. • In some instances, IBES estimates refer to a different class of

EXHIBIT 4
Details of Screening Factors (continued)

Factor, Hypothesis, and Ranking Strategy	Data Source	Formula and Definitions[a]	Interpretation
Code: CH_FY1_3M		by the number of EPS estimates that enter into the calculation. A composite forecast of earnings per share that distills current EPS estimate data for the specified fiscal time period into a single expectation. Gains from combining security analyst forecasts arise from using more information in the aggregate than is used by any individual, and from the reduction of individual analyst forecast error through diversification.	share from the IFC constituent. In these cases, we have the IBES data.
9 Consensus FY2 to FY1 Estimate Change Stocks with High Changing Medium-Term Expectations Should Outperform Through Time Top Portfolio: High Change in Estimate Bottom Portfolio: Low Change in Estimate Code: CH_FY2_FY1	IBES Estimates	[Consensus Forecast Earnings per Share Fiscal Year 2 (FY2)]/ [Consensus Forecast Earnings per Share Fiscal Year 1(FY1) – 1]100 Consensus forecasts at date of observation.	• Change in estimate captures the rate of change in earnings per share that is expected for the company into fiscal year 2. • Identifies stocks with changing medium-term earnings expectations.
10 Consensus Forecast Earnings Estimate Revision Ratio Stocks Exhibiting High Earnings Revisions and Rising Expectations Should Outperform Through Time	IBES Estimates	[(Sum of Trailing Three-Month Upward FY1 Estimate Revisions) – (Sum of Trailing Three-Month Downward FY1 Estimate Revisions)]/(Total of Trailing Three-Month FY1 Estimates)	• Good proxy for isolating pre-earnings momentum stocks and stocks with changing earnings expectations. • Similar to change in consensus FY1 estimate three- and six-month factors above, but may also measure the degree of sentiment. • The ratio is also effective in isolating changing expectations of companies that suffer relative neglect by the investment research

EXHIBIT 4
Details of Screening Factors (continued)

Factor, Hypothesis, and Ranking Strategy	Data Source	Formula and Definitions[a]	Interpretation
Top Portfolio: High Revision Ratio **Bottom Portfolio:** Low Revision Ratio Code: IREV_3M		The ratio of the number of net upward or downward current EPS estimates for FY1 over the preceding three months to the total number of estimates made over the same period.	community. • The ranked universe can be split using a portfolio midpoint to isolate homogeneous groups of upward, downward, and zero revisions.
11 Book-to-Price Ratio High Book-to-Price Ratio Stocks Should Outperform Through Time **Top Portfolio:** High Book-to-Price Ratio **Bottom Portfolio:** Low Book-to-Price Ratio Code: BPR	IFC	(Historical Book Value per Share/ Closing Monthly Market Price)100 Note: Historical book value per share — the most recent annual book value as reported on the balance sheet at the latest fiscal year-end (with interim figures used if available). This will be adjusted between balance sheet report dates by the amount of capital raised by rights issues, and, in the case of hyperinflationary economies, by intervening inflation adjustments.	• Traditional "value"/"growth" proxy. • Conventional wisdom suggests that the book-to-price ratio is one of the most straightforward and effective investment factors in the emerging markets. • Developed market studies show a high correlation between size and book value, although small-capitalization stocks tend to be small-cap "value" stocks with relatively high levels of distress. • Technically insolvent companies are included in the bottom portfolios with high-premium stocks, although the relative performance of this group may be investigated by exclusion through time. • Without some form of relative attribution adjustment, sectoral influences could appear in ranks through time.
12 Cash Earnings to Price Yield High Cash Earnings-to-Price Yield Stocks Should Outperform Through Time **Top Portfolio:** High Cash Earnings-to-Price Yield **Bottom Portfolio:** Low Cash Earnings-to-Price Yield Code: CEY	IFC	(Cash Earnings per Share/ Closing Market Price)100 Note: Cash earnings per share minus the last twelve months' trailing earnings per share plus depreciation earnings per share as reported in the cash flow statement, divided by the total number of shares outstanding.	• Traditional "value" proxy that facilitates cross-sectional comparisons by removing the effect of depreciation policies on earnings. • Not a true cash flow per share factor, although it should provide some information regarding a company's ability to leverage itself, to pay dividends, and to enjoy financial flexibility. • Obvious shortcomings in availability and "quality" of data and noise inherent in reduced samples of firms (companies that do not report depreciation figures are excluded from the factor sort). There is potential information in investigating stocks collected in the bottom portfolio and premiums paid for higher-quality cash earnings. • Inverting the traditional price-to-cash earnings ratio will

Factor, Hypothesis, and Ranking Strategy	Data Source	Formula and Definitions[a]	Interpretation
			result in the collection of deficit cash flow stocks in the bottom-ranked portfolio, although the relative performance of this group may be investigated by exclusion through time.
13 One-Month Price Momentum One-Year Price Momentum A Firm's Past Return Helps to Predict Future Returns, and Past Momentum Stocks Should Continue to Outperform Top Portfolio: High Momentum Bottom Portfolio: Low Momentum Code: PM_12M, PM_1M	IFC	One-month USD price change Last fifty-two-week USD price change	• Momentum or relative strength portfolios are formed by ranking stocks on the past one- and twelve-month returns. • As shown in other research for developed markets, momentum returns accrue gradually over a period of up to one year after ranking. • The strategy has higher implied portfolio turnover. • Previous research has introduced a one-month lag in portfolio formation after observation date to compensate for the bid-ask bounce. We check the sensitivity of our results by excluding the first lagged month in the one-year momentum screen. • Collection of extreme rankings in outlier portfolios of one-month momentum strategies may preempt a degree of reversal. • Momentum effects are more evident with longer-horizon (fifty-two-week) price changes.
14 Twelve-Month Prospective Earnings Growth Rate Stocks with the Highest Expected Short- to Medium-Term Growth Rates Should Outperform Through Time Top Portfolio: High Prospective Growth Bottom Portfolio: Low Prospective Growth Code: PEGR_1Y	IBES Estimates	[(Rolling Twelve-Month Consensus Forecast Earnings per Share – Historical Trailing Earnings per Share)/Absolute[c] (Historical Trailing Earnings per Share)]100 The rate of change in earnings per share expected for the stock over the specified period, expressed as a percentage. Note 1: Rolling twelve-month forward IBES estimates calculated as $[(M1 \times F1) + (12 - M1)F2)]/12$ where: M1 = the number of month-ends to the end of the current fiscal	• Traditional short- to medium-term growth proxy that discriminates on differential earnings expectations. • Trends over the short-term period may be dominated by the business cycle, or in some cases the industry cycle. • The use of rolling twelve-month forward estimates reduces the inherent redundancy that accrues as the fiscal year-end approaches. • Stocks with the highest expected earnings could have the greatest propensity to disappoint or torpedo, as surprises are more likely on the downside. • When the IBES database had missing financial ratios, we use the IFC data to fill in.

EXHIBIT 4
Details of Screening Factors (continued)

Factor, Hypothesis, and Ranking Strategy	Data Source	Formula and Definitions[a]	Interpretation
		year (note that the current fiscal year will be FY1 if the date is before the FY1 year-end, and FY2 if the date is after year-end); F1 = the consensus EPS forecast for the current fiscal year; F2 = the consensus EPS forecast for the next fiscal year. Rolling twenty-four-month data are constructed on the same principle as above, but will access FY3 estimates to preserve the two-year forward window. Note 2: See factor 5 for explanation of the use of absolute numbers.	
15 Three-Year Prospective Earnings Growth Rate Stocks with the Highest Expected Medium- to Longer-Term Growth Rates Should Outperform Through Time Top Portfolio: High Prospective Growth Bottom Portfolio: Low Prospective Growth Code: PEGR_3Y	IBES Estimates	The expected rate of change in consensus forecast earnings per share over a three-year time horizon. A composite forecast of the anticipated annual growth rate in earnings per share over the longer term. Note 1: See factor 6 for definitions of rate function. Note 2: Because certain markets have infrequent FY3 estimates, the best expectation of longer-term growth in those markets is constructed using FY2 data.	• The growth rate provides a more robust view of a stock's longer-term earnings expectations. • Longer forecasts are often used to justify the high multipliers of earnings sometimes commanded by growth stocks. • Provides insight into the extrapolation of past growth trends. • Higher premiums paid for "growth" stocks built on the rationale that a dollar of retained earnings in a firm with greater opportunities to invest at higher rates has a higher perceived investment value. • Three years forward is the maximum available time window, as longer forecasts incrementally lose value in volatile markets.
16 Twelve-Month Prospective Earnings Yield	IBES Estimates	(Rolling Twelve-Month Consensus Forecast Earnings per Share/ Closing Market Price)100	• Traditional "value" proxy incorporating earnings expectations. • Stocks might have perceived "value" due to the lag on estimate revisions after anticipatory price movements.

EXHIBIT 4
Details of Screening Factors (continued)

Factor, Hypothesis, and Ranking Strategy	Data Source	Formula and Definitions[a]	Interpretation
Twenty-Four-Month Prospective Earnings Yield Stocks with the Greatest Perceived Expected "Value" Should Outperform Through Time Top Portfolio: High Prospective Yield Bottom Portfolio: Low Prospective Yield Code: PEY_12M, PEY_24M		(Rolling Twenty-Four-Month Consensus Forecast Earnings per Share/Closing Market Price)100	This should, however, be a temporary phenomenon, as analysts revise forecasts in response to price changes, which are further abated by the inclusion of estimate revision factors. • Can provide powerful results in implemented with other "growth" and "quality" factors in bivariate screening models. • Inverting the price-to-prospective earnings ratio will result in the collection of prospective loss-making stocks in the bottom portfolio, although the relative performance of this group may be investigated by exclusion through time.
17 Revenue Growth Stocks with Real Perceived Growth Rates Should Outperform Through Time Top Portfolio: High Growth Bottom Portfolio: Low Growth Code: RGR	Worldscope	[(Current Year's Net Sales or Revenues/Previous Year's Net Sales or Revenues) − 1]100 For industrial companies, revenue represents gross sales and other operating revenues less discounts, returns, and other allowances; banks, insurance, and other financial companies' revenues represent the total operating revenue of the company.	• Revenue growth is often used as a proxy for "quality" and real short-term "growth." • Does not provide any insight into profit margin performance, although a screen can be constructed with earnings factors in a bivariate sort to discriminate on "quality" of growth. • Reduced universe of companies with available data and vagaries in definition and recognition of revenue will impart some noise in the results through time. • The lag incorporated on assimilation of data to ensure data item is available at the time of portfolio formation.
18 Rate of Reinvestment Growth and Emerging Growth Stocks with High Internal Growth Rates Should Outperform Through Time	IFC	(Last Twelve Months' Trailing Earnings per Share Minus Last Twelve Months' Dividend per Share)/(Last Year's Book Value per Share)100 Note: See earnings yield, dividend	• The rate of reinvestment used to discriminate "growth" companies that provide higher rates of return on invested capital but reinvest earnings to generate internal growth rather than returning the capital to shareholders. • It is generally considered sound corporate policy, usually in the interest of shareholders, to retain an appreciable amount of an average year's earnings to, inter alia, strengthen liquidity,

EXHIBIT 4
Details of Screening Factors (continued)

Factor, Hypothesis, and Ranking Strategy	Data Source	Formula and Definitions[a]	Interpretation
Top Portfolio: High Rate of Reinvestment Bottom Portfolio: Low Rate of Reinvestment Code: RIR		yield, and book-to-price ratio factors above for definitions of ratio constituents.	invest in infrastructure and product expansion, prepare for "rainy days," and maintain the dividend rate in low-earning years. • If the firm has good prospects, we expect a high reinvestment rate. • Usually has a high correlation with other growth and "quality" proxies.
19 Return on Equity High–"Quality" Stocks Should Outperform Poorer "Quality" Through Time Top Portfolio: High Return on Equity Bottom Portfolio: Low Return on Equity Code: ROE	IFC	(Last Twelve Months' Trailing Earnings per Share/Last Year's Book Value per Share)100 Note: See earnings yield and book-to-price ratio factors above for definitions of ratio constituents.	• Return on equity is fundamental in screening companies providing returns on invested capital. • Good traditional "quality" and risk proxy to investigate the performance differential between perceived "good" and "bad" stocks through time. • While nominal ROE does not provide significant insight into a stock's ability to create intrinsic value, it is thought to be a good and simple proxy for management quality and the ability of management to leverage the rate of return on equity by incurring debt. • Return on equity will, to a degree, demonstrate the efficiency of the company's management of assets, its ability to meet competitive challenges and implement pricing strategy, its ability to weather credit market conditions and to instill an overall financial policy, and its ability to take advantage of fiscal incentives. • Although there are perceived benefits in the use of advanced return and value ratios, data quality and history often preclude their effective implementation. • High-ROE stocks are visible "quality" stocks, and sometimes trade on high multiples.

[a]For all screening factors, stocks for which relevant ranking information does not exist are classified into a not-ranked fractile and monitored separately.
[b]Short-form screen code for selected tables and text.
[c]See Bernstein [1995] for a general discussion on the behavior of market capitalization and size effects.
[d]The screen can be used to corroborate the use of factors as part of a set of knockout criteria to control final model risk.
[e]In South Africa, dividend reinvestment for return purposes is calculated using financial rand (abolished March 13, 1995), recognizing that dividend yields would have been higher had commercial rand been used.

sures. The economy fell into a deep recession, however, and a dramatic turnaround on the external accounts and falling inflation enabled the authorities to relax monetary conditions fairly quickly. By 1996-1997, there were clear signs of economic recovery. Share prices rallied, bolstered by the increased transparency of the market, and corporate restructuring resulting from the recession.

The accelerated privatization program was also encouraging investment as it led to increased liquidity and added depth to the market. Confidence was enhanced by the most democratic elections in Mexican history and clear signs that the PRI, the party in power in Mexico for well over sixty years, was losing its stranglehold. However, in mid-1997, the Asian financial crisis (see below) reminded investors of emerging market risk, and international commodity prices started to weaken. After a brief period of relative outperformance, the Mexican market started to falter.

Malaysia. In sharp contrast, the Malaysian market was not plagued by the macroeconomic volatility experienced by Mexico over the same period — until 1997. The Malaysian economy experienced real GDP growth of 7.5% per year between 1988 and 1996, with an average inflation rate of only 3.5%. Although the current account deficit was rising, this was primarily due to large capital imports for investment purposes, not because of debt servicing or weak exports.

The stock market grew from a market capitalization of U.S. $18.6 billion in 1988 to U.S. $183 billion in March 1997, and the number of listed companies grew from 62 to 157. The economic boom meant that there were few political or social pressures. At the time of the Mexican crisis, the Malaysian market dipped, but soon resumed its steady rise because Malaysia did not exhibit any of Mexico's problems. Public-sector external debt was low, short-term debt was low, and government accounts were in surplus.

However, years of low interest rates, strong growth in domestic demand, and a stable exchange rate led companies to borrow heavily, at home and abroad, and to pay little attention to the productivity of investments. For the same reasons, investors were not concerned about the relative lack of transparency in the market. By 1997, private-sector debt stood at over 140% GDP, compared with a mere 9% in Mexico in 1994. The Asian currency crisis in mid-1997 revealed the weaknesses of the corporate sector and sent Malaysian share prices tumbling, which was exacerbated by the heavy weighting in the index of interest rate-sensitive stocks (40% of the index is composed of property and financial sector stocks). The Malaysian authorities have started to take steps to increase foreign participation in the market and will come under mounting pressure to improve the transparency of accounts and access to information.

South Africa. While parallels between developments in Mexico and Malaysia and its regional neighbors are visible, the characteristics of the South African market are relatively unique. The closed nature of the economy and its markets prior to the transition from apartheid made it difficult to draw inferences that would be appropriate for the open period. As a result, we have a very short sample for this country.

Even within this short period (since 1993), there has been very rapid transformation, however. In January 1993, the new IFC index covered sixty-two companies and had a market capitalization of U.S. $66 billion. The index peaked at U.S. $120 billion in January 1996, but has subsequently fallen to U.S. $92 billion (end-1997), or 73% GDP.

The liberalization of the economy initially led to a surge in domestic demand, fueled by easy monetary policy. However, by 1996, the inflationary impact became clear and the South Africa Reserve Bank moved quickly to tighten policy. Credit growth failed to respond quickly, and, with increasing pressure on the rand following the 1997 Asian crisis, interest rates have been forced to stay high despite clear signs of economic deceleration. Falling international gold and other industrial commodity prices have further dampened market sentiment (mining stocks represented 20% of the IFCG index at the end of 1997).

Another unique characteristic of the economy and equity market is the mismatch between different sectors. The regulatory environment of the market and the accounting practices of the majority of corporations are advanced relative to other emerging markets, but the economy is very sensitive to changes in international commodity prices. There is also substantial political risk as the country struggles to deal with the years of apartheid.

Screening Results

In an effort to be as complete as possible, we include numerous exhibits that show the performance of all the screening factors in the three markets. We consciously report the screens that do not work as well as the

ones that appear to add value.

There are certain observations that relate to factor screens in general:

- There is often a considerable difference between the value-weighted portfolio results and the equally weighted results. In general, size plays an important role. The equally weighted results give greater relative weight to smaller-sized firms. Our scoring screen works exclusively with the value-weighted results, which we believe provide a more realistic investment opportunity.
- Certain screens (such as debt to common equity in South Africa, for example) show all portfolios underperforming the market portfolio in the value-weighted panel. This underperformance is a function of intraportfolio weighting at each observation period, which provides different results if there are disparate firm sizes and performances in the portfolios. The performance of firms with missing data points allocated to the NA portfolio also have an influence on results, as these are analyzed separately.
- Top portfolios in certain historical and prospective growth screens exhibit extremely high growth rates and factor standard deviations. As portfolio factor averages are not value-weighted, the extreme results are induced by a few influential firms in the portfolios with remarkable past or expected growth rates.

Screening Results for Malaysia. During our sample, the Malaysia index return averaged −2.6% per year. Most of this negative performance came from 1997 when the value of $100 dropped to $28.34. Over the entire sample (114 observations) since December 1988, the market increased in sixty-four months (56% of the time), and decreased in fifty months (44% of the time). During the out-of-sample period (thirty observations), the market increased in only thirteen months and decreased in seventeen months.

To run the out-of-sample analysis in such a market upheaval might at first appear unfair to the stock selection model. However, in our opinion, this is a real test of our scoring screen. One expects episodes of extreme volatility and contagion in emerging markets. A successful stock selection method must be able to perform in both (extreme) up and down markets.

To summarize our results, our top-fractile portfolio achieved a 10.59% performance. Our bottom-fractile achieved −19.6%. Hence, the spread between top and bottom exceeded 30% per year. Importantly, our top fractile beat the market in each of the out-of-sample years, 1996-1998. Our bottom fractile greatly underperformed the market benchmark in the out-of-sample period.

Factor screens. Exhibit 5 presents an example of the factor-by-factor results (we present the dividend yield screen). The detailed analysis of the other factors is presented in Achour et al. [1998a]. Exhibit 6 summarizes these results. Exhibit 7 presents the success rates of the individual factors. Some general observations are:

- Greater than 10% average annualized excess returns are earned from the top portfolio dividend yield and change in consensus FY1 estimate over the preceding six-month strategies with excess returns (over the benchmark) of 18.66% and 10.01% per year, respectively.
- Greater than −10% average annualized returns are obtained from the bottom portfolio earnings yield and cash earnings yield with average annual excess returns of −13.74% and −10.64, respectively.
- The greatest discrimination on top minus bottom performance is produced by dividend yield and change in consensus FY1 estimate over the preceding six-month strategies, with annual average spreads of 25.15% and 15.30%, respectively.
- These two strategies are also the most successful in terms of benchmark outperformance, beating the benchmark in 67.62% (dividend yield) and 62.75% (change in consensus) of the total number of observations.
- Revenue growth and change in consensus earnings over the preceding six months are the best value-weighted top portfolio strategies in an up market, with outperformance in 71.43% and 68.75%, respectively, of up-market observations.
- Dividend yield and consensus forecast revision ratio are the best value-weighted top portfolio strategy performers in a down market, with outperformance in 82.98% and 67.39% of down-market observations.
- The greatest value-weighted top portfolio cumulative last two-year performances are delivered by dividend yield, where the value of $100 fell to $47.32; one-month price momentum, where the value of $100 fell to $32.69; and return on equity, with the value of $100 falling to $28.09. During this period, a passive $100 investment in the benchmark fell in value to $21.99.

