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Portfolio Investment in Developing Countries

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7. Portfolio Enhancement Using Emerging Markets and Conditioning Information

Campbell R. Harvey

This paper explores the implications of the low correlations of the emerging market returns with developed market returns and the relatively high degree of predictability of emerging economies' returns in the context of conditional asset allocation strategies. It is well known that low correlations improve investment opportunities and my research provides out-of-sample validation of the improved performance. The most dramatic enhancement, however, is generated by the use of conditioning information. Portfolio strategies that use conditioning information to predict emerging market returns produce out-of-sample performance that doubles traditional benchmark returns over the 1980-92 period.

Many individual investors, as well as portfolio and pension fund managers, are reexamining their basic investment strategies. In the 1980s, fund managers realized that significant performance gains could be obtained by diversifying into high-quality global equity markets. These gains are limited, however, by the fairly high cross-correlations returns in these markets.

While investment has traditionally been concentrated in developed markets, new interest has been sparked by the so-called "emerging" capital markets. The emerging markets have at least three attractive qualities, two of which are their high average returns and their low correlations with developed markets. Diversification into these markets should result in higher expected returns and lower overall volatility.

In terms of portfolio theory, adding low-correlation portfolios to an optimization enhances the reward-to-risk profile by shifting the mean-variance frontier to the left. This type of exercise may be misleading, however, because it is based on ex post returns. This paper focuses on the performance of allocation strategies that optimize investment weights at the end of the month and hold the implied portfolio for the next month. Investment weights are then reoptimized, and this strategy is continued throughout the 1980-92 period.

The portfolio optimization problem requires important inputs—the expected returns and the variance-covariance matrix. In principal, all of these measures should be forward-looking. That is, the returns, volatilities, and correlations should be forecasted. The resulting investment strategy reflects current information.

The twist in this paper is that it utilizes the third desirable property of emerging market returns—predictability. Forecasting models are developed which provide one-step-ahead forecasts for 41 markets (20 developed markets and 21 emerging markets).

Six portfolio strategies are evaluated. The first three examine traditional allocations based on developed markets, developed and emerging markets, and developed and emerging markets with a 20 percent cap on emerging markets. The allocations are traditional in that naive models, based on historical averages of the expected returns, variances and covariances, are used. For each case, two strategies are examined: holding the global minimum variance portfolio and holding the portfolio with a target volatility of 16 percent (annualized).

The fourth to sixth allocations use the same set of assets, except that conditioning information directly enters the optimization. With forecasted means, variances, and covariances, new investment weights are calculated and the out-of-sample performance is evaluated and compared to the traditional asset-allocation strategy.

Using the traditional asset allocation, there is some benefit to adding emerging markets to portfolios. The most dramatic enhancement comes with the introduction of emerging markets and conditioning information. Standard performance measures, such as ratios of expected return to volatility, more than double when both emerging markets and conditioning information are used.

The second part of the paper explores the risk of emerging markets. In the context of a global asset pricing model, each equity market has exposure to world risk

factors. If the model provides a reasonable description of the expected returns, then each risk exposure is meaningful in that it is rewarded in equilibrium. Harvey (1993a) finds that there is no relation between emerging market returns and the risk sensitivity to the Morgan Stanley Capital International (MSCI) world portfolio. This study examines four additional factors: a world currency investment portfolio, the excess return on an investment in crude oil, growth in OECD industrial production, and OECD inflation.

One weakness of previous analyses of emerging market returns is that static models are used. For example, risk exposures are often assumed to be constant. In the context of mature, developed economies, this might be an innocuous assumption. In the arena of emerging economies, it is unlikely that risk exposure remains fixed through time. Emerging economies are often characterized by shifting industrial structures which will induce changes in risk sensitivities. My research provides a first-step examination of time-varying correlations between the emerging returns and the five risk factors.

The paper begins by presenting the unconditional and conditional portfolio optimization strategies. It then presents the data used in the analysis. It evaluates the results of the out-of-sample portfolio allocation. It explores the risk exposures of the emerging markets. Finally, it offers some concluding remarks.

Portfolio Strategies

Unconditional asset allocation

The usual problem that investment managers face is how to maximize the expected returns of the portfolio, subject to some target level of volatility. That is, investment weights are chosen to give the best possible performance for an expected level of standard deviation. The target standard deviation is determined outside the problem by the investor's tolerance for risk.