EXHIBIT 5

Malaysia Dividend Yield
Sample Period: 9/89-5/98
Number of Observations: 105 Monthly

Performance Measure/ Summary Statistic	Note*	Portfolios - equal weighted -1-	-2-	-3-	-4-	-5-	Portfolios - value weighted -1-	-2-	-3-	-4-	-5-	Market portfolio
Annualized average return (USD)	1	4.62	-1.47	-9.06	-11.04	-9.14	12.85	-2.97	-7.78	-7.71	-12.31	-5.81
Cumulative return (indexed at 100 - start)	2	148.47	87.87	43.54	35.94	43.23	287.89	76.81	49.25	49.55	31.69	59.22
STD Deviation of returns	3	.46.25	46.88	44.97	46.10	42.99	35.27	40.85	34.89	36.40	37.58	35.20
Average annual excess return	Rm 4	10.43	4.35	-3.25	-5.23	-3.33	18.66	2.84	-1.96	-1.90	-6.50	
	Rf 5	-0.37	-6.19	-13.46	-15.34	-13.53	7.49	-7.63	-12.22	-12.16	-16.55	
STD Deviation of excess rtns	Rm 6	18.64	18.58	15.31	15.69	15.46	12.06	13.00	11.34	10.43	13.76	
	Rf 7	46.29	46.91	44.99	46.13	43.01	35.31	40.88	34.94	36.44	37.60	
T-stat: Average XS return Rm = 0	8	2.11	1.27	-0.08	-0.35	-0.01	4.34	1.03	-0.54	-0.51	-1.15	
Systematic risk (Beta)	9	1.22	1.25	1.22	1.26	1.15	0.94	1.11	0.94	0.99	0.99	
Alpha	10	11.83	5.97	-2.17	-4.12	-2.68	17.78	3.59	-2.46	-2.08	-7.13	
Co-efficient of determination	11	0.87	0.88	0.91	0.92	0.89						
Average market cap	12	2013.95	2239.87	2824.08	4226.00	3614.19						2983.62
% periods > Benchmark	13	60.95	47.62	46.67	48.57	48.57	67.62	57.14	40.95	45.71	44.76	
% periods > Bench up Mkt	14	58.62	53.45	56.90	60.34	60.34	55.17	55.17	34.48	46.55	50.00	
% periods > Bench Dn Mkt	15	63.83	40.43	34.04	34.04	34.04	82.98	59.57	48.94	44.68	38.30	
Max # of consecutive bmark outperformance	16	9	4	6	6	9	9	6	6	4	7	
Maximum positive excess return	17	44.33	40.57	30.67	27.20	13.62	18.21	21.11	11.38	13.09	10.63	
Maximum negative excess return	18	-12.98	-9.22	-13.09	-15.83	-17.54	-4.77	-9.94	-10.62	-7.94	-17.28	
% periods positive returns to negative	19	144.19	114.29	101.92	101.92	101.92	150.00	110.00	101.92	110.00	101.92	
% periods of negative returns	20	40.95	46.67	49.52	49.52	49.52	40.00	47.62	49.52	47.62	49.52	44.76
Max # of consecutive negative periods	21	8	11	8	8	11	4	11	8	6	5	8
Max # of consecutive positive periods	22	7	6	6	6	6	7	6	6	6	8	7
Cumulative annual returns - (index=100 each year)	23											
In sample 1989		108.26	102.98	115.17	112.50	110.32	112.29	100.59	123.73	103.76	104.53	109.76
1990		103.97	89.97	95.82	83.40	124.07	110.39	92.20	87.49	75.68	104.88	88.80
1991		121.64	136.07	92.42	99.53	108.30	120.83	126.13	90.94	109.51	103.54	112.08
1992		141.38	97.95	110.70	117.73	142.50	154.86	102.80	121.47	114.76	153.23	127.94
1993		237.31	254.42	210.44	208.37	209.89	224.24	210.08	229.12	192.31	174.10	202.86
1994		90.36	92.53	88.69	79.45	76.92	91.14	92.48	82.47	77.53	68.14	78.50
1995		102.91	107.58	101.30	99.36	87.19	107.26	110.22	108.38	105.17	96.74	103.56
Out of sample 1996		130.33	132.84	124.71	137.07	135.49	133.56	132.05	122.25	117.41	136.95	124.51
1997		29.94	23.71	20.70	20.15	14.71	41.84	27.21	24.53	31.43	18.59	28.34
1998		89.07	89.21	79.01	71.94	72.94	101.32	83.01	67.08	86.77	62.36	72.82
Relative Performance -	24											
1989		2	1	5	4	3	4	1	5	2	3	
1990		4	2	3	1	5	5	3	2	1	4	
1991		4	5	1	2	3	4	5	1	3	2	
1992		4	1	2	3	5	5	1	3	2	4	
1993		4	5	3	1	2	4	3	5	2	1	
1994		4	5	3	2	1	4	5	3	2	1	
1995		4	5	3	2	1	3	5	4	2	1	
1996		2	3	1	5	4	4	3	2	1	5	
1997		5	4	3	2	1	5	3	2	4	1	
1998		4	5	3	1	2	5	3	2	4	1	
Average Relative Performance -		3.70	3.60	2.70	2.30	2.70	4.30	3.20	2.90	2.30	2.30	
Cumulative annual returns -	25											
Last two years		29.44	23.35	17.20	15.40	11.59	47.32	26.12	17.06	28.74	13.31	21.99
Last five years		61.75	50.50	31.45	27.17	16.75	102.88	51.25	31.68	44.09	17.58	36.15
Factor average	26	6.02	2.94	2.00	1.35	0.66						2.63
Factor median	27	4.82	2.52	1.64	1.13	0.57						1.81
Factor standard deviation	28	4.02	1.30	0.95	0.64	0.39						2.45

*All definitions in Exhibit 1.

EXHIBIT 6
Factor Performance Summary — Malaysia

	Sample Period	Number of Observations	Average Annualized Return		Return Spread Top/Bottom	Annualized Excess Returns		Std. Dev. of Annualized Returns		Std. Dev. of Top/Bottom Spread Returns	% Periods Benchmark Outperformance	
			Top	Bottom		Top	Bottom	Top	Bottom		Top	Bottom
Market Capitalization	12/88-5/98	114	-4.68	-1.40	-3.28	-2.06	1.22	58.81	30.22	39.18	48.25	55.26
Change in Return on Equity	12/88-5/98	114	1.95	-1.30	3.25	4.57	1.32	41.02	33.15	19.93	51.75	46.49
Debt-to-Common Equity	12/88-5/98	114	-14.44	7.27	-21.71	-11.83	9.89	45.61	26.54	27.75	40.35	54.39
Dividend Yield	9/89-5/98	105	12.85	-12.31	25.15	18.66	-6.50	35.27	37.58	21.93	67.62	44.76
One-Year Historical Earnings Momentum	12/88-5/98	114	-1.84	-4.54	2.70	0.78	-1.92	45.85	36.70	20.44	50.00	47.37
Three-Year Historical earnings Growth Rate	12/88-5/98	114	-3.16	-2.73	-0.43	-0.54	-0.11	40.45	35.98	18.99	49.12	50.88
Earnings Yield	12/88-5/98	114	-4.55	-13.26	8.71	-1.93	-10.64	51.07	45.55	38.85	50.00	39.47
Change in Consensus FY1 Estimate — Last Three Months	12/89-5/98	102	1.16	-10.18	11.34	8.16	-3.18	32.95	43.61	23.04	59.80	42.16
Change in Consensus FY1 Estimate — Last Six Months	12/89-5/98	102	3.01	-12.29	15.30	10.01	-5.29	33.76	42.38	21.10	62.75	42.16
Consensus FY2 to FY1 Estimate Change	12/89-5/98	102	-10.68	-7.22	-3.46	-3.68	-0.22	37.88	48.71	27.85	50.00	55.88
Consensus Forecast Earnings Estimate Revision Ratio	12/89-5/98	102	0.95	-11.36	12.31	7.95	-4.36	32.86	36.64	17.39	62.75	44.12
Book-to-Price Yield	12/88-5/98	114	2.99	-1.24	4.24	5.61	1.37	59.81	29.63	43.39	51.75	53.51
Cash Earnings-to-Price Yield	1/93-5/98	65	-15.40	-27.89	12.49	-1.26	-13.74	57.43	46.34	37.27	56.92	33.85
One-Month Price Momentum	12/88-5/98	114	-2.11	0.61	-2.72	0.51	3.23	38.54	45.84	26.65	45.61	50.88
One-Year Price Momentum	12/88-5/98	114	3.56	-6.99	10.55	6.17	-4.37	33.42	60.13	45.18	55.26	45.61
Twelve-Month Prospective Earnings Growth Rate	12/89-5/98	102	-9.01	-7.15	-1.86	-2.01	-0.15	41.54	43.44	25.81	42.16	51.96
Three-Year Prospective Earnings Growth Rate	12/89-5/98	102	-4.92	-8.90	3.98	2.09	-1.90	42.93	40.76	20.80	47.06	47.06
Twelve-Month Prospective Earnings Yield	12/89-5/98	102	-9.77	-13.47	3.70	-2.77	-6.47	54.71	34.05	35.54	48.04	45.10
Twenty-Four-Month Prospective Earnings Yield	12/89-5/98	102	-8.94	-12.44	3.50	-1.94	-5.44	54.60	33.65	36.38	50.00	42.16
Revenue Growth	12/88-5/98	114	-3.12	-2.94	-0.18	-0.50	-0.32	49.20	35.89	26.05	52.63	44.74
Rate of Reinvestment	12/88-5/98	114	-3.13	8.03	-11.16	-0.51	10.65	41.51	33.01	24.24	46.49	57.02
Return on Equity	12/88-5/98	114	0.71	-5.70	6.40	3.33	-3.08	31.41	51.39	29.50	52.63	41.23

EXHIBIT 7
Success Rates — Malaysia

	Average Success Rate			Std. Dev. of Average Success Rate			Average Success Rate Consistency Ratio			Success Rate					
										Most Successful			Least Successful		
	Universe	Top	Bottom	Universe	Top	Bottom	Universe	Top	Bottom	Universe	Top	Bottom	Universe	Top	Bottom
Market Capitalization	45.0	42.3	51.1	12.3	27.7	13.2	39.5	38.6	43.0	73.3	100.0	83.3	21.7	0.0	15.4
Change in Return on Equity	45.4	46.1	56.2	12.4	16.6	19.7	40.4	44.7	59.7	73.9	83.3	96.0	21.6	8.3	0.0
Debt to Common Equity	45.1	40.7	51.8	11.5	20.9	18.9	39.5	33.3	51.8	73.4	100.0	100.0	19.2	0.0	0.0
Dividend Yield	45.5	48.6	55.9	10.4	18.0	17.8	41.9	51.4	60.0	68.4	88.2	90.0	20.0	7.1	14.3
1-Yr. Hist. Earnings Momentum	45.6	45.9	57.5	12.8	19.5	20.3	42.1	42.1	62.3	75.2	83.3	92.3	20.4	0.0	0.0
3-Yr. Hist. Earn. Growth Rate	45.8	45.2	56.6	10.5	19.0	19.2	39.5	41.2	59.7	69.4	87.5	100.0	25.0	0.0	0.0
Earnings Yield	45.0	44.9	59.1	12.4	17.7	26.6	37.3	43.0	61.4	73.3	87.5	100.0	21.2	0.0	0.0
Change in Consensus FY1 Est. Last 3 Mos.	45.5	48.0	58.7	9.8	13.8	15.9	40.2	44.1	68.6	66.7	83.3	90.0	26.8	15.4	17.7
Change in Consensus FY1 Est. Last 6 Mos.	45.6	50.3	58.7	9.8	12.5	15.8	40.2	52.0	70.6	65.8	81.8	88.2	26.8	15.4	15.4
Consensus FY2 to FY1 Est. Change	45.7	43.4	54.1	9.7	17.4	17.6	37.3	44.1	51.0	68.0	86.7	90.5	25.0	0.0	0.0
Consensus Forecast Earn. Est. Revision Ratio	45.4	48.8	57.8	9.9	12.8	15.3	40.2	52.9	63.7	67.6	78.6	88.2	26.3	14.8	18.9
Book-to-Price Yield	45.0	46.1	54.5	12.4	23.1	13.2	39.5	42.1	58.8	73.3	100.0	81.8	21.2	0.0	25.0
Cash Earnings-to-Price Yield	45.5	47.2	59.4	12.0	18.4	23.0	38.5	46.2	67.7	73.3	85.7	95.5	21.2	9.4	13.6
1-Mo. Price Momentum	44.9	44.6	56.1	12.2	18.6	21.5	39.5	35.1	57.9	73.3	87.5	100.0	20.7	0.0	0.0
1-Yr. Price Momentum	45.7	48.6	57.9	12.7	17.3	24.8	42.1	49.1	58.8	75.2	82.8	100.0	20.4	9.1	0.0
12-Mo. Prosp. Earn. Growth Rate	45.3	43.1	54.0	9.8	20.5	17.0	40.2	37.3	53.9	67.1	87.5	100.0	26.6	0.0	12.5
3-Yr. Prosp. Earn. Growth Rate	45.5	45.4	55.0	9.6	18.8	17.7	37.3	43.1	55.9	67.1	91.7	100.0	26.6	0.0	20.0
12-Mo. Prospective Earnings Yield	45.3	44.8	57.3	9.8	18.4	16.8	40.2	41.2	63.7	67.1	95.2	90.9	26.6	0.0	11.8
24-Mo. Prospective Earnings Yield	45.3	44.3	58.5	9.8	18.1	17.8	40.2	42.2	63.7	67.1	95.2	94.1	26.6	0.0	17.7
Revenue Growth	46.5	45.0	55.6	11.0	20.9	22.4	41.2	44.7	53.5	73.8	100.0	100.0	20.0	0.0	0.0
Rate of Reinvestment	45.7	45.8	54.2	12.7	15.8	21.5	41.2	41.2	60.5	74.7	90.9	100.0	20.4	7.7	0.0
Return on Equity	45.3	47.4	57.2	12.3	14.2	26.5	37.7	41.2	57.9	73.7	84.6	100.0	19.9	15.4	0.0

Fundamental factors. Although the collective "value" (earnings yield, prospective earnings yield, book-to-price yield, and cash earnings-to-price yield) strategies do have high correlation coefficients, they behave differently through time, as indicated by reported top-bottom spreads and market portfolio outperformance.

The size effect pervades much of the results and, with the exception of cash earnings-to-price strategy, on average the smallest firms are collected in the top portfolios of the value strategies through time. There is a large size effect occurring within the top and bottom portfolios (not shown in the exhibits). For example, the average small-capitalization–large-capitalization annualized spread within the top book-to-price ratio portfolio is 18.5%, while the spread on small-capitalization stocks between the top and bottom portfolios is 40.8% per year.

The return on equity and change in return on equity factor screens both generated large return premiums through time, although much of that was generated in one year in the case of the change screen (in the large bull market of 1993). The return on equity screen seems to proxy for "quality" in down-market observations, as exhibited in the cumulative last two-year performance in extremely volatile market conditions.

Expectation factors. The revision screens (consensus forecast earnings revisions and change in consensus FY1 estimates) provide the most consistent results through time and performed well in both up and down markets. The "last six months" estimate change was the most consistent, producing a factor relative score of 3.00 in the equal-weighted panel and 2.78 in the value-weighted, underperforming marginally on a value-weighted basis in only one year out of nine. The last six-month screen also exhibited the second-highest risk-adjusted performance of the factor universe (not shown in the exhibits). The revision screens displayed the highest correlation coefficients with our one-year momentum technical indicator.

Prospective earnings growth screens show a large disparity in performance in a dichotomous market, although these factors tend to work better in bivariate screening.

Technical indicators. Momentum effects are more evident with longer-horizon (fifty-two-week) price changes, with the top portfolio one-year momentum indicator producing an average excess return of 6.17%, and performing better in an up-trending market. Little

benefits accrued to the shorter-term indicator, although it did produce fairly substantial outperformance in the volatile markets of 1996 and 1997.

Size. In line with our prior expectations on "quality" and "value," top-portfolio (small-capitalization) stocks exhibited high risk but insignificant return spreads through time. Despite an almost 60% outperformance in the bull market of 1993, small-capitalization firms still delivered an average annual excess return of only −2.06%. This is illustrated by the severe underperformance in the turbulent market of 1997 and 1998. The value of a $100 investment in small stocks over the past two years fell to $10.68, as investors appear to have gravitated to less risky larger-capitalization firms.

The scoring screen. Exhibit 8 presents the correlation of the factor returns for both the top and bottom portfolios for each of the factors. Interestingly, there are no obvious redundancies in the factors. It is also interesting that the correlations of the factor portfolio returns can be different in the top portfolios versus the bottom portfolios.

The performance of the scoring screens is detailed in Exhibits 9A-9D. The performance is summarized in Exhibit 10. The first three exhibits show the impact of rebalancing, monthly, quarterly, and semiannually. The last exhibit imposes the final step in our analysis — the knockout criteria. For example, the performance of the top fractile with monthly rebalancing is 10.59% per year (compared to the benchmark of −2.62%). With quarterly rebalancing, the average return decreases to 6.68%. While this return is lower, note in the quarterly rebalancing that our top fractile beats the benchmark a remarkable 81.58% of the time. In addition, the quarterly rebalanced portfolio exceeds the benchmark in the difficult 1996-1998 out-of-sample period. The performance is similar when semiannual rebalancing is considered.

Success rates (the proportion of stocks in the top portfolio that beat the benchmark and the proportion in the bottom portfolio that underperform the benchmark) are detailed in Exhibit 11. The success rates are greater than 50% in all cases. The strength of the screens is robust across rebalancing periods. Average success consistency ratios further highlight the strength of the screen through time. For example, in 79% of the rebalancing periods, more than 50% of the stocks beat the benchmark in the top portfolio (semiannual rebalancing after knockout).

EXHIBIT 8

Correlation Coefficient Matrix — Malaysia, December 1989–May 1998

Note: Values in parentheses denote negative correlations.

Top Portfolio

	EY	HEGR_1Y	HEGR_3Y	BPR	RGR	PM_1M	CAP	DY	CEY	IREV_3M	DE	PEY_12M	PEY_24M	ROE	CH_ROE	PEGR_1Y	PEGR_3Y	CH_FY1_3M	CH_FY1_6M	CH_FY2_FY1	RIR
PM_12M	(0.65)	(0.43)	(0.00)	(0.60)	(0.42)	(0.09)	(0.28)	(0.07)	(0.68)	0.42	(0.43)	(0.63)	(0.61)	0.16	(0.35)	0.08	(0.17)	0.51	0.47	0.35	(0.53)
EY		0.67	0.18	0.93	0.74	0.19	0.60	0.23	0.95	(0.61)	0.62	0.95	0.94	(0.34)	0.50	0.07	0.40	(0.66)	(0.62)	(0.28)	0.77
HEGR_1Y			0.43	0.67	0.70	0.11	0.53	0.10	0.68	(0.38)	0.55	0.68	0.69	(0.42)	0.61	0.31	0.52	(0.41)	(0.32)	(0.07)	0.60
HEGR_3Y				0.13	0.39	0.03	0.30	0.07	0.12	(0.05)	0.22	0.21	0.21	(0.04)	0.29	0.35	0.43	0.04	0.06	(0.00)	0.20
BPR					0.73	0.28	0.66	0.25	0.93	(0.61)	0.60	0.90	0.89	(0.45)	0.44	0.15	0.49	(0.65)	(0.62)	(0.23)	0.66
RGR						0.18	0.71	0.13	0.73	(0.37)	0.62	0.77	0.77	(0.38)	0.51	0.32	0.58	(0.41)	(0.25)	(0.03)	0.60
PM_1M							0.26	0.07	0.25	(0.18)	0.12	0.19	0.19	(0.06)	0.16	0.10	0.24	(0.21)	(0.42)	(0.03)	0.16
CAP								0.13	0.67	(0.41)	0.56	0.65	0.64	(0.44)	0.38	0.51	0.60	(0.40)	(0.02)	0.07	0.35
DY									0.24	0.01	(0.07)	0.22	0.20	0.11	(0.09)	0.05	0.18	(0.04)	(0.02)	(0.16)	0.02
CEY										(0.66)	0.65	0.93	0.92	(0.52)	0.57	0.06	0.37	(0.73)	(0.68)	(0.36)	0.76
IREV_3M											(0.42)	(0.57)	(0.55)	0.27	(0.22)	0.11	(0.29)	0.87	0.82	0.13	(0.56)
DE												0.68	0.68	(0.31)	0.39	0.15	0.41	(0.46)	(0.46)	0.05	0.46
PEY_12M													0.98	(0.35)	0.48	0.11	0.45	(0.64)	(0.59)	(0.20)	0.76
PEY_24M														(0.34)	0.49	0.12	0.45	(0.63)	(0.57)	(0.22)	0.75
ROE															(0.26)	(0.25)	(0.24)	0.31	0.28	(0.02)	(0.06)
CH_ROE																0.19	0.28	(0.24)	(0.09)	(0.16)	0.47
PEGR_1Y																	0.63	0.20	0.20	0.15	(0.06)
PEGR_3Y																		(0.21)	0.20	0.14	0.24
CH_FY1_3M																			0.89	0.22	(0.59)
CH_FY1_6M																				0.12	(0.52)
CH_FY2_FY1																					(0.21)

Bottom Portfolio

	EY	HEGR_1Y	HEGR_3Y	BPR	RGR	PM_1M	CAP	DY	CEY	IREV_3M	DE	PEY_12M	PEY_24M	ROE	CH_ROE	PEGR_1Y	PEGR_3Y	CH_FY1_3M	CH_FY1_6M	CH_FY2_FY1	RIR
PM_12M	(0.19)	0.20	(0.01)	(0.62)	(0.12)	0.64	(0.68)	(0.33)	(0.31)	0.21	(0.69)	(0.50)	(0.57)	0.49	(0.18)	0.67	0.56	0.74	0.74	0.79	(0.41)
EY		0.05	(0.08)	0.14	0.47	0.03	0.34	0.15	0.91	(0.19)	(0.02)	0.34	0.30	0.60	0.32	0.49	0.43	(0.27)	(0.25)	(0.18)	0.43
HEGR_1Y			0.25	(0.18)	0.17	(0.02)	(0.22)	(0.21)	(0.25)	0.20	(0.13)	(0.01)	(0.01)	0.25	0.25	0.14	0.03	0.34	0.43	0.13	0.07
HEGR_3Y				(0.09)	0.07	0.02	0.01	0.02	(0.12)	(0.01)	(0.04)	(0.13)	(0.10)	(0.08)	0.01	(0.02)	(0.09)	0.05	0.13	(0.11)	(0.08)
BPR					0.14	(0.34)	0.42	0.13	0.47	(0.12)	0.70	0.45	0.52	0.37	0.26	(0.53)	(0.36)	(0.53)	(0.56)	(0.54)	0.45
RGR						0.03	(0.23)	(0.05)	0.36	0.02	0.13	0.31	0.33	0.32	0.41	(0.22)	(0.18)	0.09	0.04	0.09	0.42
PM_1M							(0.43)	(0.15)	0.03	0.12	(0.41)	(0.26)	(0.29)	(0.72)	(0.08)	0.34	0.27	0.44	0.37	0.41	(0.21)
CAP								0.27	(0.26)	(0.01)	0.63	0.18	0.26	0.24	0.05	(0.21)	(0.16)	(0.44)	(0.48)	(0.56)	0.06
DY									0.23	(0.04)	0.07	0.04	0.03	(0.01)	0.27	(0.24)	(0.23)	(0.33)	(0.32)	(0.38)	(0.21)
CEY										(0.34)	0.18	0.50	0.45	(0.57)	0.05	(0.64)	(0.51)	(0.34)	(0.41)	(0.31)	0.45
IREV_3M											(0.06)	0.01	0.08	(0.08)	0.32	0.47	0.37	0.46	0.52	0.18	(0.16)
DE												0.45	0.50	(0.14)	0.17	(0.47)	(0.31)	(0.55)	(0.56)	(0.65)	0.50
PEY_12M													0.92		0.22	(0.33)	(0.18)	(0.35)	(0.33)	(0.42)	0.49
PEY_24M															0.14	(0.34)	(0.23)	(0.34)	(0.34)	(0.47)	0.48
ROE																0.15	0.15	0.36	0.38	0.52	0.14
CH_ROE																(0.24)	(0.21)	(0.13)	(0.14)	(0.27)	0.36
PEGR_1Y																	0.90	0.65	0.68	0.62	(0.48)
PEGR_3Y																		0.49	0.51	0.55	(0.30)
CH_FY1_3M																			0.90	0.69	(0.39)
CH_FY1_6M																				0.70	(0.37)
CH_FY2_FY1																					(0.29)

EXHIBIT 9A

Malaysia Scoring Model
Sample Period: 12/88-5/98
Number of Observations: 114 Monthly

Performance Measure/ Summary Statistic	Note	Portfolios - equal weighted -1-	-2-	-3-	-4-	-5-	Portfolios - value weighted -1-	-2-	-3-	-4-	-5-	Market portfolio
Annualized average return (USD)	1	10.06	8.61	-3.99	-6.67	-16.60	10.59	2.90	-2.41	-5.16	-19.60	-2.62
Cumulative return (indexed at 100 - start)	2	248.59	219.21	67.93	51.90	17.82	260.17	131.25	79.29	60.42	12.59	77.72
STD Deviation of returns	3	45.29	48.27	48.60	48.27	46.51	32.71	37.38	36.60	38.88	36.73	34.12
Average annual excess return Rm	4	12.68	11.23	-1.37	-4.05	-13.98	13.21	5.52	0.21	-2.55	-16.98	
Rf	5	4.57	3.19	-8.83	-11.39	-20.86	5.08	-2.26	-7.33	-9.95	-23.71	
STD Deviation of excess rtns Rm	6	15.93	20.96	20.75	20.85	19.47	8.89	11.51	10.24	12.66	13.01	
Rf	7	45.30	48.27	48.62	48.26	46.50	32.74	37.40	36.62	38.89	36.71	
T-stat: Average XS return Rm = 0	8	2.98	2.30	0.44	0.14	-1.58	4.26	1.74	0.23	-0.25	-4.21	
Systematic risk (Beta)	9	1.27	1.31	1.33	1.31	1.27	0.93	1.04	1.03	1.08	1.01	
Alpha	10	13.00	11.77	-0.54	-3.40	-14.66	12.56	5.63	0.29	-2.43	-18.95	
Co-efficient of determination	11	0.92	0.86	0.87	0.86	0.86						
Average market cap	12	2730.57	2570.73	2290.16	2154.48	2169.67						2383.12
% periods > Benchmark	13	64.04	57.02	43.86	46.49	37.72	64.91	54.39	45.61	40.35	33.33	
% periods > Bench up Mkt	14	73.44	65.63	56.25	60.94	51.56	67.19	59.38	40.63	46.88	34.38	
% periods > Bench Dn Mkt	15	52.00	46.00	28.00	28.00	20.00	62.00	48.00	52.00	32.00	32.00	
Max # of consecutive bmark outperformance	16	10	10	5	5	4	10	6	4	4	6	
Maximum positive excess return	17	40.54	37.65	50.76	34.68	19.29	8.11	18.85	13.73	13.80	12.21	
Maximum negative excess return	18	-9.47	-15.29	-15.95	-14.55	-18.20	-9.65	-8.76	-6.34	-7.13	-11.80	
% periods positive returns to negative	19	137.50	128.00	103.57	115.09	93.22	142.55	132.65	123.53	107.27	75.38	
% periods of negative returns	20	42.11	43.86	49.12	46.49	51.75	41.23	42.98	44.74	48.25	57.02	43.86
Max # of consecutive negative periods	21	8	7	11	8	11	8	8	8	11	11	8
Max # of consecutive positive periods	22	7	6	6	6	6	10	8	7	6	5	7
Cumulative annual returns - (index=100 each year)	23											
1989		161.61	218.07	143.22	173.11	182.18	139.76	176.96	142.60	149.44	159.41	144.04
1990		110.60	105.93	83.26	92.88	83.92	110.22	80.36	80.99	76.94	88.37	88.80
1991		126.02	111.37	115.40	107.42	95.93	124.58	108.07	113.70	127.97	90.21	112.08
1992		127.63	110.16	131.09	131.95	105.75	141.97	130.86	127.37	116.16	110.12	127.94
1993		235.99	303.72	207.23	180.77	223.22	244.88	278.72	191.72	180.54	154.05	202.86
1994		100.61	92.13	88.23	75.46	69.15	92.89	79.44	89.02	76.78	56.44	78.50
1995		114.12	105.81	97.04	87.74	80.67	114.28	111.28	107.52	95.66	82.72	103.56
1996		137.38	136.61	130.67	133.03	111.48	132.34	131.58	125.43	126.52	97.22	124.51
1997		23.65	22.45	22.28	19.65	12.50	30.68	26.62	28.17	28.72	22.17	28.34
1998		98.20	85.17	72.89	72.79	66.23	90.47	75.62	73.12	73.36	58.01	72.82
Relative Performance -	24											
1989		2	5	1	3	4	1	5	2	3	4	
1990		5	4	1	3	2	5	2	3	1	4	
1991		5	3	4	2	1	4	2	3	5	1	
1992		3	2	4	5	1	5	4	3	2	1	
1993		4	5	2	1	3	4	5	3	2	1	
1994		5	4	3	2	1	5	3	4	2	1	
1995		5	4	3	2	1	5	4	3	2	1	
1996		5	4	2	3	1	5	4	2	3	1	
1997		5	4	3	2	1	5	2	3	4	1	
1998		5	4	3	2	1	5	4	2	3	1	
Average Relative Performance -		4.40	3.90	2.60	2.50	1.60	4.40	3.50	2.80	2.70	1.60	
Cumulative annual returns -	25											
Last two years		26.10	21.26	16.81	14.97	7.93	31.13	22.92	20.83	22.64	12.37	21.99
Last five years		69.32	54.91	29.51	20.00	8.89	76.61	49.72	38.99	32.70	8.16	36.15
Factor average	26	3.43	1.66	0.49	-0.40	-2.00						0.66
Factor median	27	3.50	1.50	0.50	-0.50	-2.00						0.50
Factor standard deviation	28	0.92	0.43	0.38	0.39	0.88						1.85

EXHIBIT 9B

Malaysia Scoring Model
Sample Period: 12/88-3/98
Number of Observations: 38 Quarterly

Performance Measure/ Summary Statistic		Note	Portfolios - equal weighted					Portfolios - value weighted					Market portfolio
			-1-	-2-	-3-	-4-	-5-	-1-	-2-	-3-	-4-	-5-	
Annualized average return (USD)		1	8.88	7.00	-1.25	-6.56	-16.92	6.68	2.72	-4.28	-4.07	-16.67	-2.62
Cumulative return (indexed at 100 - start)		2	224.30	190.09	88.71	52.49	17.19	184.77	129.06	66.00	67.35	17.68	77.72
STD Deviation of returns		3	.45.00	49.66	42.76	44.55	47.93	36.25	41.82	35.53	37.71	34.58	36.15
Average annual excess return	Rm	4	11.49	9.61	1.37	-3.94	-14.30	9.29	5.34	-1.66	-1.46	-14.05	
	Rf	5	3.43	1.62	-6.31	-11.41	-21.36	1.32	-2.49	-9.22	-9.02	-21.12	
STD Deviation of excess rtns	Rm	6	14.89	20.13	12.49	18.18	20.76	6.19	11.38	9.17	13.80	10.82	
	Rf	7	45.02	49.66	42.80	44.55	47.91	36.31	41.91	35.61	37.71	34.53	
T-stat: Average XS return Rm = 0		8	3.00	2.33	1.19	0.11	-1.24	4.39	1.97	-0.67	-0.19	-4.41	
Systematic risk (Beta)		9	1.19	1.29	1.14	1.13	1.21	0.99	1.12	0.95	0.97	0.91	
Alpha		10	11.74	10.23	1.76	-3.73	-14.90	9.13	5.66	-1.84	-1.57	-15.42	
Co-efficient of determination		11	0.91	0.88	0.93	0.85	0.84						
Average market cap		12	2713.58	2725.90	2182.88	2217.81	2201.04						2408.24
% periods > Benchmark		13	78.95	55.26	60.53	42.11	39.47	81.58	65.79	42.11	52.63	18.42	
% periods > Bench up Mkt		14	81.48	62.96	70.37	48.15	48.15	85.19	66.67	40.74	51.85	14.81	
% periods > Bench Dn Mkt		15	72.73	36.36	36.36	27.27	18.18	72.73	63.64	45.45	54.55	27.27	
Max # of consecutive bmark outperformance		16	12	6	7	5	3	11	10	5	3	2	
Maximum positive excess return		17	35.96	31.31	20.15	28.74	19.70	10.06	16.84	9.41	16.48	12.25	
Maximum negative excess return		18	-8.53	-12.54	-14.22	-16.15	-23.19	-5.29	-9.68	-11.50	-17.70	-14.30	
% periods positive returns to negative		19	322.22	171.43	192.31	153.33	100.00	322.22	192.31	171.43	171.43	111.11	
% periods of negative returns		20	23.68	36.84	34.21	39.47	50.00	23.68	34.21	36.84	36.84	47.37	28.95
Max # of consecutive negative periods		21	3	3	3	3	5	3	4	4	3	4	3
Max # of consecutive positive periods		22	9	6	9	6	5	9	5	9	6	5	9
Cumulative annual returns - (index=100 each year)		23											
1989			155.87	219.18	164.29	170.18	161.74	135.86	149.05	135.75	163.35	152.42	144.04
1990			114.21	98.27	93.06	90.78	83.56	108.66	84.30	87.17	79.07	78.13	88.80
1991			130.13	108.49	114.19	98.84	106.45	125.71	110.25	101.95	115.78	97.13	112.08
1992			121.48	112.06	130.86	122.57	121.22	138.37	134.55	117.65	110.38	114.91	127.94
1993			259.16	289.89	229.50	197.65	183.79	230.44	254.32	213.77	187.29	157.41	202.86
1994			92.05	97.76	89.23	80.72	61.35	81.07	89.26	88.28	83.68	50.15	78.50
1995			110.24	101.18	89.13	95.69	82.60	111.92	108.25	96.49	99.71	92.74	103.56
1996			134.57	133.62	132.57	129.94	118.20	130.32	132.66	124.41	118.49	107.90	124.51
1997			23.89	23.77	21.40	21.07	13.08	29.75	26.09	28.96	32.36	27.19	28.34
1998			94.28	79.72	74.98	67.10	68.43	88.77	81.42	70.88	68.10	61.92	72.82
Relative Performance -		24											
1989			1	5	3	4	2	2	3	1	5	4	
1990			5	4	3	2	1	5	3	4	2	1	
1991			5	3	4	1	2	5	3	2	4	1	
1992			3	1	5	4	2	5	4	3	1	2	
1993			4	5	3	2	1	4	5	3	2	1	
1994			4	5	3	2	1	2	5	4	3	1	
1995			5	4	2	3	1	5	4	2	3	1	
1996			5	4	3	2	1	4	5	3	2	1	
1997			5	4	3	2	1	4	1	3	5	2	
1998			5	4	3	1	2	5	4	3	2	1	
Average Relative Performance -			4.20	3.90	3.20	2.30	1.40	4.10	3.70	2.80	2.90	1.50	
Cumulative annual returns -		25											
Last two years			25.11	20.55	18.01	14.25	8.73	28.88	24.52	22.34	21.54	16.86	21.99
Last five years			56.66	60.11	29.25	21.59	8.35	55.82	59.28	35.61	32.26	12.21	36.15
Factor average		26	3.44	1.67	0.49	-0.39	-1.98						0.67
Factor median		27	3.50	1.50	0.50	-0.50	-2.00						0.50
Factor standard deviation		28	0.92	0.43	0.39	0.38	0.90						1.83

EXHIBIT 9B

Malaysia Scoring Model
Sample Period: 12/88-3/98
Number of Observations: 38 Quarterly

Performance Measure/ Summary Statistic	Note	Portfolios - equal weighted -1-	-2-	-3-	-4-	-5-	Portfolios - value weighted -1-	-2-	-3-	-4-	-5-	Market portfolio
Annualized average return (USD)	1	8.88	7.00	-1.25	-6.56	-16.92	6.68	2.72	-4.28	-4.07	-16.67	-2.62
Cumulative return (indexed at 100 - start)	2	224.30	190.09	88.71	52.49	17.19	184.77	129.06	66.00	67.35	17.68	77.72
STD Deviation of returns	3	45.00	49.66	42.76	44.55	47.93	36.25	41.82	35.53	37.71	34.58	36.15
Average annual excess return	Rm 4	11.49	9.61	1.37	-3.94	-14.30	9.29	5.34	-1.66	-1.46	-14.05	
	Rf 5	3.43	1.62	-6.31	-11.41	-21.36	1.32	-2.49	-9.22	-9.02	-21.12	
STD Deviation of excess rtns	Rm 6	14.89	20.13	12.49	18.18	20.76	6.19	11.38	9.17	13.80	10.82	
	Rf 7	45.02	49.66	42.80	44.55	47.91	36.31	41.91	35.61	37.71	34.53	
T-stat: Average XS return Rm = 0	8	3.00	2.33	1.19	0.11	-1.24	4.39	1.97	-0.67	-0.19	-4.41	
Systematic risk (Beta)	9	1.19	1.29	1.14	1.13	1.21	0.99	1.12	0.95	0.97	0.91	
Alpha	10	11.74	10.23	1.76	-3.73	-14.90	9.13	5.66	-1.84	-1.57	-15.42	
Co-efficient of determination	11	0.91	0.88	0.93	0.85	0.84						
Average market cap	12	2713.58	2725.90	2182.88	2217.81	2201.04						2408.24
% periods > Benchmark	13	78.95	55.26	60.53	42.11	39.47	81.58	65.79	42.11	52.63	18.42	
% periods > Bench up Mkt	14	81.48	62.96	70.37	48.15	48.15	85.19	66.67	40.74	51.85	14.81	
% periods > Bench Dn Mkt	15	72.73	36.36	36.36	27.27	18.18	72.73	63.64	45.45	54.55	27.27	
Max # of consecutive bmark outperformance	16	12	6	7	5	3	11	10	5	3	2	
Maximum positive excess return	17	35.96	31.31	20.15	28.74	19.70	10.06	16.84	9.41	16.48	12.25	
Maximum negative excess return	18	-8.53	-12.54	-14.22	-16.15	-23.19	-5.29	-9.68	-11.50	-17.70	-14.30	
% periods positive returns to negative	19	322.22	171.43	192.31	153.33	100.00	322.22	192.31	171.43	171.43	111.11	
% periods of negative returns	20	23.68	36.84	34.21	39.47	50.00	23.68	34.21	36.84	36.84	47.37	28.95
Max # of consecutive negative periods	21	3	3	3	3	5	3	4	4	3	4	3
Max # of consecutive positive periods	22	9	6	9	6	5	9	5	9	6	5	9
Cumulative annual returns - (index=100 each year)	23											
1989		155.87	219.18	164.29	170.18	161.74	135.86	149.05	135.75	163.35	152.42	144.04
1990		114.21	98.27	93.06	90.78	83.56	108.66	84.30	87.17	79.07	78.13	88.80
1991		130.13	108.49	114.19	98.84	106.45	125.71	110.25	101.95	115.78	97.13	112.08
1992		121.48	112.06	130.86	122.57	121.22	138.37	134.55	117.65	110.38	114.91	127.94
1993		259.16	289.89	229.50	197.65	183.79	230.44	254.32	213.77	187.29	157.41	202.86
1994		92.05	97.76	89.23	80.72	61.35	81.07	89.26	88.28	83.68	50.15	78.50
1995		110.24	101.18	89.13	95.69	82.60	111.92	108.25	96.49	99.71	92.74	103.56
1996		134.57	133.62	132.57	129.94	118.20	130.32	132.66	124.41	118.49	107.90	124.51
1997		23.89	23.77	21.40	21.07	13.08	29.75	26.09	28.96	32.36	27.19	28.34
1998		94.28	79.72	74.98	67.10	68.43	88.77	81.42	70.88	68.10	61.92	72.82
Relative Performance -	24											
1989		1	5	3	4	2	2	3	1	5	4	
1990		5	4	3	2	1	5	3	4	2	1	
1991		5	3	4	1	2	5	3	2	4	1	
1992		3	1	5	4	2	5	4	3	1	2	
1993		4	5	3	2	1	4	5	3	2	1	
1994		4	5	3	2	1	2	5	4	3	1	
1995		5	4	2	3	1	5	4	2	3	1	
1996		5	4	3	2	1	4	5	3	2	1	
1997		5	4	3	2	1	4	1	3	5	2	
1998		5	4	3	1	2	5	4	3	2	1	
Average Relative Performance -		4.20	3.90	3.20	2.30	1.40	4.10	3.70	2.80	2.90	1.50	
Cumulative annual returns -	25											
Last two years		25.11	20.55	18.01	14.25	8.73	28.88	24.52	22.34	21.54	16.86	21.99
Last five years		56.66	60.11	29.25	21.59	8.35	55.82	59.28	35.61	32.26	12.21	36.15
Factor average	26	3.44	1.67	0.49	-0.39	-1.98						0.67
Factor median	27	3.50	1.50	0.50	-0.50	-2.00						0.50
Factor standard deviation	28	0.92	0.43	0.39	0.38	0.90						1.83

EXHIBIT 9C

Malaysia Scoring Model
Sample Period: 12/88-12/98
Number of Observations: 19 Semiannual