The solution to this problem,

$$\begin{aligned} \max_{\mathbf{w}} \quad & \mathbf{w}'\boldsymbol{\mu} \\ \text{Subject to} \quad & \mathbf{w}'\mathbf{V}\mathbf{w} = \text{Target} \\ & \mathbf{w}'\mathbf{1} = 1 \end{aligned} \quad (1)$$

where \mathbf{w} represents a $N \times 1$ vector of investment proportions, $\boldsymbol{\mu}$ is a $N \times 1$ vector of expected asset returns, \mathbf{V} is a $N \times N$ variance-covariance matrix, and N is the number of economies in the problem, is a standard quadratic

program.

In this problem, the investment proportions are unrestricted in size but must sum to unity. This opens the possibility of extremely large short and long positions in any market. Given that thin trading is a problem in many emerging markets, it seems plausible that all short sales should be disallowed,

$$w_i \geq 0 \quad \text{for } i = 1, \dots, N. \quad (2)$$

This adds a third set of asset-specific constraints to the problem (1).

The strategies evaluated in this paper involve solving (1) at the end of each month and holding the implied portfolio for the next month. The sample is updated using a 60-month moving window and the portfolio is reoptimized at each point in time. In all strategies, transactions costs are ignored, although it is straightforward to modify the problem to add proportional transactions costs. All strategies are evaluated on an out-of-sample basis over the 1980.12 to 1992.06 period. That is, the first allocation is based on data from 1976.12 to 1980.11.

Two basic strategies are evaluated. The first is to choose the minimum-variance portfolio. That is, the investment weights match the weights implied by the minimum-variance portfolio over the previous five years. These weights are used to form a portfolio, and it is held over the next month. The second strategy involves choosing a portfolio with a target level of volatility of 16 percent (annualized). This volatility is roughly the volatility of holding the MSCI world market portfolio (see Harvey 1991), a common benchmark.

In solving the problem, there is always a minimum-variance portfolio. There is not always a portfolio with the 16 percent target volatility, however, because of the short-sales constraints. In the case where the 16 percent cannot be attained from below (on the negatively sloped section of the mean-variance frontier) the maximum-variance portfolio is chosen. When the 16 percent cannot be attained from above (on the positively sloped section of the mean-variance frontier), the minimum-variance portfolio is chosen.

Three sets of equity groups are considered. The first restricts the assets to 21 equity markets in the MSCI universe. The second group adds 20 emerging equity markets from the International Finance Corporation (IFC). The third group includes the 41 economies, but imposes the additional constraint to (1) and (2) that the sum of the weights in the emerging markets must be less than or equal to 20 percent. This precludes the possibility that an

unreasonable proportion of the portfolio is placed in emerging market assets.

The strategy is considered unconditional because of the way that expected returns, variances, and covariances are chosen. The expected returns are the mean returns over the previous 60 months. Although these mean returns change through time as the 60-month window moves, using the average returns assumes that the best forecast of the equity return is its past average. This is consistent with a random walk model of stock prices with drift. This model implies that there is no other information relevant for forecasting next month's stock price other than the previous price. In other words, stock returns are not predictable.

The unconditional strategy also places restrictions on other inputs to the problem. The variances and covariances are assumed to be the unconditional variances and covariances over the previous 60 months. This precludes the possibility that these measures move in more complex ways.

All strategies are developed and implemented in U.S. dollar terms. This assumes that no currency hedging takes place. Implementing the problem in local currency terms would be consistent with perfect foresight currency hedges being initiated for each country. This assumption is tenuous for developed markets and unreasonable for the emerging markets. As a result, the evaluation is done in a common numeraire currency.¹

Conditional asset allocation

In the mean-variance problem in (1), three sets of inputs are needed: means, variances, and covariances. At the end of the month, the investor is trying to design the portfolio that guarantees the highest possible expected return for the level of volatility that is consistent with the risk tolerance. In solving the unconditional problem, a set of portfolio weights are obtained that guarantees the highest ex post returns for a level of volatility—over the past five years. In other words, the unconditional mean-variance problem delivers a set of investment weights that "work"—but only over the past history.