Performance Measure/ Summary Statistic		Note	Portfolios - equal weighted					Portfolios - value weighted					Market portfolio
			-1-	-2-	-3-	-4-	-5-	-1-	-2-	-3-	-4-	-5-	
Annualized average return (USD)		1	4.60	12.08	-4.23	-1.80	-17.17	4.26	7.60	-3.35	-4.64	-18.14	-2.62
Cumulative return (indexed at 100 - start)		2	153.35	295.49	66.34	84.12	16.69	148.59	200.56	72.31	63.65	14.93	77.72
STD Deviation of returns		3	40.32	51.07	48.18	43.16	38.18	40.11	43.42	41.57	37.24	32.68	37.76
Average annual excess return	Rm	4	7.22	14.70	-1.61	0.81	-14.56	6.88	10.22	-0.74	-2.03	-15.53	
	Rf	5	-0.73	6.56	-9.33	-6.97	-21.91	-1.07	2.19	-8.48	-9.73	-22.85	
STD Deviation of excess rtns	Rm	6	8.09	19.56	14.94	17.84	15.20	6.82	11.78	11.10	12.66	12.99	
	Rf	7	40.35	51.11	48.31	43.15	38.01	40.18	43.64	41.67	37.37	32.53	
T-stat: Average XS return Rm = 0		8	3.52	2.98	0.67	1.01	-2.43	3.52	2.75	0.07	-0.30	-4.18	
Systematic risk (Beta)		9	1.05	1.28	1.24	1.04	0.93	1.05	1.11	1.06	0.93	0.82	
Alpha		10	7.31	15.11	-1.02	0.93	-15.53	6.97	10.39	-0.58	-2.25	-16.90	
Co-efficient of determination		11	0.96	0.90	0.94	0.83	0.85						
Average market cap		12	2727.11	2581.74	2259.03	2118.26	2371.17						2411.46
% periods > Benchmark		13	78.95	73.68	42.11	57.89	21.05	84.21	73.68	47.37	63.16	5.26	
% periods > Bench up Mkt		14	81.82	81.82	54.55	63.64	36.36	90.91	63.64	36.36	54.55	9.09	
% periods > Bench Dn Mkt		15	75.00	62.50	25.00	50.00	0.00	75.00	87.50	62.50	75.00	0.00	
Max # of consecutive bmark outperformance		16	9	8	5	3	1	12	7	3	4	1	
Maximum positive excess return		17	18.22	42.28	29.33	31.79	17.29	12.08	28.03	16.18	16.48	11.55	
Maximum negative excess return		18	-5.62	-10.01	-15.72	-16.71	-27.22	-7.35	-7.14	-13.83	-17.69	-34.17	
% periods positive returns to negative		19	171.43	216.67	137.50	171.43	72.73	137.50	171.43	137.50	171.43	90.00	
% periods of negative returns		20	36.84	31.58	42.11	36.84	57.89	42.11	36.84	42.11	36.84	52.63	42.11
Max # of consecutive negative periods		21	3	2	3	3	4	3	3	3	3	4	3
Max # of consecutive positive periods		22	4	4	4	4	3	4	4	4	4	4	4
Cumulative annual returns - (index=100 each year)		23											
1989			153.05	229.58	169.76	173.48	156.43	139.93	148.32	145.31	145.57	145.84	144.04
1990			111.70	97.63	77.12	98.95	92.63	109.10	86.77	76.80	79.02	84.38	88.80
1991			119.47	108.39	107.75	106.63	108.23	120.66	112.93	130.26	98.87	93.64	112.08
1992			125.20	123.07	130.18	129.41	111.13	136.33	135.21	121.33	110.88	106.78	127.94
1993			237.67	293.65	240.69	217.92	147.63	223.77	273.67	208.02	211.69	144.78	202.86
1994			88.37	101.00	89.38	86.18	69.82	82.08	91.58	89.19	88.12	57.85	78.50
1995			108.36	105.25	89.58	92.56	79.95	111.28	110.31	100.66	102.73	93.31	103.56
1996			135.01	129.14	132.70	145.78	111.05	129.54	124.16	120.69	137.74	98.81	124.51
1997			24.29	30.68	20.49	18.97	14.79	26.82	36.81	24.72	25.01	25.52	28.34
1998			80.36	79.92	68.93	73.87	70.79	83.32	80.77	73.60	76.45	61.56	72.82
Relative Performance -		24											
1989			1	5	3	4	2	1	5	2	3	4	
1990			5	3	1	4	2	5	4	1	2	3	
1991			5	4	2	1	3	4	3	5	2	1	
1992			3	2	5	4	1	5	4	3	2	1	
1993			3	5	4	2	1	4	5	2	3	1	
1994			3	5	4	2	1	2	5	4	3	1	
1995			5	4	2	3	1	5	4	2	3	1	
1996			4	2	3	5	1	4	3	2	5	1	
1997			4	5	3	2	1	4	5	1	2	3	
1998			5	4	1	3	2	5	4	2	3	1	
Average Relative Performance -			3.80	3.90	2.80	3.00	1.50	3.90	4.20	2.40	2.80	1.70	
Cumulative annual returns -		25											
Last two years			21.76	26.00	15.00	15.76	9.94	24.05	31.34	18.97	21.62	14.54	21.99
Last five years			44.28	72.47	30.38	26.08	9.46	48.72	74.99	36.50	37.75	11.64	36.15
Factor average		26	3.48	1.68	0.49	-0.39	-2.00						0.68
Factor median		27	3.50	1.50	0.50	-0.50	-2.00						0.50
Factor standard deviation		28	0.90	0.44	0.40	0.38	0.90						1.86

Exhibit 9D
Malaysia Scoring Model — with Knockout
Sample Period: 12/88-12/98
Number of Observations: 19 Semiannual

Performance Measure/ Summary Statistic		Note	Portfolios - equal weighted			Portfolios - value weighted			Market portfolio
			-1-	-2-	-3-	-1-	-2-	-3-	
Annualized average return (USD)		1	9.78	-2.00	-7.32	7.28	-0.12	-11.13	-2.62
Cumulative return (indexed at 100 - start)		2	242.66	82.54	48.57	194.97	98.85	32.58	77.72
STD Deviation of returns		3	45.43	42.66	36.43	42.02	38.09	32.72	37.76
Average annual excess return	Rm	4	12.40	0.62	-4.70	9.90	2.50	-8.52	
	Rf	5	4.32	-7.16	-12.33	1.88	-5.33	-16.04	
STD Deviation of excess rtns	Rm	6	10.80	9.84	14.29	8.29	10.40	13.76	
	Rf	7	45.48	42.83	36.30	42.11	38.35	32.59	
T-stat: Average XS return Rm = 0		8	4.33	0.71	-0.74	4.10	0.38	-2.24	
Systematic risk (Beta)		9	1.18	1.10	0.89	1.10	0.97	0.81	
Alpha		10	12.67	0.90	-5.10	10.04	2.44	-9.33	
Co-efficient of determination		11	0.97	0.96	0.86				
Average market cap		12	3199.47	3187.29	3547.82				3311.53
% periods > Benchmark		13	84.21	47.37	36.84	89.47	57.89	26.32	
% periods > Bench up Mkt		14	90.91	36.36	45.45	90.91	45.45	27.27	
% periods > Bench Dn Mkt		15	75.00	62.50	25.00	87.50	75.00	25.00	
Max # of consecutive bmark outperformance		16	9	3	2	16	4	2	
Maximum positive excess return		17	26.53	22.80	19.86	19.89	12.78	11.67	
Maximum negative excess return		18	-3.31	-9.51	-30.13	-5.72	-14.72	-33.04	
% periods positive returns to negative		19	171.43	137.50	171.43	137.50	171.43	111.11	
% periods of negative returns		20	36.84	42.11	36.84	42.11	36.84	47.37	42.11
Max # of consecutive negative periods		21	3	3	3	3	3	3	3
Max # of consecutive positive periods		22	4	4	4	4	6	4	4
Cumulative annual returns - (index=100 each year)		23							
1989			169.88	146.15	159.97	142.93	122.62	147.90	144.04
1990			115.79	78.91	102.62	113.28	85.08	98.63	88.80
1991			121.70	111.31	111.32	123.94	104.18	91.47	112.08
1992			128.89	115.33	124.46	136.16	130.30	113.42	127.94
1993			275.22	225.61	161.42	248.95	215.80	149.24	202.86
1994			88.12	94.36	77.82	82.17	91.65	69.60	78.50
1995			110.93	100.96	88.86	112.83	103.64	100.82	103.56
1996			135.83	130.74	127.71	129.94	128.00	121.64	124.51
1997			27.18	25.65	21.07	28.99	34.41	25.32	28.34
1998			79.19	77.34	71.11	82.07	77.31	66.76	72.82
Relative Performance -		24							
1989			3	1	2	2	1	3	
1990			3	1	2	3	1	2	
1991			3	1	2	3	2	1	
1992			3	1	2	3	2	1	
1993			3	2	1	3	2	1	
1994			2	3	1	2	3	1	
1995			3	2	1	3	2	1	
1996			3	2	1	3	2	1	
1997			3	2	1	2	3	1	
1998			3	2	1	3	2	1	
Average Relative Performance -			2.90	1.70	1.40	2.70	2.00	1.30	
Cumulative annual returns -		25							
Last two years			24.31	21.23	16.07	26.39	28.68	18.08	21.99
Last five years			57.03	48.40	18.91	55.31	60.10	20.20	36.15
Factor average		26	3.21	0.88	-1.15				1.00
Factor median		27	3.00	1.00	-1.00				1.00
Factor standard deviation		28	1.00	0.64	1.00				2.01

EXHIBIT 10
Factor Performance Summary

	Sample Period	Number of Observations	Average Annualized Return		Return Spread Top/Bottom	Annualized Excess Returns		Std. Dev. of Annualized Returns		Std. Dev. of Top/Bottom Spread Returns	% Periods Benchmark Outperformance	
			Top	Bottom		Top	Bottom	Top	Bottom		Top	Bottom
Scoring Model — Monthly Obs.	12/88-5/98	114	10.59	-19.60	30.19	13.21	-16.98	32.71	36.73	16.33	64.91	33.33
Scoring Model — Quarterly Obs.	12/88-3/98	38	6.68	-16.67	23.35	9.29	-14.05	36.25	34.58	14.00	81.58	18.42
Scoring Model — Semiannual Obs.	12/88-12/98	19	4.26	-18.14	22.40	6.88	-15.53	40.11	32.68	18.04	84.21	5.26
Scoring Model — with Knockout, Semiannual Observations	12/88-12/98	19	7.28	-11.13	18.41	9.90	-8.52	42.02	32.72	20.39	89.47	26.32

EXHIBIT 11
Success Rates — Malaysia

	Average Success Rate			Std. Dev. of Average Success Rate			Average Success Rate Consistency Ratio			Success Rate Most Successful			Success Rate Least Successful		
	Universe	Top	Bottom	Universe	Top	Bottom	Universe	Top	Bottom	Universe	Top	Bottom	Universe	Top	Bottom
Scoring Model — Monthly Obs.	45.0	50.9	61.1	12.3	12.9	17.8	39.5	55.3	72.8	73.3	76.9	100.0	21.7	21.4	14.3
Scoring Model — Quart. Obs.	45.4	53.4	64.0	12.9	13.4	19.6	39.5	65.8	71.1	68.3	78.1	95.0	18.6	21.4	23.8
Scoring Model — Semiann. Obs.	47.6	55.4	67.5	12.5	14.5	19.6	47.4	68.4	84.2	67.3	76.9	91.7	20.0	16.7	8.3
Scoring Model — Semiannual Obs. with Knockout	50.1	59.2	58.3	10.9	15.1	18.7	63.2	79.0	68.4	70.8	84.6	90.9	25.7	26.5	8.3

In the first five months of 1998, the monthly rebalancing value-weighted top-bottom spread is 32.46%. The excess return on the top portfolio is 17.65%, which is marginally better than the quarterly rebalancing.

Exhibits 12 and 13 provide graphical representations of the scoring screen results. In Exhibit 12, the cumulative performance of the top and bottom portfolios is compared to the benchmark. We separate the in-sample from the out-of-sample analysis. We track the value of $100 invested in December 1988 through December 1995 (the in-sample period) presented on the right axis. We then track the value of $100 invested in December 1995 through May 1998 (the out-of-sample period). Exhibit 12 shows the substantial ability of the top and bottom portfolios to discriminate among stocks in the out-of sample period.

Exhibit 13 shows the quarter-by-quarter performance of the top portfolio compared to the benchmark. In a high proportion of the sample, the top portfolio return exceeds the benchmark. Overlaid on this graph (and scaled on the right axis) is the success rate. Visually, one can see that our results are not driven by a few firms. The success rate is generally above 50%. There are instances when the success rate drops below 50% that we do see some underperformance. However, in general, the top portfolio tends to outperform when the success

EXHIBIT 12
Malaysia: Performance of Stock Selection Model
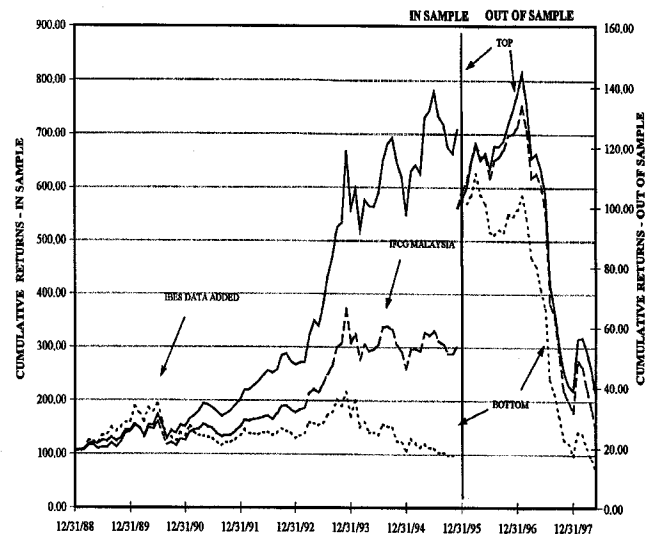
EXHIBIT 13
Malaysia: Success Ratio Analysis

Legend: IFCG Malaysia, Top Portfolio Returns, Success Ratio - Top Portfolio
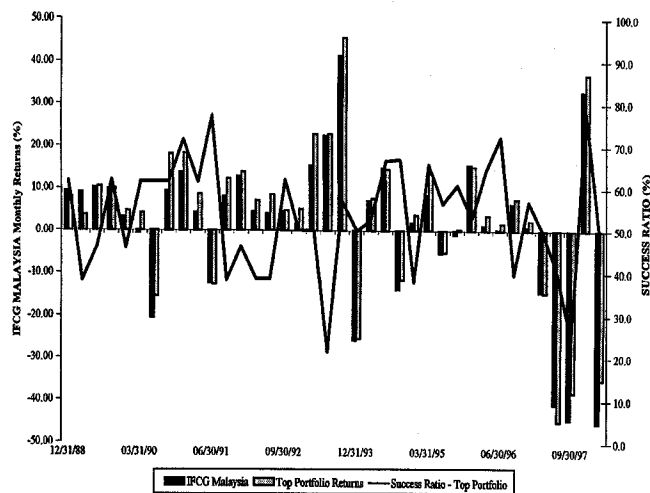
rate is above or below 50%.

Screening Results for Mexico. During our sample, the Mexican index return averaged 18.54% per year. Much of this performance was generated in 1989 and 1991, when $100 invested at the beginning of each year would have been worth $173.35 and $206.76, respectively. Over the entire sample (114 observations) since December 1988, the market increased in seventy-two months (63% of the time) and decreased in forty-two (37% of the time). During the out-of-sample period (thirty observations), the market increased in eighteen months and decreased in twelve.

Factor screens. Exhibit 14 presents an example of the factor-by-factor results (we present the one-year historical momentum screen). The detailed analysis of the other factors is presented in Achour et al. [1998b]. Exhibit 15 summarizes these results. Exhibit 16 presents the success rates of the individual factors. Some general observations are:

- The best top-portfolio average annualized excess returns are earned from one-year price momentum and change in return on equity strategies, with excess returns over the benchmark of 12.04% and 10.29%, respectively.
- These two strategies also deliver the highest top minus bottom spread differential, with 19% (one-year price momentum) and 18.33% (change in return on common equity). We do record large

negative top-bottom portfolio spread discrimination in market capitalization and dividend yield strategies of –15.09% and –13.17%, respectively.

- The greatest bottom-portfolio average annualized underperformance against the benchmark is obtained from rate of reinvestment and change in return on equity strategies, with –8.63% and –8.05%, respectively.
- In terms of benchmark outperformance through time, the change in consensus FY1 estimate over the last six months and one-year price momentum factors are the most successful top-portfolio strategies observed, beating the benchmark in 63.64% and 62.28% of the total market observations.
- In an up market, top-portfolio one-year price momentum and debt-to-common equity produced the most consistent outperformance, beating the benchmark in 70.83% (one-year price momentum) and 69.44% (debt to common equity) of all up-market observations. The debt-to-equity factor was created as a diagnostic screen, constructed to give insight into the performance differential between levered and unlevered stocks, and is not considered for incorporation into the selection model. The next-highest up-market outperformance ratio was obtained from large-capitalization stocks in the bottom-portfolio capitalization screen with an observed outperformance ratio of 68.06%.
- The best performers in a down market were bottom-portfolio three-year historical earnings growth and top-portfolio dividend yield screens, with outperformance in 76.19% and 70.00% of all down-market observations.
- The bottom-portfolio dividend yield and top-portfolio one-year historical earnings growth screens exhibit the greatest last two-year performance, where the value of $100 increased to $145.76 for companies exhibiting low dividend yield, and to $142.46 for top-portfolio one-year historical growth. During this period a passive investment in the benchmark rose in value to $114.02.

Fundamental Factors. One remarkable feature about the Mexican results is what doesn't work. In particular, the performances from our fundamental factors (such as earnings yield, book-to-price ratio, and earnings growth screens) are surprising. The top-bottom portfolio spread for the book-to-price ratio screen was a massive –11.39%, although much of that can probably be

EXHIBIT 14
Mexico — One-Year Historical Earnings Momentum
Sample Period: 12/88-5/98
Number of Observations: 114 Monthly

Performance Measure/ Summary Statistic		Note*	Portfolios - equal weighted -1-	-2-	-3-	Portfolios - value weighted -1-	-2-	-3-	Market portfolio
Annualized average return (USD)		1	26.61	17.99	3.31	26.30	16.28	10.50	18.54
Cumulative return (indexed at 100 - start)		2	940.44	481.49	136.25	919.04	419.19	258.17	503.29
STD Deviation of returns		3	35.21	33.06	31.68	36.24	34.90	32.19	33.10
Average annual excess return	Rm	4	8.06	-0.55	-15.23	7.76	-2.26	-8.04	
	Rf	5	20.36	12.14	-1.87	20.07	10.51	4.99	
STD Deviation of excess rtns	Rm	6	16.82	12.08	15.42	9.49	11.86	12.93	
	Rf	7	35.17	33.04	31.65	36.21	34.85	32.16	
T-stat: Average XS return Rm = 0		8	1.32	-0.13	-2.87	2.46	-0.38	-1.78	
Systematic risk (Beta)		9	0.94	0.93	0.85	1.06	0.99	0.90	
Alpha		10	7.78	0.69	-11.29	5.45	-1.80	-5.33	
Co-efficient of determination		11	0.78	0.87	0.79				
Average market cap		12	8740.14	9386.77	4516.18				7547.70
% periods > Benchmark		13	50.00	50.00	38.60	58.77	50.88	43.86	
% periods > Bench up Mkt		14	40.28	48.61	30.56	61.11	51.39	38.89	
% periods > Bench Dn Mkt		15	66.67	52.38	52.38	54.76	50.00	52.38	
Max # of consecutive bmark outperformance		16	9	6	4	8	5	12	
Maximum positive excess return		17	38.06	10.11	12.61	12.29	11.90	15.06	
Maximum negative excess return		18	-7.48	-10.57	-12.88	-6.26	-13.13	-10.80	
% periods positive returns to negative		19	185.00	159.09	119.23	185.00	159.09	142.55	
% periods of negative returns		20	35.09	38.60	45.61	35.09	38.60	41.23	36.84
Max # of consecutive negative periods		21	6	6	6	4	7	4	4
Max # of consecutive positive periods		22	17	8	9	8	7	6	9
Cumulative annual returns - (index=100 each year)		23							
In sample 1989			265.23	192.12	142.76	180.65	195.03	150.43	173.35
1990			129.90	137.29	118.93	134.77	151.73	116.60	129.69
1991			178.80	147.28	137.39	271.68	141.97	136.87	206.76
1992			124.99	124.91	110.81	133.27	120.55	117.93	121.18
1993			167.55	174.26	125.82	176.25	142.55	131.21	149.90
1994			62.18	66.91	62.89	54.42	62.25	67.99	59.36
1995			74.63	67.09	64.68	62.52	78.81	78.93	74.02
Out of sample 1996			147.41	122.66	92.93	127.81	121.82	104.76	117.83
1997			148.29	147.59	132.44	159.84	140.73	158.00	150.45
1998			71.87	70.06	83.67	85.10	69.04	78.24	76.52
Relative Performance -		24							
1989			3	2	1	2	3	1	
1990			2	3	1	2	3	1	
1991			3	2	1	3	2	1	
1992			3	2	1	3	2	1	
1993			2	3	1	3	2	1	
1994			1	3	2	1	2	3	
1995			3	2	1	1	2	3	
1996			3	2	1	3	2	1	
1997			3	2	1	3	1	2	
1998			2	1	3	3	1	2	
Average Relative Performance -			2.50	2.20	1.30	2.40	2.00	1.60	
Cumulative annual returns -		25							
Last two years			115.69	98.31	94.95	142.46	99.25	112.18	114.02
Last five years			119.88	96.78	58.28	100.02	90.27	94.66	93.09
Factor average		26	1044.39	14.45	-362.56				221.17
Factor median		27	102.71	11.83	-57.12				11.49
Factor standard deviation		28	16609.60	64.27	1742.13				655.32

*See Exhibit 1 for all definitions

EXHIBIT 15
Factor Performance Summary — Mexico

	Sample Period	Number of Observations	Average Annualized Return Top	Average Annualized Return Bottom	Return Spread Top/Bottom	Annualized Excess Returns Top	Annualized Excess Returns Bottom	Std. Dev. of Annualized Returns Top	Std. Dev. of Annualized Returns Bottom	Std. Dev. of Top/Bottom Spread Returns	% Periods Benchmark Outperformance Top	% Periods Benchmark Outperformance Bottom
Market Capitalization	12/88-5/98	114	7.22	22.31	-15.09	-11.32	3.77	35.15	34.99	27.47	40.35	61.40
Change in Return on Equity	12/88-5/98	114	28.83	10.50	18.33	10.29	-8.05	37.79	35.30	20.36	59.65	50.00
Debt to Common Equity	12/88-5/98	114	26.45	17.07	9.38	7.91	-1.47	41.22	31.20	23.51	57.89	50.00
Dividend Yield	5/89-5/98	109	13.99	27.17	-13.17	-1.99	11.18	36.79	40.61	29.86	51.38	56.88
One-Year Historical Earnings Momentum	12/88-5/98	114	26.30	10.50	15.80	7.76	-8.04	36.24	32.19	19.13	58.77	43.86
Three-Year Historical Earnings Growth Rate	12/88-5/98	114	18.15	20.57	-2.43	-0.40	2.03	36.01	30.98	21.39	47.37	57.89
Earnings Yield	12/88-5/98	114	23.16	11.70	11.47	4.62	-6.85	35.97	32.71	19.37	52.63	41.23
Change in Consensus FY1 Estimate — Last Three Months	9/92-5/98	69	7.08	-0.03	7.11	4.57	-2.54	36.48	37.75	12.97	50.72	47.83
Change in Consensus FY1 Estimate — Last Six Months	12/92-5/98	66	5.48	-2.59	8.07	7.50	-0.56	35.53	37.11	13.01	63.64	40.91
Consensus FY2 to FY1 Estimate Change	6/92-5/98	72	2.90	-0.39	3.29	2.68	-0.61	37.26	38.74	18.09	55.56	44.44
Consensus Forecast Earnings Estimate Revision Ratio	6/92-5/98	72	5.78	-1.20	6.98	5.56	-1.42	36.14	38.49	14.93	58.33	43.06
Book-to-Price Yield	12/88-5/98	114	11.36	22.76	-11.39	-7.18	4.21	36.95	35.21	22.06	44.74	55.26
Cash Earnings-to-Price Yield	1/93-5/98	65	0.71	0.27	0.44	1.73	1.29	36.33	37.68	16.17	56.92	49.23
One-Month Price Momentum	12/88-5/98	114	18.55	18.85	-0.30	0.01	0.31	34.36	35.09	22.02	48.25	54.39
One-Year Price Momentum	12/88-5/98	114	30.58	11.58	19.00	12.04	-6.96	35.57	38.23	25.41	62.28	52.63
Twelve-Month Prospective Earnings Growth Rate	6/92-5/98	72	2.20	-0.04	2.24	1.98	-0.26	38.56	37.37	16.29	59.72	55.56
Three-Year Prospective Earnings Growth Rate	6/92-5/98	72	3.97	3.91	0.07	3.75	3.68	41.82	36.21	17.86	52.78	55.56
Twelve-Month Prospective Earnings Yield	6/92-5/98	72	-2.60	5.97	-8.57	-2.82	5.75	38.46	35.21	14.03	48.61	55.56
Twenty-Four-Month Prospective Earnings Yield	6/92-5/98	72	-0.03	6.59	-6.61	-0.25	6.37	38.70	35.24	14.06	45.83	58.33
Revenue Growth	12/88-5/98	114	25.47	16.63	8.84	6.93	-1.91	40.40	34.23	21.79	53.51	51.75
Rate of Reinvestment	12/88-5/98	114	23.76	9.91	13.85	5.22	-8.63	37.28	30.96	20.09	54.39	39.47
Return on Equity	12/88-5/98	114	23.57	12.43	11.14	5.03	-6.11	36.15	31.42	20.65	54.39	43.86

EXHIBIT 16
Success Rates — Mexico

	Average Success Rate Universe	Average Success Rate Top	Average Success Rate Bottom	Std. Dev. of Average Success Rate Universe	Std. Dev. of Average Success Rate Top	Std. Dev. of Average Success Rate Bottom	Average Success Rate Consistency Ratio Universe	Average Success Rate Consistency Ratio Top	Average Success Rate Consistency Ratio Bottom	Most Successful Universe	Most Successful Top	Most Successful Bottom	Least Successful Universe	Least Successful Top	Least Successful Bottom
Market Capitalization	45.92	41.78	51.64	12.07	20.68	11.15	41.23	39.47	50.88	77.78	88.24	82.35	20.41	0.00	25.00
Change in Return on Equity	46.35	48.96	57.68	12.69	15.11	16.41	39.47	50.88	65.79	80.95	85.71	100.00	19.05	14.29	14.29
Debt to Common Equity	47.14	47.14	51.83	11.91	15.92	18.75	42.98	53.51	45.61	78.95	85.71	100.00	15.38	11.76	0.00
Dividend Yield	47.63	47.89	51.83	13.69	24.49	17.00	47.71	47.71	46.79	92.31	100.00	100.00	13.04	0.00	0.00
1-Yr. Hist. Earnings Momentum	45.91	48.39	57.77	12.28	14.71	16.95	39.47	51.75	64.04	77.55	76.92	93.33	18.60	15.38	11.76
3-Yr. Hist. Earn. Growth Rate	47.62	47.90	54.09	12.98	17.96	21.33	42.98	50.88	56.14	81.82	90.00	100.00	17.14	8.33	7.69
Earnings Yield	45.97	48.39	58.13	12.16	16.09	16.76	38.60	47.37	63.16	78.85	88.24	95.24	20.41	12.50	16.67
Change in Consensus FY1 Est. Last 3 Mos.	48.12	50.98	56.41	9.77	15.08	14.68	40.58	53.62	65.22	77.27	93.33	86.67	27.91	17.65	16.67
Change in Consensus FY1 Est. Last 6 Mos.	48.35	52.42	56.13	9.93	13.46	14.97	43.94	60.61	62.12	78.05	88.89	86.67	28.26	12.50	13.33
Consensus FY2 to FY1 Est. Change	48.55	44.95	51.32	10.05	13.93	14.62	38.89	41.67	51.39	78.57	75.00	83.33	26.09	12.50	23.08
Consensus Forecast Earn. Est. Revision Ratio	47.69	49.98	54.92	10.49	14.78	13.31	43.06	55.56	55.56	79.59	88.89	86.67	22.81	15.38	18.75
Book-to-Price Yield	45.91	43.93	53.25	12.19	19.27	13.06	42.11	41.23	56.14	78.85	82.35	76.47	20.41	5.88	16.67
Cash Earnings-to-Price Yield	48.26	49.40	54.64	9.55	15.60	16.94	50.77	53.85	60.00	76.09	83.33	89.47	26.79	12.50	23.53
1-Mo. Price Momentum	46.00	45.53	53.23	12.20	18.50	16.33	40.35	43.86	61.40	79.25	100.00	88.24	20.41	5.56	17.65
1-Yr. Price Momentum	46.18	50.12	59.20	12.64	15.64	20.00	37.72	54.39	65.79	78.95	100.00	100.00	19.05	20.00	12.50
12-Mo. Prosp. Earn. Growth Rate	47.65	45.03	51.18	10.49	13.65	14.93	43.06	44.44	52.78	79.55	76.47	81.25	22.81	11.11	14.29
3-Yr. Prosp. Earn. Growth Rate	49.07	47.71	49.66	10.34	13.95	15.17	44.44	47.22	47.22	82.50	84.62	80.00	30.30	13.33	10.00
24-Mo. Prospective Earnings Yield	47.69	47.02	52.03	10.39	15.30	15.21	41.67	43.06	55.56	79.17	87.50	78.95	22.81	17.65	11.11
12-Mo. Prospective Earnings Yield	47.69	48.06	52.88	10.39	15.55	15.06	41.67	47.22	58.33	79.17	87.50	84.21	22.81	15.79	15.79
Revenue Growth	47.28	46.20	53.04	12.53	16.98	22.31	40.35	45.61	48.25	82.14	85.71	100.00	14.29	0.00	20.00
Rate of Reinvestment	46.11	49.21	56.96	12.10	13.48	19.70	38.60	56.14	61.40	78.00	81.82	93.75	21.28	15.79	0.00
Return on Equity	45.87	49.63	57.06	12.13	13.83	18.58	40.35	50.00	62.28	79.55	81.82	100.00	18.18	14.29	6.67

attributed to a large-capitalization size effect. We find that the low average market capitalization of stocks collected in the top portfolio through time (MP 2,582.67 million, compared with an average universe market capitalization of MP 7,064.66 million, and bottom portfolio of MP 19,671.02 million). The large-capitalization–small-capitalization average return spread differential equals 15.09% a year (see size effect below). This may also impact the earnings yield factor screen, although there is some effect originating from the collection of historical loss-making firms in this portfolio. Excluding the loss-making stocks results in the bottom portfolio returning an average 15.48% a year (compared with an average annualized 11.70% earned including these firms — resulting in an inclusion exclusion spread of 3.78%) and a top minus bottom portfolio spread differential of 8.42%. This is more pronounced on an equal-weighted basis, where the bottom portfolio inclusion exclusion spread was an average annualized 8.25%. The average market capitalization of the excluded loss-making firms was MP 2,896 million.

The hypothesis of a potential lack of immediate size effect (there appears to be some size effect inherent in the loss-making firms) is corroborated by the low correlation coefficients between this screen and market capitalization.

Expectation Screens. As observed in the other markets that we studied, revision-type screens deliver consistent performance through time. Consensus forecast earnings revision ratio and change in consensus FY1 earnings over the last six months earned the highest top-portfolio relative performance scores across all factors, with 2.71 and 2.67, respectively.

Technical Indicators. Longer-term (one-year) price momentum generates a large return premium of 12.04% a year, although the high top-portfolio relative performance score earned in the in-sample period (of almost 3) is somewhat less in the out-of-sample period (marginally above 1). This is evidenced further in the last two-year cumulative performance, where $100 invested would have increased to $109.94 compared with a passive investment in the benchmark earning 114.02%.

This strategy still delivers the highest top portfolio minus bottom portfolio spread of an annualized 19% a year. The momentum effect does not seem to persist in shorter-duration strategies.

Longer-term price momentum strategies appear to show high correlation coefficients with other momentum-type strategies such as one-year historical earnings growth and change in consensus FY1 factors.

Size Effect. There appears to be large size effects existing in Mexico.[9] Top-portfolio market capitalization underperformed the market by an average –11.32% a year, evidenced further by a massive annualized –15.09% small-capitalization– (top-portfolio) large-capitalization (bottom-portfolio) spread. Much of the small-capitalization performance was generated in 1989 and this strategy has underperformed the market portfolio in seven out of the ten sample years (although 1998 cannot be regarded as a full year). Indeed, small-capitalization stocks have underperformed the market portfolio every year since the end of 1994, and $100 invested five years before the end of the sample would have fallen to $55.48. A passive investment in the benchmark over the same time period would be worth $93.09.

Correlation coefficients between market capitalization and the top and bottom portfolios of the fundamental factors show relatively high values for book-to-price ratio and dividend yield (correlations are presented in Exhibit 17). This is also reflected in the correspondingly high correlation coefficients measured between bottom portfolios.

Negative correlation coefficients between market capitalization and return on equity, along with the average size of firms collected in the top portfolio (MP 11, 672 million) compared with the average size of bottom-portfolio firms (MP 2,992 million), reinforces the ex ante hypothesis that smaller-capitalization firms are generally of lower perceived quality as proxied by the return on equity factor.

It appears that change in consensus FY1 estimates over the last six months is particularly strong at discriminating on small- and mid-capitalization stocks in the screen. For example, the average mid-capitalization annualized spread across the top and bottom change in consensus FY1 forecast portfolio is a massive 27.43%, compared with a total annualized spread between top and bottom portfolios of 8.07%.

Scoring. The scoring model screen with a monthly holding period earned an average excess return of 15.21% a year, with an excess return in the corresponding bottom portfolio of –8.62%, resulting in an average annualized return spread of 23.38%. The performance of the screens is presented in Exhibit 18. The scoring screens are summarized in Exhibit 19.

The strongest performance, after allowing for the effects of transaction costs, was delivered by the quarterly holding-period screen, which delivered a top-portfo-

EXHIBIT 17

Correlation Coefficient Matrix — Mexico, December 1990-May 1998

Top Portfolio

	PM_12M	EY	HEGR_1Y	HEGR_3Y	BPR	RGR	PM_1M	CAP	DY	CEY	IREV_3M	DE	PEY_12M	PEY_24M	ROE	CH_ROE	PEGR_1Y	PEGR_3Y	CH_FY1_3M	CH_FY1_6M	CH_FY2_FY1	RIR
PM_12M	·																					
EY	(0.27)	·																				
HEGR_1Y	0.45	(0.13)	·																			
HEGR_3Y	0.01	0.03	0.24	·																		
BPR	(0.36)	0.14	(0.19)	(0.03)	·																	
RGR	0.27	(0.18)	0.65	0.52	(0.06)	·																
PM_1M	0.40	(0.18)	0.38	0.07	0.09	0.22	·															
CAP	(0.41)	0.05	(0.37)	(0.14)	0.67	(0.26)	0.21	·														
DY	(0.23)	0.17	(0.23)	(0.20)	0.49	(0.29)	(0.02)	0.30	·													
CEY	0.12	0.45	(0.01)	0.15	(0.02)	(0.11)	0.05	(0.03)	0.17	·												
IREV_3M	0.08	(0.11)	0.16	0.02	0.23	0.18	0.41	0.37	0.05	(0.02)	·											
DE	(0.20)	0.06	0.02	(0.17)	0.23	(0.02)	(0.07)	0.19	0.13	(0.23)	0.11	·										
PEY_12M	(0.20)	0.38	0.06	0.25	0.27	0.20	(0.05)	0.05	0.07	0.09	(0.13)	(0.04)	·									
PEY_24M	(0.12)	0.50	0.24	0.16	0.26	0.22	0.04	0.11	0.20	0.30	(0.01)	(0.04)	0.82	·								
ROE	0.27	0.07	0.54	0.49	(0.27)	0.65	0.04	(0.45)	(0.21)	0.28	(0.07)	(0.20)	0.44	0.44	·							
CH_ROE	0.47	(0.14)	0.78	0.26	(0.30)	0.55	0.43	(0.34)	(0.13)	0.07	0.14	0.07	0.02	0.20	0.48	·						
PEGR_1Y	(0.22)	(0.18)	0.14	(0.08)	0.30	0.13	0.04	0.24	0.08	(0.33)	0.37	0.25	(0.10)	(0.04)	(0.36)	0.05	·					
PEGR_3Y	(0.22)	(0.10)	0.11	(0.06)	0.43	0.33	0.04	(0.11)	0.25	0.05	(0.20)	0.31	0.21	0.01	0.05	(0.17)	(0.06)	0.69	·			
CH_FY1_3M	0.18	(0.11)	0.36	0.11	0.03	0.25	0.12	0.03	(0.21)	0.03	0.30	(0.12)	(0.14)	(0.08)	0.01	0.19	0.16	0.12	·			
CH_FY1_6M	0.24	(0.16)	0.24	0.19	(0.21)	0.00	0.13	(0.11)	(0.25)	0.03	0.25	(0.24)	(0.23)	(0.11)	(0.01)	0.20	0.12	0.02	0.69	·		
CH_FY2_FY1	0.16	(0.07)	0.12	(0.15)	0.00	0.13	0.17	(0.07)	(0.09)	(0.23)	0.05	(0.04)	0.10	0.11	0.01	0.05	0.23	0.20	0.18	(0.09)	·	
RIR	0.35	0.04	0.59	0.53	(0.28)	0.68	0.13	(0.44)	(0.38)	0.35	(0.10)	(0.18)	0.50	0.47	0.89	0.52	(0.30)	(0.17)	0.02	0.04	0.03	·

Bottom Portfolio

	PM_12M	EY	HEGR_1Y	HEGR_3Y	BPR	RGR	PM_1M	CAP	DY	CEY	IREV_3M	DE	PEY_12M	PEY_24M	ROE	CH_ROE	PEGR_1Y	PEGR_3Y	CH_FY1_3M	CH_FY1_6M	CH_FY2_FY1	RIR
PM_12M	·																					
EY	0.24	·																				
HEGR_1Y	0.30	0.44	·																			
HEGR_3Y	(0.07)	0.06	0.37	·																		
BPR	(0.32)	(0.04)	(0.35)	(0.00)	·																	
RGR	0.23	0.33	0.63	0.31	(0.33)	·																
PM_1M	0.25	0.00	0.13	0.11	(0.03)	0.12	·															
CAP	(0.43)	(0.05)	(0.40)	0.02	0.78	(0.32)	(0.13)	·														
DY	(0.24)	(0.05)	(0.19)	(0.08)	0.53	(0.29)	(0.09)	0.52	·													
CEY	0.10	0.84	0.38	(0.07)	(0.05)	0.11	(0.14)	(0.18)	0.20	·												
IREV_3M	(0.16)	(0.10)	(0.14)	0.05	0.29	(0.16)	0.01	0.25	0.20	0.05	·											
DE	0.12	0.24	0.17	0.29	0.12	0.10	0.17	0.15	(0.09)	(0.14)	0.20	·										
PEY_12M	(0.18)	0.52	(0.05)	(0.04)	0.52	(0.25)	(0.11)	0.36	0.36	0.53	0.19	0.29	·									
PEY_24M	(0.28)	0.38	(0.15)	0.09	0.62	(0.37)	(0.08)	0.42	0.38	0.38	0.23	0.36	0.91	·								
ROE	0.34	0.54	0.71	0.42	(0.28)	0.49	(0.00)	(0.31)	(0.30)	0.49	(0.15)	0.17	0.06	(0.06)	·							
CH_ROE	0.34	0.41	0.58	0.25	(0.18)	0.42	0.31	(0.24)	(0.15)	0.34	0.05	0.24	0.01	(0.03)	0.40	·						
PEGR_1Y	(0.12)	(0.19)	(0.20)	0.02	0.16	(0.00)	0.09	0.04	(0.01)	0.20	0.02	0.26	0.24	(0.24)	(0.33)		·					
PEGR_3Y	0.01	(0.05)	(0.04)	0.14	0.22	0.09	0.07	(0.09)	(0.11)	0.10	0.23	0.02	0.24	0.26	0.11	(0.06)	0.67	·				
CH_FY1_3M	0.06	(0.08)	0.00	0.10	0.18	0.05	0.05	(0.03)	(0.07)	(0.04)	0.42	0.01	0.19	0.21	0.10	0.15	0.21	0.30	·			
CH_FY1_6M	0.02	(0.01)	(0.05)	0.20	0.32	(0.14)	0.11	0.01	0.09	(0.00)	0.30	0.05	0.35	0.38	0.05	0.00	0.07	0.28	0.49	·		
CH_FY2_FY1	0.28	0.19	0.03	(0.18)	(0.19)	0.08	(0.08)	(0.39)	0.08	0.44	(0.12)	0.10	0.08	0.11	0.22	(0.09)	0.18	0.01	0.03		·	
RIR	0.29	0.57	0.65	0.31	(0.29)	0.40	0.02	(0.32)	(0.31)	0.53	(0.08)	0.21	0.08	(0.02)	0.85	0.36	(0.18)	0.08	0.06	0.07	0.22	·

lio average annualized return of 14.31% (and top-bottom return spread of 22.41%). This performance was achieved at marginally higher levels of portfolio risk (relative to monthly holding periods) measured by a standard deviation of 41.76% compared with a bottom portfolio of 38.03%, and systematic risk (beta of 1.07 compared to 0.92 in the bottom portfolio), although the top portfolio performed better in down markets. The maximum recorded negative quarterly excess return was –6.24%, compared to a similar return in the bottom portfolio of –22.99%. Excess performance above the market portfolio year to date in 1998 was a credible 6.87%.