The only way for the manager to obtain an efficient portfolio (highest expected return for a level of volatility) in the unconditional problem is to hold the investment weights implied by the actual data. Suppose that a manager is being evaluated over the 1981.01 to 1985.12 period. In 1980.12, the manager begins to manage the portfolio. Evaluation is measured in terms of how close the manager

is to the efficient frontier. But the manager can obtain this efficient portfolio only by knowing the data for 1981.01 to 1985.12—which is obviously impossible.

In implementing the unconditional asset allocation strategies, managers will optimize their portfolio over 1976.01 to 1980.12 and hold the implied portfolio weights over the next period. These weights guarantee that the portfolio is efficient over the 1976.01 to 1980.12—not in the future.

So, in practice, what is really required for the mean-variance problem is the best possible *forecasts* of the expected returns, variances, and covariances *for the next period*. The past averages may not be that meaningful because the investment manager cares about the future, not the past. Past averages are used only if the means, variances, and covariances are completely unpredictable.

The conditional asset allocation implements forecasting models for the inputs of the mean-variance problems. Linear regression models are built for the conditional means using a number of information variables,

$$E[r_{it} | Z_{t-1}] \quad (3)$$

where r_{it} is the return on country i over the period from $t-1$ to t , Z_{t-1} is a $1 \times l$ vector of l global and country-specific information variables that are known at time $t-1$, and δ_i is a $l \times 1$ coefficient matrix. The errors from this regression, ϵ_{it} , are assumed to be unrelated to the conditioning information, Z_{t-1} .

I use linear models for conditional means, which is consistent with a number of previous studies.² The forecasting variables include a constant as well as world variables such as the lagged world dividend yield and lagged world returns, and country-specific variables, including lagged country dividend yield, and lagged country returns. All of the forecasting variables are financial variables—to ensure data availability on the last day of the month.

The portfolio problem also requires the forecast of the variance-covariance matrix. Consider the covariance between assets i and j :

$$\text{Cov}[r_{it}, r_{jt} | Z_{t-1}] = E[(r_{it} - E[r_{it} | Z_{t-1}])(r_{jt} - E[r_{jt} | Z_{t-1}]) | Z_{t-1}]. \quad (4)$$

Given the regression errors in (3), we can rewrite (4) as:

$$\text{Cov}[r_{it}, r_{jt} | Z_{t-1}] = E[\epsilon_{it}\epsilon_{jt} | Z_{t-1}] \quad (5)$$

The conditional covariance is the forecasted value of the product of the residuals for the regression models for asset i and asset j .

In principle, the conditioning information for asset i and asset j is different. In addition, the conditioning information on the product of the two residuals could be the intersection of the two information sets plus additional variables. For example, an autoregressive-conditional heteroskedasticity (ARCH) type model would include lagged values of the product of the residuals in the information set.

The approach of this paper is to use the unconditional mean of the product of the residuals as the forecasted variance-covariance matrix. This implicitly assumes that the product of the residuals is not predictable. This follows, in spirit, the approach of Solnik (1993). The matrix used in this paper is not the unconditional variance-covariance matrix, however. It is the average conditional variance-covariance matrix. Importantly, the $Z_{i,j}$ variables are allowed to affect the means.

This approach greatly simplifies the estimation. Indeed, a full model of the variance-covariance matrix would require up to 820 forecasting equations if 41 markets are examined. In addition, the most important inputs for asset allocation are the expected values for the asset returns. The optimal weights are much more sensitive to a change in the means than to a change in the variances or covariances.

Similar to the unconditional asset allocation, the variance-covariance matrix is based on a 60-month moving window average of the product of the regression residuals through the sample. In the analysis, the regressions are estimated over the full sample which implies that the regression coefficients, δ_i , are constant. More elaborate models using moving-window estimation for the conditional means are also possible. This would allow for out-of-sample forecasts at every step.³

In addition, to minimize the data-snooping problem, a set of predetermined information variables are chosen before the data are examined. While the set of information variables resembles the set of variables used in potentially datasnooped studies of developed markets, no one has examined the predictability of emerging market returns. In addition, given the low correlations between emerging returns and developed returns, it does not necessarily follow that the variables that predict developed market returns automatically predict emerging market returns.