The average success (presented in Exhibit 20) for the top portfolio further highlights the strength of this screen through time. For example, in 57% of the holding periods, more than 50% of the firms beat the benchmark in the top portfolio.

Exhibits 21 and 22 visually present the performance of the scoring screens. In Exhibit 21, an investment of $100 at the beginning of our in-sample period grows to approximately $950 by December 1995 (this compares to $380 for the benchmark and $180 for the bottom portfolio). An investment of $100 in December 1995 grows to $160 by May 1998 for the top portfolio, compared to $140 for the benchmark portfolio and $135 for the bottom portfolio. This analysis reveals some weakness in the bottom portfolio to underperform the index, however. In early 1996, the bottom portfolio returns exceed those of the index.

Exhibit 22 presents the quarter-by-quarter performance of the top portfolio relative to the benchmark. The top-portfolio return usually exceeds the benchmark. The success rates (right axis) are generally above 50% and especially above 50% in the out-of-sample period. There is no particular pattern in the success rates suggesting that the outperformance of the top portfolio is originating from a broad number of securities rather than a small number.

Screening Results for South Africa. Due to the nature of the South African economy, with a large mining and commodity cyclical influence, the process of screening is influenced by important exogenous factors such as the price of gold and other commodity prices. To assess the sensitivity to these exogenous influences, the screens were rerun (but not reported), excluding metal mining firms.

During our sample, the South African index returns averaged 18.86% per year. However, the index

performance is significantly different in the in-sample and out-of-sample periods. The market returned an average 41% per year from 1993 through the end of 1995. Since the beginning of 1996, however, the average market return is –1.9% per year. Over the entire sample (sixty-three observations) since January 1993, the market increased in forty months (63% of the time), and decreased in twenty-three months (37% of the time). During the out-of-sample period, the market increased in thirteen months and decreased in fifteen. Although the scoring screens have been run to the end of May 1998, our factor analysis for the purpose of this article extends to March 1998.

Factor screens. Exhibit 23 presents an example of the factor-by-actor results (we present change in consensus FY1 estimates over the past three months). The detailed analysis of the other factors is presented in Achour et al. [1998c]. Exhibit 24 summarizes these results. Exhibit 25 presents the success rates of the individual factors. Some general observations are:

- The highest average annualized excess returns are from earnings yield and change in consensus FY1 estimate over the preceding three-month strategies, with excess returns over the benchmark of 8.0% and 7.85%, respectively. The benchmark return is 18.86%.

- The greatest average annualized underperformance against the benchmark is obtained from bottom-portfolio change in consensus FY1 estimate over the last three and six months, with –12.93% and –8.71% respectively. Although these two factors do exhibit high correlations, the different horizons produce different behavior in various stages of a dichotomous market. Book-to-price ratio delivered marginally worse results with a –8.42% bottom-portfolio average annual excess return.

- The greatest top minus bottom spread differential is produced by change in consensus FY1 estimate over the preceding three months and consensus forecast estimate revision ratio, with 20.78% and 15.44%, respectively.

- These two strategies are also the most successful in terms of benchmark outperformance, beating the benchmark in 61.90% (consensus revision ratio) and 60.32% (last three-month estimate change). Earnings yield and rate of reinvestment produced similar results to the latter. Although rate of reinvestment outperformed consistently over the sample period,

EXHIBIT 18A

Mexico Scoring Model
Sample Period: 12/88-5/98
Number of Observations: 114 Monthly

Performance Measure/ Summary Statistic		Note*	Portfolios - equal weighted -1-	-2-	-3-	Portfolios - value weighted -1-	-2-	-3-	Market portfolio
Annualized average return (USD)		1	30.08	9.45	5.02	33.75	10.44	9.92	18.54
Cumulative return (indexed at 100 - start)		2	1216.09	235.83	159.22	1584.39	256.75	245.68	503.29
STD Deviation of returns		3	34.99	31.90	34.05	36.54	33.69	35.39	33.10
Average annual excess return	Rm	4	11.54	-9.09	-13.53	15.21	-8.11	-8.62	
	Rf	5	23.68	3.99	-0.24	27.19	4.93	4.44	
STD Deviation of excess rtns	Rm	6	15.50	11.89	16.06	10.43	10.76	13.53	
	Rf	7	34.93	31.89	34.03	36.51	33.65	35.37	
T-stat: Average XS return Rm = 0		8	1.99	-2.20	-2.29	3.92	-1.99	-1.55	
Systematic risk (Beta)		9	0.95	0.90	0.91	1.06	0.97	0.99	
Alpha		10	10.33	-6.35	-10.71	11.28	-6.57	-7.43	
Co-efficient of determination		11	0.81	0.87	0.78				
Average market cap		12	8942.21	7427.25	5647.08				7338.84
% periods > Benchmark		13	53.51	39.47	34.21	63.16	50.00	42.11	
% periods > Bench up Mkt		14	45.83	33.33	30.56	63.89	48.61	41.67	
% periods > Bench Dn Mkt		15	66.67	50.00	40.48	61.90	52.38	42.86	
Max # of consecutive bmark outperformance		16	10	4	2	6	7	6	
Maximum positive excess return		17	33.17	8.28	18.26	13.58	7.85	12.57	
Maximum negative excess return		18	-7.78	-10.61	-12.26	-5.44	-10.55	-11.84	
% periods positive returns to negative		19	192.31	147.83	115.09	208.11	147.83	119.23	
% periods of negative returns		20	34.21	40.35	46.49	32.46	40.35	45.61	36.84
Max # of consecutive negative periods		21	5	5	6	3	4	5	4
Max # of consecutive positive periods		22	17	7	7	9	7	5	9
Cumulative annual returns - (index=100 each year)		23							
In sample	1989		271.59	163.85	154.75	200.39	190.02	161.50	173.35
	1990		154.90	110.14	121.39	148.57	122.40	129.24	129.69
	1991		185.16	139.18	131.12	260.78	159.06	121.16	206.76
	1992		114.11	118.82	114.36	128.97	104.35	130.54	121.18
	1993		166.65	178.35	142.92	176.87	148.17	146.03	149.90
	1994		66.09	61.69	58.44	62.73	56.73	54.49	59.36
	1995		76.51	67.95	57.35	87.32	62.36	65.62	74.02
Out of sample	1996		128.63	119.79	107.45	131.63	112.89	121.91	117.83
	1997		161.21	130.70	139.57	150.43	150.79	166.69	150.45
	1998		78.29	67.50	78.68	82.48	74.52	70.14	76.52
Relative Performance -		24							
	1989		3	2	1	3	2	1	
	1990		3	1	2	3	1	2	
	1991		3	2	1	3	2	1	
	1992		1	3	2	2	1	3	
	1993		2	3	1	3	2	1	
	1994		3	2	1	3	2	1	
	1995		3	2	1	3	1	2	
	1996		3	2	1	3	1	2	
	1997		3	1	2	1	2	3	
	1998		2	1	3	3	2	1	
Average Relative Performance -			2.60	1.90	1.50	2.70	1.60	1.70	
Cumulative annual returns -		25							
Last two years			123.86	89.56	96.07	128.25	116.50	108.67	114.02
Last five years			138.24	71.29	58.60	161.02	67.48	74.55	93.09
Factor average		26	3.23	0.81	-0.85				1.09
Factor median		27	3.00	1.00	-0.50				1.00
Factor standard deviation		28	1.70	0.59	1.00				1.77

*All definitions in Exhibit 1

EXHIBIT 18B
Mexico Scoring Model
Sample Period: 12/88-3/98
Number of Observations: 38 Quarterly

Performance Measure/ Summary Statistic		Note*	Portfolios - equal weighted			Portfolios - value weighted			Market portfolio
			-1-	-2-	-3-	-1-	-2-	-3-	
Annualized average return (USD)		1	28.79	7.46	2.81	32.85	11.79	10.44	18.54
Cumulative return (indexed at 100 - start)		2	1106.14	198.02	130.07	1486.02	288.35	256.86	503.29
STD Deviation of returns		3	40.38	37.25	35.25	41.76	38.07	38.03	37.75
Average annual excess return	Rm	4	10.24	-11.09	-15.74	14.31	-6.75	-8.10	
	Rf	5	22.61	2.07	-2.41	26.53	6.24	4.94	
STD Deviation of excess rtns	Rm	6	13.39	12.44	15.37	11.50	11.71	16.18	
	Rf	7	40.25	37.21	35.14	41.62	37.95	37.89	
T-stat: Average XS return Rm = 0		8	2.19	-2.49	-3.04	3.56	-1.54	-1.34	
Systematic risk (Beta)		9	1.01	0.93	0.85	1.07	0.96	0.92	
Alpha		10	8.58	-8.95	-12.05	10.93	-5.38	-5.85	
Co-efficient of determination		11	0.89	0.89	0.83				
Average market cap		12	8742.64	7670.41	5509.39				7307.48
% periods > Benchmark		13	60.53	34.21	28.95	68.42	39.47	34.21	
% periods > Bench up Mkt		14	62.50	33.33	16.67	66.67	33.33	37.50	
% periods > Bench Dn Mkt		15	57.14	35.71	50.00	71.43	50.00	28.57	
Max # of consecutive bmark outperformance		16	7	5	2	7	2	3	
Maximum positive excess return		17	19.59	10.83	14.31	18.04	14.34	15.51	
Maximum negative excess return		18	-9.03	-18.62	-23.05	-6.24	-19.37	-22.99	
% periods positive returns to negative		19	192.31	153.33	137.50	171.43	153.33	153.33	
% periods of negative returns		20	34.21	39.47	42.11	36.84	39.47	39.47	36.84
Max # of consecutive negative periods		21	3	3	3	4	3	3	3
Max # of consecutive positive periods		22	7	3	6	7	3	5	6
Cumulative annual returns - (index=100 each year)		23							
In sample	1989		210.69	158.70	170.48	218.73	170.74	177.44	173.35
	1990		147.40	116.63	124.41	129.51	128.97	153.63	129.69
	1991		181.70	146.28	116.68	264.49	161.61	120.39	206.76
	1992		119.10	114.75	119.71	130.74	99.25	130.41	121.18
	1993		168.08	179.73	132.81	173.06	150.88	139.03	149.90
	1994		66.83	65.37	56.43	59.14	65.57	52.52	59.36
	1995		85.21	59.11	55.37	90.11	62.40	61.93	74.02
Out of sample	1996		133.54	108.18	109.81	131.54	113.13	122.86	117.83
	1997		168.58	127.24	135.41	149.96	156.79	152.01	150.45
	1998		76.38	66.67	71.16	83.39	74.57	71.07	76.52
Relative Performance -		24							
	1989		3	1	2	3	1	2	
	1990		3	1	2	2	1	3	
	1991		3	2	1	3	2	1	
	1992		2	1	3	3	1	2	
	1993		2	3	1	3	2	1	
	1994		3	2	1	2	3	1	
	1995		3	2	1	3	2	1	
	1996		3	1	2	3	1	2	
	1997		3	1	2	1	3	2	
	1998		3	1	2	3	2	1	
Average Relative Performance -			2.80	1.50	1.70	2.60	1.80	1.60	
Cumulative annual returns -		25							
Last two years			133.91	77.20	85.62	130.88	117.94	100.26	114.02
Last five years			165.11	59.89	46.97	152.74	84.08	59.62	93.09
Factor average		26	3.27	0.82	-0.84				1.11
Factor median		27	3.00	1.00	-0.50				1.00
Factor standard deviation		28	1.69	0.60	1.01				1.74

*All definitions in Exhibit 1

EXHIBIT 18C
Mexico Scoring Model
Sample Period: 12/88-12/98
Number of Observations: 19 Semiannual

| Performance Measure/ Summary Statistic		Note*	Portfolios - equal weighted			Portfolios - value weighted			Market portfolio
			-1-	-2-	-3-	-1-	-2-	-3-	
Annualized average return (USD)		1	25.72	9.63	1.38	26.60	15.78	10.06	18.54
Cumulative return (indexed at 100 - start)		2	879.52	239.56	113.86	939.79	402.19	248.49	503.29
STD Deviation of returns		3	36.23	35.20	36.33	41.33	36.99	39.55	36.13
Average annual excess return	Rm	4	7.17	-8.91	-17.17	8.05	-2.77	-8.49	
	Rf	5	19.87	4.17	-3.87	20.73	10.17	4.59	
STD Deviation of excess rtns	Rm	6	14.67	15.19	18.78	14.43	14.33	16.82	
	Rf	7	35.90	34.99	36.14	41.10	36.57	39.34	
T-stat: Average XS return Rm = 0		8	1.31	-1.70	-2.67	1.81	-0.47	-1.25	
Systematic risk (Beta)		9	0.92	0.89	0.87	1.07	0.95	0.99	
Alpha		10	7.91	-6.32	-14.08	5.95	-1.58	-7.77	
Co-efficient of determination		11	0.84	0.83	0.75				
Average market cap		12	9171.03	7080.80	5006.66				7086.16
% periods > Benchmark		13	73.68	42.11	31.58	68.42	47.37	42.11	
% periods > Bench up Mkt		14	69.23	38.46	30.77	69.23	38.46	46.15	
% periods > Bench Dn Mkt		15	83.33	50.00	33.33	66.67	66.67	33.33	
Max # of consecutive bmark outperformance		16	10	3	3	3	3	2	
Maximum positive excess return		17	34.08	11.41	16.90	21.88	24.24	19.24	
Maximum negative excess return		18	-23.74	-29.56	-41.26	-16.23	-26.54	-29.83	
% periods positive returns to negative		19	216.67	171.43	137.50	280.00	171.43	171.43	
% periods of negative returns		20	31.58	36.84	42.11	26.32	36.84	36.84	31.58
Max # of consecutive negative periods		21	3	4	4	3	4	4	3
Max # of consecutive positive periods		22	8	7	5	8	4	8	8
Cumulative annual returns - (index=100 each year)		23							
In sample 1989			188.31	165.81	171.40	180.30	190.42	165.08	173.35
1990			139.35	133.21	111.50	124.63	148.88	127.16	129.69
1991			196.88	134.22	116.69	259.29	154.56	139.83	206.76
1992			123.43	110.67	117.50	127.84	108.31	116.14	121.18
1993			160.32	170.62	143.76	161.09	159.21	161.70	149.90
1994			69.14	58.54	63.59	62.61	57.83	61.38	59.36
1995			81.10	64.77	50.00	77.63	74.71	57.14	74.02
Out of sample 1996			124.75	125.91	98.31	126.60	116.93	117.36	117.83
1997			160.79	137.79	133.11	151.49	152.18	154.59	150.45
1998			76.49	65.06	72.65	84.03	69.24	70.83	76.52
Relative Performance -		24							
1989			3	1	2	2	3	1	
1990			3	2	1	1	3	2	
1991			3	2	1	3	2	1	
1992			3	1	2	3	1	2	
1993			2	3	1	2	1	3	
1994			3	1	2	3	1	2	
1995			3	2	1	3	2	1	
1996			2	3	1	3	1	2	
1997			3	2	1	1	2	3	
1998			3	1	2	3	1	2	
Average Relative Performance -			2.80	1.80	1.40	2.40	1.70	1.90	
Cumulative annual returns -		25							
Last two years			122.35	86.57	82.30	132.53	106.20	101.57	114.02
Last five years			139.86	69.66	47.23	139.46	79.68	72.85	93.09
Factor average		26	3.35	0.87	-0.82				1.15
Factor median		27	3.00	1.00	-0.50				1.00
Factor standard deviation		28	1.78	0.63	1.07				1.81

*All definitions in Exhibit 1

EXHIBIT 19
Factor Performance Summary

	Sample Period	Number of Observations	Average Annualized Return Top	Bottom	Return Spread Top/Bottom	Annualized Excess Returns Top	Bottom	Std. Dev. of Annualized Returns Top	Bottom	Std. Dev. of Top/Bottom Spread Returns	% Periods Benchmark Outperformance Top	Bottom
Scoring Model — Monthly Observations	12/88–5/98	114	33.75	9.92	23.83	15.21	–8.62	36.54	35.39	19.86	63.16	42.11
Scoring Model — Quarterly Observations	12/88–3/98	38	32.85	10.44	22.41	14.31	–8.10	41.76	38.03	24.62	68.42	34.21
Scoring Model — Semiannual obs.	12/88–12/97	19	26.60	10.06	16.54	8.05	–8.49	41.33	39.55	27.85	68.42	42.11

EXHIBIT 20
Success Rates — Mexico

	Average Success Rate Universe	Top	Bottom	Std. Dev. of Average Success Rate Universe	Top	Bottom	Average Success Rate Consistency Ratio Universe	Top	Bottom	Most Successful Universe	Top	Bottom	Success Rate / Least Successful Universe	Top	Bottom
Scoring Model — Monthly Obs.	45.69	49.64	57.46	12.28	14.98	17.61	37.72	48.25	64.91	78.85	92.86	94.12	16.28	21.43	12.5
Scoring Model — Quart. Obs.	45.19	52.05	59.64	11.33	14.82	18.89	31.58	57.89	68.42	65.96	77.78	100	16.67	11.11	6.25
Scoring model — Semiannual Observations	41.72	50.36	63.41	11.97	14.89	17.41	21.05	47.37	73.68	59.46	81.82	92.86	9.52	21.43	22.22

EXHIBIT 21
Mexico: Performance of Stock Selection Model
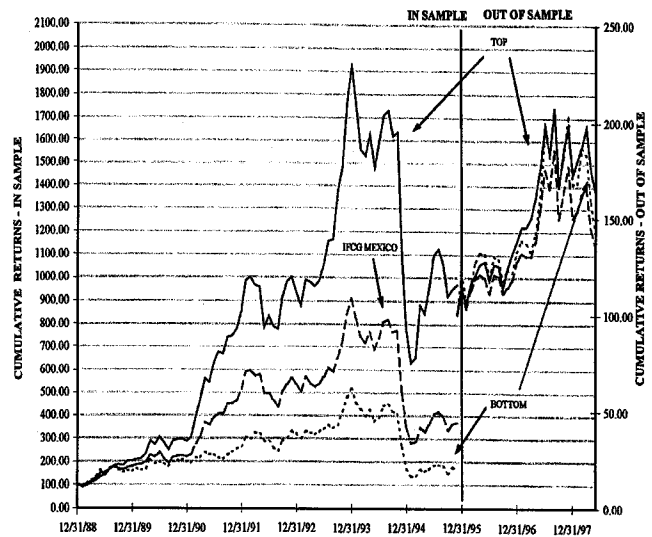
EXHIBIT 22
Mexico: Success Ratio Analysis
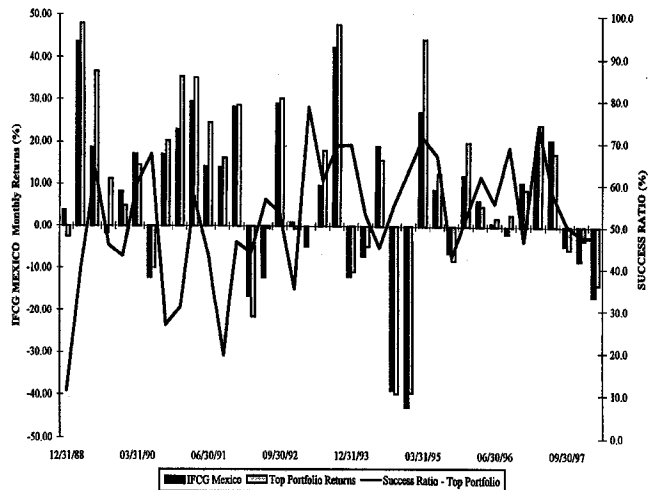
the average annual excess returns over the bench-mark were disappointing, due mainly to poor per-formance in the large bull market of 1993. Exoge-nous factors such as the price of gold may confound these results. These factors were also the best per-formers in an up market.

• The best performer in a down market was market capitalization, with outperformance in 73.91% of down markets, although this strategy was particular-

EXHIBIT 23
South Africa Change in Consensus FY1 Estimate — Last Three Months
Sample Period: 1/93-3/98
Number of Observations: 63 Monthly

Performance Measure/ Summary Statistic		Note*	Portfolios - equal weighted			Portfolios - value weighted			Market portfolio
			-1-	-2-	-3-	-1-	-2-	-3-	
Annualized average return (USD)		1	29.64	18.12	8.75	26.71	17.74	5.93	18.86
Cumulative return (indexed at 100 - start)		2	390.80	239.76	155.31	346.50	235.72	135.31	247.68
STD Deviation of returns		3	23.43	23.42	23.20	24.25	23.67	23.73	22.01
Average annual excess return	Rm	4	10.79	-0.73	-10.11	7.85	-1.11	-12.93	
	Rf	5	24.04	12.98	3.98	21.22	12.62	1.28	
STD Deviation of excess rtns	Rm	6	7.25	10.44	11.92	8.24	8.35	11.60	
	Rf	7	23.51	23.46	23.27	24.30	23.71	23.78	
T-stat: Average XS return Rm = 0		8	2.89	-0.07	-1.68	1.94	-0.17	-2.21	
Systematic risk (Beta)		9	1.01	0.95	0.91	1.04	1.01	0.94	
Alpha		10	8.63	0.18	-7.40	5.87	-1.07	-10.62	
Co-efficient of determination		11	0.90	0.80	0.74				
Average market cap		12	8918.88	7755.75	5251.60				7308.74
% periods > Benchmark		13	61.90	47.62	38.10	60.32	49.21	34.92	
% periods > Bench up Mkt		14	65.00	42.50	30.00	62.50	47.50	32.50	
% periods > Bench Dn Mkt		15	56.52	56.52	52.17	56.52	52.17	39.13	
Max # of consecutive bmark outperformance		16	5	4	3	9	5	3	
Maximum positive excess return		17	7.23	8.90	10.63	6.89	9.42	9.06	
Maximum negative excess return		18	-2.85	-4.82	-9.70	-8.29	-6.63	-12.36	
% periods positive returns to negative		19	186.36	142.31	110.00	186.36	133.33	103.23	
% periods of negative returns		20	34.92	41.27	47.62	34.92	42.86	49.21	36.51
Max # of consecutive negative periods		21	4	7	11	4	7	10	6
Max # of consecutive positive periods		22	7	7	7	10	8	8	8
Cumulative annual returns - (index=100 each year)		23							
In Sample 1993			222.87	153.77	160.73	187.00	155.13	148.48	167.26
1994			140.30	155.32	144.96	130.06	141.69	131.26	131.32
1995			117.91	137.52	97.08	119.02	134.16	100.72	117.78
Out of sample 1996			83.49	71.76	80.92	90.22	75.29	78.26	82.94
1997			94.19	81.40	68.13	101.25	80.88	69.65	88.51
1998			134.80	124.98	124.55	131.05	131.26	126.44	130.42
Relative Performance -		24							
1993			3	1	2	3	2	1	
1994			1	3	2	1	3	2	
1995			2	3	1	2	3	1	
1996			3	1	2	3	1	2	
1997			3	2	1	3	2	1	
1998			3	2	1	2	3	1	
Average Relative Performance -			2.50	2.00	1.50	2.33	2.33	1.33	
Cumulative annual returns -		25							
Last two years			116.38	85.44	65.83	125.72	91.74	67.11	101.59
Last five years			308.14	229.70	128.77	292.39	225.20	116.28	216.53
Factor average		26	7.39	-1.13	-14.24				-2.39
Factor median		27	3.40	-0.74	-8.73				-0.64
Factor standard deviation		28	24.13	2.01	29.96				16.95

*All definitions in Exhibit 1

EXHIBIT 24
Factor Performance Summary — South Africa

	Sample Period	Number of Observations	Average Annualized Return Top	Bottom	Return Spread Top/Bottom	Annualized Excess Returns Top	Bottom	Std. Dev. of Annualized Returns Top	Bottom	Std. Dev. of Top/Bottom Spread Returns	% Periods Benchmark Outperformance Top	Bottom
Market Capitalization	1/93–3/98	63	24.75	18.74	6.01	5.89	–0.11	25.55	23.29	16.84	57.14	52.38
Change in Return on Equity	1/93–3/98	63	18.53	20.93	–2.40	–0.32	2.07	21.82	23.02	10.34	53.97	50.79
Debt to Common Equity	1/93–3/98	63	16.18	14.72	1.47	–2.67	–4.14	22.79	26.54	17.86	46.03	47.62
Dividend Yield	2/93–3/98	62	18.42	16.29	2.12	0.09	–2.03	27.34	24.90	19.51	50.00	50.00
One-Year Historical Earnings Momentum	1/93–3/98	63	12.59	23.76	–11.17	–6.26	4.91	20.67	26.17	13.44	42.86	55.56
Three-Year Historical Earnings Growth Rate	1/93–3/98	63	13.12	19.22	–6.09	–5.73	0.36	21.60	25.90	15.44	50.79	53.97
Earnings Yield	1/93–3/98	63	26.86	12.00	14.86	8.00	–6.85	25.82	23.49	18.39	60.32	49.21
Change in Consensus FY1 Estimate — Last Three Months	1/93–3/98	63	26.71	5.93	20.78	7.85	–12.93	24.25	23.73	18.68	60.32	34.92
Change in Consensus FY1 Estimate — Last Six Months	1/93–3/98	63	23.70	10.14	13.57	4.85	–8.72	25.14	23.98	18.41	50.79	42.86
Consensus FY2 to FY1 Estimate Change	1/93–3/98	63	20.59	19.47	1.12	1.73	0.61	22.38	26.03	15.89	50.79	53.97
Consensus Forecast Earnings Estimate Revision Ratio	1/93–3/98	63	26.69	11.25	15.44	7.83	–7.60	23.51	23.50	16.65	61.90	38.10
Book-to-Price Yield	1/93–3/98	63	17.76	10.44	7.32	–1.10	–8.42	26.07	21.88	18.58	49.21	42.86
Cash Earnings-to-Price Yield	1/93–3/98	63	17.93	12.38	5.55	–0.93	–6.48	25.81	22.33	17.59	50.79	38.10
One-Month Price Momentum	2/93–3/98	62	16.61	19.99	–3.38	–1.71	1.67	25.10	23.31	18.83	43.55	53.23
One-Year Price Momentum	1/93–3/98	63	18.21	17.65	0.56	–0.65	–1.21	24.98	26.23	21.15	46.03	58.73
Twelve-Month Prospective Earnings Growth Rate	1/93–3/98	63	16.31	24.04	–7.74	–2.55	5.19	21.76	22.93	14.63	42.86	50.79
Three-Year Prospective Earnings Growth Rate	1/93–3/98	63	16.57	20.38	–3.81	–2.29	1.52	21.69	25.43	14.92	44.44	47.62
Twenty-Four-Month Prospective Earnings Yield	1/93–3/98	63	23.07	15.36	7.72	4.22	–3.50	24.24	23.62	17.37	58.73	44.44
Twelve-Month Prospective Earnings Yield	1/93–3/98	63	20.73	13.01	7.71	1.87	–5.85	24.25	24.11	18.09	47.62	44.44
Revenue Growth	1/93–3/98	63	20.04	17.94	2.10	1.18	–0.92	23.05	22.83	16.80	52.38	52.38
Rate of Reinvestment	1/93–3/98	63	18.35	13.84	4.50	–0.51	–5.01	21.55	23.61	15.20	60.32	49.21
Return on Equity	1/93–3/98	63	19.92	18.29	1.63	1.06	–0.57	20.99	24.27	12.65	53.97	50.79

EXHIBIT 25
Success Rates — South Africa

	Average Success Rate Universe	Top	Bottom	Std. Dev. of Average Success Rate Universe	Top	Bottom	Average Success Rate Consistency Ratio Universe	Top	Bottom	Success Rate Most Successful Universe	Top	Bottom	Success Rate Least Successful Universe	Top	Bottom
Market Capitalization	48.47	49.28	50.64	7.66	14.76	9.57	38.10	49.21	52.38	69.84	80.00	71.43	30.16	14.29	28.57
Change in Return on Equity	48.88	49.16	51.19	9.03	13.21	13.46	49.21	57.14	46.03	68.75	81.25	81.25	29.31	20.00	15.00
Debt to Common Equity	48.10	47.30	51.52	9.32	19.71	16.79	46.03	46.03	50.79	68.52	94.12	81.25	27.78	5.88	11.11
Dividend Yield	48.87	49.16	51.96	8.22	15.52	13.42	40.32	50.00	53.23	77.78	100.00	80.95	30.00	25.00	19.05
3-Yr. Hist. Earn. Growth Rate	48.81	45.63	47.74	8.50	14.50	13.70	49.21	47.62	39.68	68.33	75.00	80.00	28.57	5.88	22.22
1-Yr. Hist. Earnings Momentum	48.71	47.94	48.83	8.29	12.49	11.35	47.62	49.21	44.44	68.85	72.22	70.83	28.57	16.67	28.57
Earnings Yield	48.10	51.75	54.86	8.24	12.27	14.90	41.27	60.32	60.32	69.35	90.91	90.48	28.81	25.00	0.00
Change in Consensus FY1 Est. Last 3 Mos.	48.39	52.33	55.43	8.39	12.91	13.59	42.86	61.90	65.08	67.86	77.78	82.35	29.09	25.00	27.78
Change in Consensus FY1 Est. Last 6 Mos.	48.35	51.20	52.68	8.45	13.72	14.65	42.86	58.73	57.14	67.86	75.00	88.89	29.63	15.79	23.81
Consensus FY2 to FY1 Est. Change	48.46	49.70	52.08	8.38	13.55	12.60	42.86	58.73	50.79	67.86	84.21	78.26	29.09	26.32	13.04
Consensus Forecast Earn. Est. Revision Ratio	48.37	52.98	56.84	8.31	13.47	14.80	42.86	63.49	65.08	67.86	89.47	88.24	29.09	27.27	22.22
Book-to-Price Yield	48.05	49.74	53.13	8.19	13.99	15.80	41.27	55.56	52.38	69.35	90.91	89.47	28.81	10.00	23.81
Cash Earnings-to-Price Yield	48.10	48.31	53.83	11.83	17.95	16.59	50.79	42.86	52.38	76.00	93.75	92.86	27.08	21.43	7.14
1-Mo. Price Momentum	48.37	47.22	50.04	7.66	13.65	17.78	35.48	43.55	48.39	69.84	80.00	95.24	30.16	14.29	19.05
1-Yr. Price Momentum	48.22	48.48	51.53	8.06	15.72	15.28	36.51	44.44	55.56	69.84	80.95	90.48	30.00	12.50	23.81
12-Mo. Prosp. Earn. Growth Rate	48.44	49.25	50.72	8.39	12.66	13.17	41.27	50.79	46.03	68.42	73.68	80.00	28.57	22.22	17.39
3-Yr. Prosp. Earn. Growth Rate	48.48	48.92	51.58	8.49	12.51	12.46	42.86	50.79	55.56	68.42	78.95	80.00	28.57	16.67	15.79
24-Mo. Prospective Earnings Yield	48.44	50.23	52.05	8.39	14.56	15.52	41.27	50.79	57.14	68.42	86.96	90.00	28.57	21.05	10.00
12-Mo. Prospective Earnings Yield	48.46	49.50	50.69	7.66	14.67	29.61	38.10	47.62	41.27	69.84	86.96	100.00	30.16	15.79	0.00
Revenue Growth	48.50	47.06	48.37	9.49	12.44	14.04	47.62	50.79	42.86	68.00	72.22	82.35	27.45	17.65	17.65
Rate of Reinvestment	48.73	48.04	50.79	8.50	16.95	13.97	47.62	55.56	52.38	69.35	80.95	80.95	29.63	5.56	22.22
Return on Equity	48.71	47.95	51.44	8.48	15.62	12.07	47.62	52.38	47.62	68.33	81.25	80.00	31.25	18.75	30.00

ly hard hit in the last quarter of 1997. Return on equity, as expected, performed well in down markets, with outperformance in almost 70% of the observed down markets.

- The "growth" and forecast earnings revision factors have exhibited the greatest last two-year performance, where the value of $100 increased to $136.44 for companies exhibiting high revenue growth, and to $132.11 for top-portfolio consensus revision. During this period, a passive investment in the benchmark rose in value to $101.59.

Fundamental factors. Our "value" and "growth" screens, as expected, perform differently through time, with "growth" proxies showing outperformance in the last two years. The shift in factor performance through our sample period is remarkable. However, the earnings yield factor does deliver consistent performance and outperforms the benchmark on a value-weighted basis in five out of six years, with a factor relative score of 2.5. Book-to-price yield provided average equal-weighted annual outperformance of 6.06% a year, although this turned into a −1.10% average annual underperformance when the post-rank returns were value-weighted. As seen in Malaysia, this reflects a "size effect" occurring within the top portfolio.

For example, the average small-capitalization–large-capitalization annualized spread within that portfolio is 17.2%, while the same spread in the bottom portfolio is 11.5% (these numbers are based on our unreported bivariate analysis of size and the screening factor). The longer-horizon twenty-four-month prospective earnings yield screen generates higher average excess annual returns over the benchmark than the shorter twelve-month expectation (4.22% compared to 1.87%), although this factor does underperform in the volatile markets of 1997.

Expectation factors. Expectation revision screens (change in consensus FY1 forecasts over the preceding three or six months and consensus estimate revision ratios) provide the highest top minus bottom return spreads and on average the highest annualized benchmark outperformance. They are strong in both up and down markets, with all factors providing more than 5% excess returns a year in both down markets of 1996 and 1997, while also outperforming substantially in the bull markets of 1993. This is consistent across all capitalizations (not reported) in the top portfolio and seems to be particularly effective at discriminating on large cap-

italizations in the bottom portfolio, with this group underperforming by an average annual −13.89%. Although the frequency of estimate revisions and magnitude of variation from mean estimates increases in volatile macroeconomic environments, the consensus revision screen seems to have worked better in these types of markets (1997 through 1998).

Technical indicators. There seems to be little information in the momentum indicators.

Size effect. Small-capitalization firms outperformed larger-capitalization firms by on average 14.07% a year on an equal-weighted basis, and by 6.01% after value-weighting the portfolio returns. Similar to the findings in Malaysia, despite a massive outperformance of almost 70% in 1993 and over 20% in 1994, smaller-capitalization stocks underperformed by almost 30% over the last two years of the sample. This is evidenced by the higher risk-adjusted returns associated with this strategy.

The scoring screen. The correlations of the portfolio returns are presented in Exhibit 26. The performance of the scoring screens is detailed in Exhibit 27 and summarized in Exhibit 28. As mentioned previously, South Africa has a short in-sample screening window. Nevertheless, our final scoring model has delivered significant outperformance, before and after considering the effects of potential transaction costs (shown by the robust performance of longer-horizon holding periods). Our monthly holding-period top portfolio has outperformed by 8.64% a year on average, while the bottom portfolio has underperformed by −15.63% a year, resulting in a top-bottom spread of 24.27% a year. Although the average annual excess returns decrease incrementally with longer holding periods, during the out-of-sample period this difference is trivial. All screens outperform by more than 5% year to date in 1998.

Success rates are detailed in Exhibit 29. The strength of the scoring screens is further highlighted in the success rate results. The ratios remain strong across all holding periods. The semiannual holding period shows that more than half the stocks outperform in over 90% of the observations. Also note the ability to pick losers. In over 70% of the periods, more than half the stocks in the bottom portfolio underperformed the benchmark.

Exhibits 30 and 31 display the performance of the scoring screens. In Exhibit 30, an investment of $100 at the beginning of our in-sample period (December 1992) grows to approximately $320 by December 1995. In this same period, the benchmark grew to $260 and the bot-

EXHIBIT 26

EXHIBIT 26
Correlation Coefficient Matrix — South Africa, January 1993-May 1998

Top Portfolio

	PM_12M	EY	HEGR_1Y	HEGR_3Y	BPR	RGR	PM_1M	CAP	DY	CEY	IREV_3M	DE	PEY_12M	PEY_24M	ROE	CH_ROE	PEGR_1Y	PEGR_3Y	CH_FY1_3M	CH_FY1_6M	CH_FY2_FY1	RIR
PM_12M	·	(0.45)	(0.20)	(0.19)	(0.59)	0.06	0.04	(0.47)	(0.58)	(0.30)	0.49	(0.00)	(0.43)	(0.45)	0.12	0.02	(0.03)	0.17	0.42	0.67	0.30	0.04
EY		·	0.11	0.10	0.82	(0.14)	0.00	0.31	0.48	0.66	(0.40)	0.02	0.72	0.72	(0.09)	0.23	(0.08)	(0.30)	(0.43)	(0.48)	(0.51)	(0.16)
HEGR_1Y			·	0.52	0.12	0.15	(0.36)	0.11	0.07	0.32	(0.12)	0.26	0.30	0.33	0.24	0.43	0.20	0.22	0.15	0.22	0.10	0.41
HEGR_3Y				·	(0.03)	0.49	(0.33)	0.10	(0.14)	0.37	(0.15)	0.57	0.36	0.33	0.43	0.51	0.26	0.28	(0.33)	(0.25)	(0.15)	0.68
BPR					·	(0.34)	0.01	0.54	0.66	0.55	(0.48)	(0.11)	0.61	0.66	(0.21)	0.19	(0.16)	(0.40)	(0.44)	(0.55)	(0.38)	(0.40)
RGR						·	(0.36)	(0.35)	(0.44)	0.06	0.19	0.43	0.11	0.10	0.15	0.14	0.34	0.43	0.20	0.17	0.06	0.44
PM_1M							·	0.02	0.24	(0.15)	0.15	(0.36)	(0.21)	(0.32)	(0.28)	(0.11)	(0.18)	(0.24)	0.06	0.15	0.02	(0.20)
CAP								·	0.54	0.26	(0.38)	0.06	0.22	0.28	(0.05)	0.01	(0.20)	(0.34)	(0.43)	(0.48)	(0.13)	(0.20)
DY									·	0.22	(0.41)	(0.37)	0.26	0.32	(0.31)	(0.01)	(0.14)	(0.31)	(0.31)	(0.45)	(0.17)	(0.39)
CEY										·	(0.42)	0.47	0.73	0.73	0.31	0.50	(0.08)	(0.10)	(0.41)	(0.42)	(0.37)	0.23
IREV_3M											·	(0.15)	(0.36)	(0.40)	(0.03)	(0.19)	0.19	0.15	0.67	0.68	0.22	(0.05)
DE												·	0.30	0.29	0.53	0.34	0.18	(0.04)	(0.24)	(0.16)	(0.13)	0.61
PEY_12M													·	0.94	(0.00)	0.36	0.15	(0.04)	(0.40)	(0.50)	(0.51)	0.12
PEY_24M														·	0.02	0.36	0.09	0.18	(0.44)	(0.51)	(0.44)	0.07
ROE															·	0.44	0.30	0.17	0.01	0.04	0.18	0.65
CH_ROE																·			(0.27)	(0.04)	0.01	0.31
PEGR_1Y																	·	0.79	0.01	0.09	0.42	0.16
PEGR_3Y																		·	0.27	0.22	0.56	0.29
CH_FY1_3M																			·	0.70	0.36	(0.09)
CH_FY1_6M																				·	0.42	(0.10)
CH_FY2_FY1																					·	(0.06)
RIR																						·

Bottom Portfolio

	PM_12M	EY	HEGR_1Y	HEGR_3Y	BPR	RGR	PM_1M	CAP	DY	CEY	IREV_3M	DE	PEY_12M	PEY_24M	ROE	CH_ROE	PEGR_1Y	PEGR_3Y	CH_FY1_3M	CH_FY1_6M	CH_FY2_FY1	RIR
PM_12M	·	(0.31)	0.46	0.35	(0.37)	0.36	0.41	(0.41)	(0.39)	(0.30)	0.61	0.41	(0.21)	(0.16)	0.42	0.30	0.53	0.59	0.56	0.74	0.43	0.35
EY		·	(0.15)	(0.11)	0.69	0.06	(0.20)	0.07	0.15	0.17	(0.25)	0.16	0.85	0.80	0.02	0.02	(0.23)	(0.30)	(0.08)	(0.22)	(0.29)	0.40
HEGR_1Y			·	0.63	(0.39)	0.40	0.07	(0.05)	(0.21)	0.21	0.31	0.53	(0.14)	0.09	0.53	0.41	0.33	0.33	0.33	0.41	0.37	0.38
HEGR_3Y				·	(0.40)	0.54	(0.09)	(0.15)	0.12	0.20	0.14	0.46	(0.01)	0.03	0.59	(0.01)	0.25	0.27	0.37	0.34	0.41	0.55
BPR					·	(0.25)	(0.10)	(0.04)	0.15	0.31	(0.24)	(0.38)	0.58	0.58	(0.24)	0.04	(0.47)	(0.47)	(0.18)	(0.31)	(0.50)	0.02
RGR						·	0.12	(0.44)	(0.21)	0.29	0.28	0.59	0.14	0.17	0.29	0.10	0.46	0.44	0.42	0.50	0.31	0.51
PM_1M							·	(0.34)	(0.27)	0.03	0.27	0.08	(0.25)	(0.26)	0.08	(0.18)	0.25	0.28	0.22	0.30	0.18	(0.11)
CAP								·	0.21	0.18	(0.45)	(0.09)	0.01	0.03	(0.06)	(0.20)	(0.29)	(0.33)	(0.43)	(0.46)	(0.04)	(0.24)
DY									·	0.15	(0.46)	(0.05)	0.16	0.12	(0.11)	(0.09)	(0.33)	(0.31)	(0.29)	(0.33)	(0.27)	(0.10)
CEY										·	(0.12)	(0.28)	(0.04)	(0.08)	(0.23)	0.28	(0.32)	(0.43)	(0.19)	(0.34)	(0.05)	(0.26)
IREV_3M											·	0.31	(0.28)	(0.21)	0.17	0.15	0.54	0.51	0.68	0.74	0.48	0.21
DE												·	0.13	0.14	0.38	(0.14)	0.51	0.55	0.43	0.47	0.52	0.56
PEY_12M													·	0.95	(0.02)	(0.14)	(0.21)	(0.26)	(0.11)	(0.17)	(0.34)	0.46
PEY_24M														·	(0.04)	0.19	(0.15)	(0.20)	(0.10)	(0.14)	(0.30)	0.48
ROE															·		0.09	0.08	0.34	0.36	0.24	0.59
CH_ROE																·	0.25	0.28	0.26	0.27	0.16	0.02
PEGR_1Y																	·	0.86	0.59	0.66	0.63	0.19
PEGR_3Y																		·	0.62	0.70	0.67	0.14
CH_FY1_3M																			·	0.85	0.60	0.35
CH_FY1_6M																				·	0.54	0.35
CH_FY2_FY1																					·	0.14
RIR																						·