There is also the issue of survivorship biases in the emerging markets data, which is examined in Harvey

(1993a). The IFC began publishing indexes in 1981—yet its data reach back to 1975.¹² In some of the markets, the indexes were back-tracked. This induces a look-back bias in the sample. That is, the stocks in 1976 are the ones that survived to 1981. Harvey argues that it is not clear that this problem is serious. In addition, the asset allocation routine avoids the look-back by requiring that the market exist for five years before it is included in the allocation.

Data

Sources and summary statistics

Data are available on 21 developed markets from MSCI and 20 emerging markets from the IFC of the World Bank. Some summary statistics are presented in Table 1.

The summary statistics are presented for the full sample period, 1976.01 to 1992.06, and for a recent subperiod, 1985.01 to 1992.06. Both dollar returns and local currency returns are displayed. The statistics include the average (annualized) arithmetic and geometric returns, standard deviation, and autocorrelations. The developed market summary statistics are presented over different samples by other authors and appear for the purpose of comparison with the emerging returns.

The mean dollar returns for the emerging markets range from 72 percent (Argentina) to -6 percent (Indonesia, whose sample only begins in January 1990). This sharply contrasts with the range of average returns in the developed markets. In the MSCI sample, no economy has an average arithmetic return that exceeds 25 percent. In the IFC emerging sample, nine economies (Argentina, Chile, Colombia, the Philippines, Portugal, Taiwan (China), Thailand, Turkey, and Venezuela) have returns that average above 25 percent.

It is important to present both the arithmetic and geometric average returns. The geometric average reflects the average returns to a buy-and-hold strategy. With high volatility, there could be large differences in the arithmetic and geometric mean returns. This is especially evident in the emerging markets sample. The most dramatic example is Argentina where the arithmetic average return is 72 percent and the geometric average is 27 percent.

The emerging market returns are characterized by high volatility. Volatility ranges from 18 percent (Jordan) to 105.6 percent (Argentina). In contrast, the MSCI economies have a range of volatility between 15 percent and 33 percent. There are 13 emerging economies with volatility higher than 33 percent (Argentina, Brazil, Chile, Greece,

Indonesia, Mexico, Nigeria, the Philippines, Portugal, Taiwan (China), Turkey, Venezuela, and Zimbabwe).

The autocorrelations are also presented in Table 1. In the MSCI sample, there are only five economies with first-order autocorrelations that exceed 10 percent. In the emerging economies, there are 12 economies with autocorrelations greater than 10 percent. Indeed, there are eight economies with autocorrelations above 20 percent (Colombia, Indonesia, Mexico, Pakistan, the Philippines, Portugal, Turkey, and Venezuela). This suggests that the returns in these economies are predictable based on past information.

The second panel of Table 1 examines the most recent subperiod. The same pattern in the summary statistics is evident. For example, one might think that the extraordinary 72 percent average return for Argentina might be the function of a look-back bias because the data begin in 1975.12. However, in the most recent subperiod, the average return in Argentina is 88 percent. Indeed, in the most recent subperiod, there are 10 economies whose returns exceed 33 percent. The predictability is also retained with 10 economies exhibiting serial correlation above 20 percent.

For comparison purposes, the statistics on the returns in local currency terms are also presented. The wild inflation in Argentina and Brazil is evident in their 228 percent and 156 percent average returns over the full sample. Other economies that have experienced severe inflation, such as Colombia, Chile, and Venezuela, also have much higher local returns. Calculating the returns in dollars eliminates the local inflation. However, the U.S. inflation remains in the returns.

Cross-correlations of the emerging markets are calculated, as well as correlations of the emerging markets and the MSCI markets. The dollar return correlations within the emerging markets are remarkably small. For example, the correlation between Argentina and Brazil is only -3 percent. The correlation between Pakistan and India is -10 percent. The correlation between Colombia and Chile is zero percent. The correlations in the most recent subperiod show the same characteristics. The correlation between Argentina and Brazil is still -4 percent.

When the correlations are in local currency terms, they do not change much. For example, the correlation between the Argentina and Brazil returns increases to 15 percent when measured in local currency terms. Over the shorter sample, the correlation is 16 percent. The correlation between Colombia and Chile is -6 percent.