EXHIBIT 27A
South Africa Scoring Model
Sample Period: 1/93-5/98
Number of Observations: 65 Monthly

Performance Measure/ Summary Statistic		Note*	Portfolios - equal weighted			Portfolios - value weighted			Market portfolio
			-1-	-2-	-3-	-1-	-2-	-3-	
Annualized average return (USD)		1	24.06	10.40	-5.46	18.69	8.98	-5.58	10.05
Cumulative return (indexed at 100 - start)		2	321.54	170.91	73.77	252.97	159.32	73.27	168.02
STD Deviation of returns		3	27.44	24.89	25.69	26.50	24.33	26.28	24.74
Average annual excess return	Rm	4	14.01	0.35	-15.52	8.64	-1.07	-15.63	
	Rf	5	18.67	5.56	-9.66	13.51	4.19	-9.78	
STD Deviation of excess rtns	Rm	6	9.38	8.13	10.97	5.77	5.53	10.03	
	Rf	7	27.52	24.96	25.74	26.55	24.38	26.32	
T-stat: Average XS return Rm = 0		8	3.19	0.08	-3.15	3.24	-0.47	-3.45	
Systematic risk (Beta)		9	1.04	0.95	0.94	1.05	0.96	0.98	
Alpha		10	11.72	0.78	-14.66	7.19	-0.59	-15.17	
Co-efficient of determination		11	0.88	0.90	0.82				
Average market cap		12	8477.36	6921.67	5838.13				7079.05
% periods > Benchmark		13	66.15	43.08	38.46	66.15	44.62	30.77	
% periods > Bench up Mkt		14	67.50	32.50	30.00	72.50	37.50	27.50	
% periods > Bench Dn Mkt		15	64.00	60.00	52.00	56.00	56.00	36.00	
Max # of consecutive bmark outperformance		16	10	4	3	8	3	2	
Maximum positive excess return		17	7.04	5.16	7.82	4.72	3.86	7.94	
Maximum negative excess return		18	-8.02	-6.29	-8.49	-3.64	-4.12	-9.72	
% periods positive returns to negative		19	195.45	132.14	91.18	150.00	103.13	85.71	
% periods of negative returns		20	33.85	43.08	52.31	40.00	49.23	53.85	38.46
Max # of consecutive negative periods		21	4	7	12	6	7	12	6
Max # of consecutive positive periods		22	10	6	7	7	5	5	8
Cumulative annual returns - (index=100 each year)		23							
In sample 1993			244.35	180.51	135.64	188.90	170.16	131.44	167.26
1994			154.65	133.04	138.79	137.79	125.58	126.88	131.32
1995			124.79	116.38	102.12	122.35	120.39	102.56	117.78
Out of sample 1996			83.52	80.91	74.86	94.06	76.97	73.54	82.94
1997			87.38	81.07	67.21	90.29	92.68	72.92	88.51
1998			93.43	93.22	76.26	93.53	86.82	79.88	88.47
Relative Performance -		24							
1993			3	2	1	3	2	1	
1994			3	1	2	3	1	2	
1995			3	2	1	3	2	1	
1996			3	2	1	3	2	1	
1997			3	2	1	2	3	1	
1998			3	2	1	3	2	1	
Average Relative Performance -			3.00	1.83	1.17	2.83	2.00	1.17	
Cumulative annual returns -		25							
Last two years			74.62	65.61	42.58	80.01	67.53	47.97	69.57
Last five years			214.98	129.25	67.95	198.30	127.41	68.33	137.90
Factor average		26	2.41	-0.46	-3.33				-0.28
Factor median		27	2.00	-0.50	-3.00				0.00
Factor standard deviation		28	1.12	0.78	1.33				2.44

*All definitions are in Exhibit 1

EXHIBIT 27B

South Africa Scoring Model
Sample Period: 3/93-3/98
Number of Observations: 21 Quarterly

Performance Measure/ Summary Statistic		Note*	Portfolios - equal weighted			Portfolios - value weighted			Market portfolio
			-1-	-2-	-3-	-1-	-2-	-3-	
Annualized average return (USD)		1	20.71	5.55	-4.35	14.99	8.44	-4.73	8.70
Cumulative return (indexed at 100 - start)		2	268.63	132.78	79.19	208.17	152.98	77.54	154.94
STD Deviation of returns		3	31.41	24.72	24.71	29.86	24.59	25.34	25.91
Average annual excess return	Rm	4	12.01	-3.15	-13.05	6.29	-0.26	-13.43	
	Rf	5	15.57	0.90	-8.66	10.03	3.69	-9.03	
STD Deviation of excess rtns	Rm	6	10.42	7.99	9.31	6.73	5.13	7.86	
	Rf	7	31.63	24.92	24.90	29.99	24.77	25.52	
T-stat: Average XS return Rm = 0		8	2.68	-0.94	-3.22	2.68	-0.94	-3.22	
Systematic risk (Beta)		9	1.15	0.91	0.89	1.13	0.93	0.93	
Alpha		10	9.55	-2.21	-11.92	4.69	0.34	-12.67	
Co-efficient of determination		11	0.91	0.91	0.87				
Average market cap		12	8754.16	6995.01	5780.97				7176.71
% periods > Benchmark		13	71.43	52.38	28.57	57.14	42.86	19.05	
% periods > Bench up Mkt		14	69.23	53.85	30.77	53.85	53.85	23.08	
% periods > Bench Dn Mkt		15	75.00	50.00	25.00	62.50	25.00	12.50	
Max # of consecutive bmark outperformance		16	8	4	4	7	4	1	
Maximum positive excess return		17	19.78	5.02	4.29	9.67	5.43	3.99	
Maximum negative excess return		18	-6.55	-10.73	-11.36	-3.37	-7.32	-11.20	
% periods positive returns to negative		19	200.00	162.50	90.91	200.00	162.50	75.00	
% periods of negative returns		20	33.33	38.10	52.38	33.33	38.10	57.14	38.10
Max # of consecutive negative periods		21	3	3	4	3	4	5	4
Max # of consecutive positive periods		22	8	8	3	8	7	3	7
Cumulative annual returns - (index=100 each year)		23							
In sample 1993			214.47	157.27	132.87	164.39	155.14	136.39	154.24
1994			142.40	138.14	145.54	126.97	134.16	135.51	131.32
1995			128.06	116.89	98.24	123.31	124.52	94.96	117.78
Out of sample 1996			85.71	80.56	70.79	95.02	78.56	67.77	82.94
1997			84.96	77.00	74.33	88.79	92.57	77.72	88.51
1998			94.32	84.29	79.22	95.86	81.17	83.88	88.47
Relative Performance -		24							
1993			3	2	1	3	2	1	
1994			2	1	3	1	2	3	
1995			3	2	1	2	3	1	
1996			3	2	1	3	2	1	
1997			3	2	1	2	3	1	
1998			3	2	1	3	1	2	
Average Relative Performance -			2.83	1.83	1.33	2.33	2.17	1.50	
Cumulative annual returns -		25							
Last two years			72.20	55.77	49.50	79.27	64.50	54.59	69.57
Last five years			203.30	115.99	74.01	185.85	136.19	71.72	137.90
Factor average		26	2.49	-0.44	-3.34				-0.27
Factor median		27	2.50	-0.50	-3.00				0.00
Factor standard deviation		28	1.12	0.80	1.31				2.45

*All definitions are in Exhibit 1

EXHIBIT 27C

South Africa Scoring Model
Sample Period: 6/93-12/98
Number of Observations: 10 Semiannual

Performance Measure/ Summary Statistic		Note*	Portfolios - equal weighted -1-	-2-	-3-	Portfolios - value weighted -1-	-2-	-3-	Market portfolio
Annualized average return (USD)		1	12.88	3.63	-2.45	11.76	4.61	-2.11	6.64
Cumulative return (indexed at 100 - start)		2	183.23	119.51	88.35	174.37	125.25	89.90	137.90
STD Deviation of returns		3	31.17	25.29	29.32	27.19	26.41	26.77	25.64
Average annual excess return	Rm	4	6.24	-3.01	-9.08	5.12	-2.03	-8.75	
	Rf	5	8.03	-1.02	-6.95	6.94	-0.06	-6.62	
STD Deviation of excess rtns	Rm	6	8.74	7.57	9.84	6.26	5.45	5.93	
	Rf	7	31.51	25.65	29.70	27.45	26.72	27.13	
T-stat: Average XS return Rm = 0		8	1.86	-0.89	-1.80	1.89	-0.70	-3.13	
Systematic risk (Beta)		9	1.18	0.94	1.08	1.03	1.01	1.02	
Alpha		10	4.77	-2.56	-9.52	4.69	-2.03	-8.77	
Co-efficient of determination		11	0.94	0.91	0.89				
Average market cap		12	8783.44	7173.67	6120.64				7359.25
% periods > Benchmark		13	80.00	40.00	30.00	70.00	50.00	10.00	
% periods > Bench up Mkt		14	83.33	33.33	50.00	66.67	66.67	16.67	
% periods > Bench Dn Mkt		15	75.00	50.00	0.00	75.00	25.00	0.00	
Max # of consecutive bmark outperformance		16	5	2	2	5	4	1	
Maximum positive excess return		17	18.27	5.88	9.83	8.00	4.04	2.26	
Maximum negative excess return		18	-5.33	-12.42	-15.04	-3.89	-8.00	-11.67	
% periods positive returns to negative		19	150.00	150.00	100.00	150.00	150.00	100.00	
% periods of negative returns		20	40.00	40.00	50.00	40.00	40.00	50.00	40.00
Max # of consecutive negative periods		21	2	2	2	2	2	2	2
Max # of consecutive positive periods		22	5	5	3	4	5	3	5
Cumulative annual returns - (index=100 each year)		23							
In sample 1993			155.55	134.05	133.94	143.95	133.13	134.34	137.28
1994			136.80	141.04	148.13	125.45	139.24	134.12	131.32
1995			123.02	114.72	108.86	120.20	123.45	106.78	117.78
Out of sample 1996			83.75	82.21	72.16	93.17	78.87	72.55	82.94
1997			85.79	83.98	72.96	89.38	86.25	77.94	88.51
1998			97.43	79.81	77.71	96.47	80.47	82.63	88.47
Relative Performance -		24							
1993			3	2	1	3	1	2	
1994			1	2	3	1	3	2	
1995			3	2	1	2	3	1	
1996			3	2	1	3	2	1	
1997			3	2	1	3	2	1	
1998			3	2	1	3	1	2	
Average Relative Performance -			2.67	2.00	1.33	2.50	2.00	1.50	
Cumulative annual returns -		25							
Last two years			74.42	58.67	47.90	79.47	60.51	55.27	69.57
Last five years			183.23	119.51	88.35	174.37	125.25	89.90	137.90
Factor average		26	2.48	-0.40	-3.35				-0.29
Factor median		27	2.50	-0.50	-3.00				0.00
Factor standard deviation		28	1.08	0.75	1.37				2.46

*All definitions are in Exhibit 1

EXHIBIT 28
Factor Performance Summary — South Africa

	Sample Period	Number of Observations	Average Annualized Return		Return Spread Top/Bottom	Annualized Excess Returns		Std. Dev. of Annualized Returns		Std. Dev. of Top/Bottom Spread Returns	% Periods Benchmark Outperformance	
			Top	Bottom	Bottom	Top	Bottom	Top	Bottom	Returns	Top	Bottom
Scoring Model — Monthly Observations	1/93-5/98	65	18.69	-5.58	24.27	8.64	-15.63	26.50	26.28	14.45	66.15	30.77
Scoring Model — Quarterly Observations	3/93-3/98	21	14.99	-4.73	19.72	6.29	-13.43	29.86	25.34	13.60	57.14	19.05
Scoring Model — Semiannual Obs.	6/93-12/98	10	11.76	-2.11	13.87	5.12	-8.75	27.19	26.77	11.97	70.00	10.00

EXHIBIT 29
Success Rates — South Africa

	Average Success Rate			Std. Dev. of Average Success Rate			Average Success Rate Consistency Ratio			Most Successful			Success Rate Least Successful		
	Universe	Top	Bottom	Universe	Top	Bottom	Universe	Top	Bottom	Universe	Top	Bottom	Universe	Top	Bottom
Scoring Model — Monthly Obs.	48.07	53.10	57.12	8.00	13.83	16.16	40.00	67.69	67.69	69.84	82.61	88.89	28.81	25.00	23.53
Scoring Model — Quart. Obs.	47.87	54.79	59.21	8.74	11.14	13.35	42.86	71.43	66.67	66.13	78.26	84.21	33.33	33.33	35.29
Scoring model — Semiannual Observations	46.95	52.15	60.23	8.40	5.80	14.83	50.00	90.00	70.00	58.33	65.22	73.68	36.76	42.86	29.41

EXHIBIT 30
South Africa: Performance of Stock Selection Model
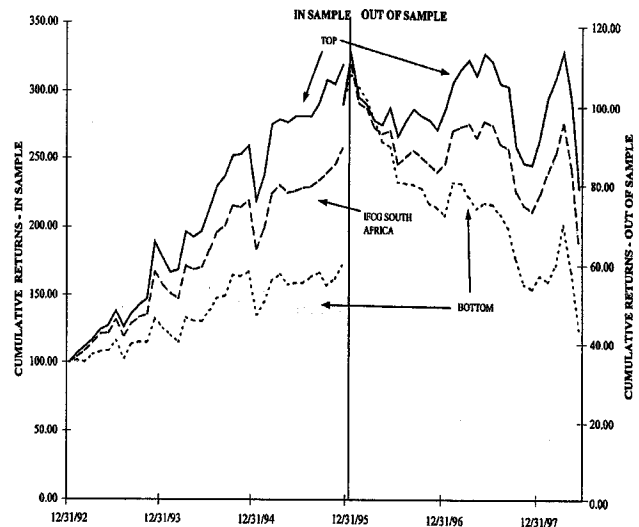
EXHIBIT 31
South Africa: Success Ratio Analysis
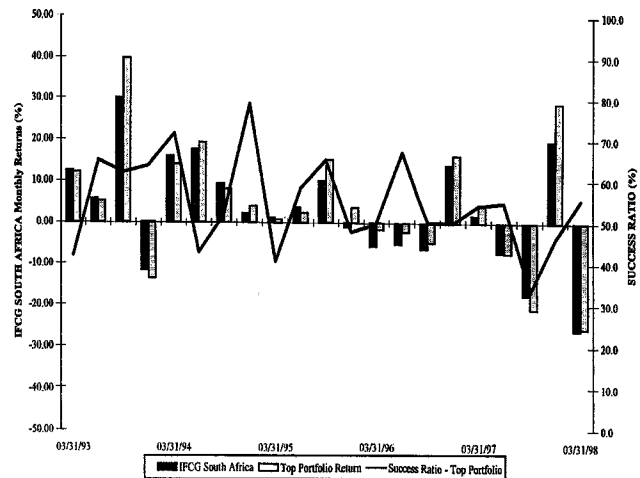
tom portfolio grew to only $170. An investment of $100 in December 1995 (the beginning of our out-of-sample period) falls to $80 by March 1998 for the top portfolio, compared to $68 for the benchmark portfolio and $44 for the bottom portfolio.

Exhibit 31 presents the quarter-by-quarter performance of the top portfolio relative to the benchmark. The top-portfolio return usually exceeds the benchmark. The relative consistency appears to be stronger in

the out-of-sample period. The success rates (right axis) are generally above 50%. The lowest success rate is 35%, which coincides with the third quarter of 1997 when the top portfolio underperformed the benchmark. However, this quarter is anomalous. Indeed, the top portfolio substantially outperformed the benchmark in the fourth quarter of 1997 (here the success rate was slightly below 50%).

CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

Most of the focus in both the research on emerging markets and in the practice of investment has been on the country selection mechanisms. Contrary to conventional wisdom, country selection is not the only way to add value in emerging markets; stock selection can also be a source of significant outperformance.

Indeed, the recent turmoil in Asia and many other emerging markets emphasizes the importance of the country selection mechanism. For example, even though we show considerable ability to identify relative winners and losers in Malaysia (top-portfolio performance is sharply better than the bottom portfolio), any investment in Malaysia in 1997 and the first part of 1998 is a bad investment. An investment of $100 in our top portfolio at the beginning of the out-of-sample period falls in value to $38 by May 1998.

So it is obvious that the country selection mechanism is still very important, but perhaps more than at any other time stock selection is just as important. Prices are relatively low (compared to last year), suggesting that top-down value-based strategies might find some of these markets attractive. But which stocks should be purchased and which should be sold? Our analysis is useful because we provide detailed information about the performance of various screening factors in both up and down markets.

Another useful part of our analysis is related to the bottom portfolio. While it is virtually impossible to execute long-short (hedge) strategies in most emerging markets, the bottom portfolio yields important information about stocks to avoid. With the recent volatility in many emerging markets, this type of risk control is increasingly important for active portfolio management.

The most pressing problem for future research is the merging of the country selection and stock selection exercises. In all of our reported scoring screens, the

weights on the factors are constant through time. It makes sense that some factors perform better in certain economic environments. Hence, to enhance the performance of the stock selection mechanism, it is important to know both the current economic state and have an expectation of country performance that interacts with the factor weights. This is the research direction that we are currently pursuing.

ENDNOTES

[1]To list a few important references, Graham and Dodd [1934], Basu [1977, 1983], Rosenberg and Marathe [1979], Banz [1981], Reinganum [1981], Keim [1983], DeBondt and Thaler [1985], Chan, Hamao, and Lakonishok [1991], Fama and French [1992, 1993, 1995, 1996, 1998], Ferson and Harvey [1994], Lakonishok, Shleifer, and Vishny [1994], Kothari, Shanken, and Sloan [1995], Jagannathan and Wang [1996], Daniel and Titman [1997], Brennan, Chordia, and Subrahmanyam [1998], Ferson and Harvey [1998a, 1998b], Davis, Fama, and French [1998], and Rouwenhorst [1998a, 1998b].

[2]See Bekaert and Harvey [1995, 1997, 1998a, 1998b] and Bekaert, Harvey, and Lumsdaine [1998].

[3]Claessens, Dasgupta, and Glen [1997] examine beta, size, trading volume, dividend yield, and earnings price ratios. Rouwenhorst [1998b] examines price-to-book, size, momentum, and beta.

[4]See, for example, Bernstein [1995].

[5]See, for example, DeBondt and Thaler [1987], Jaffe, Keim, and Westerfield [1989], Chan, Hamao, and Lakonishok [1991], Fama and French [1992, 1993, 1995, 1996, 1998], Ferson and Harvey [1994], Lakonishok, Shleifer, and Vishny [1994], Davis [1994], Kothari, Shanken, and Sloan [1995], Jagannathan and Wang [1996], Daniel and Titman [1997], Brennan, Chordia, and Subrahmanyam [1998], Ferson and Harvey [1998a, 1998b], Davis, Fama, and French [1998], and Maroney and Protopapadakis [1998]. Daniel, Hirshleifer, and Subrahmanyam [1998a] present a theory of overconfidence that attempts to explain why fundamental factors predict the cross-section of asset returns. Fama and French [1996] argue that the attributes represent risk exposures.

[6]There is considerable literature on slow adjustment to

earnings announcements. See Bernard and Thomas [1989, 1990]. The information in analyst recommendations has been studied recently by Womack [1996] and Michaely and Womack [1996].

[7]See Jegadeesh [1990], Lehmann [1990], and Jegadeesh and Titman [1993].

[8]See, for example, Banz [1981], Basu [1983], and Jaffe, Keim, and Westerfield [1987].

[9]See also Herrera and Lockwood [1994].

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