The average correlations between the emerging and

developed markets are very small. Malaysia has the highest correlation with developed markets and Mexico has the second highest. For the other economies, the correlations are often less than 10 percent. For example, Argentina has correlations less than 10 percent for 18 of the 21 developed markets. The Republic of Korea has correlations less than 10 percent for eight of the 21 developed markets.

The same holds true in the most recent subperiod. Argentina's and Venezuela's correlations with each of the 21 MSCI markets are less than 10 percent. There are many economies that have negative correlations with a number of developed markets.

Mullins (1993) argues that the low average monthly correlations could be due to market imperfections such as lead and lag effects. Mullins shows that the annual correlations are higher than the monthly correlations. It is not clear, however, that they are statistically higher. In my sample (excluding Indonesia), there are 171 cross-correlation coefficients for 19 returns. Using monthly data, 26 are significantly different from zero. With the annual data, only five are significantly different from zero. This evidence supports the position that the low correlations are real rather than the result of infrequent trading.⁴

The low correlations imply that significant benefits can be gained by diversifying into the emerging markets. Even though the volatility of the individual emerging markets is high, the low correlations should reduce portfolio volatility. This is evident in the work of Divecha, Drach, and Stefek (1992), Stone (1990), and Wilcox (1992). Next, I will assess how these benefits translate into portfolio performance.

Asset Allocation

Performance of unconditional asset allocation strategies

The unconditional minimum-variance frontiers for each month between 1980.12 and 1992.06 are graphed in Figure 1. The first panel presents frontiers based on the MSCI sample of developed equity markets. The second panel introduces the emerging markets into the optimization. It is evident that the introduction of the emerging markets, overlaying these two panels, greatly increases the investment possibilities. The frontiers move up (higher mean) and shift inward (lower standard deviation). This is evident even if the emerging markets are restricted to 20 percent of the investment portfolio.

Figure 2 presents the weights placed on the aggregate

of the MSCI portfolio and the emerging market portfolios for the two investment strategies. In the first panel, the weights for the minimum-variance strategy are shown. Through the entire sample, the weight on the developed markets decreases and the weight on the emerging markets increases. By the end of the sample, the optimizer wants to place over 90 percent of investment funds in emerging markets. The second panel shows the weights of the minimum-variance strategy when the investment in emerging markets is constrained to be at 20 percent or below. This constraint is binding in every month.

The next two panels show the weights for the 16 percent target volatility strategy. The weights are much more variable in this exercise. Indeed, the weight on the developed markets plunges from above 80 percent at the beginning of 1985 to zero for five months. Other than this one extreme swing, the same pattern persists: if the optimizer is unconstrained, it will place increasing weight on the emerging equities. The constrained optimization with the 20 percent cap, shown in the final panel, suggests that the constraint is binding after 1987.

Performance measures for the minimum-variance strategy show that, when restricted to developed markets, the out-of-sample performance amounts to 16.09 percent per year with a 15.39 percent standard deviation.⁵ If emerging markets are added to the problem, the performance increases slightly to 16.35 percent. More dramatically, the volatility drops to only 11.63 percent. When the emerging markets are capped at 20 percent, the actual return increases to 17.02 percent and the volatility increases to 14.02 percent—however, this is still almost a full percentage point lower than the strategy that restricts investment to only developed economies. The Sharpe ratios (return in excess of the Eurodollar rate⁶ divided by the standard deviation) for the three minimum-variance investment strategies are: 0.48, 0.66, and 0.59. These results suggest an unambiguous benefit to diversifying into emerging markets. Interestingly, the benefit is driven mainly by lower portfolio volatility rather than higher returns.

In measures of the year-by-year performance of these strategies, the developed markets plus the emerging markets with the 20 percent cap produce returns that are almost always better than the developed economies alone. The exception is the first six months of 1992.

Results for the 16 percent target volatility strategy show that all of these strategies have lower returns than the minimum-variance strategies. The highest return, 13.48 percent, is found in the developed and emerging sample.

The Sharpe ratios for the three strategies are 0.23, 0.24, and 0.16.

In year-by-year performance, the 16 percent target strategy sustains serious losses in 1982, 1984, and 1990. An explanation of the returns of the different 16 percent volatility strategies does not suggest that any one dominates the others.

Why doesn't the 16 percent target strategy perform better than the minimum-variance strategy? The answer has to do with the mean. In solving for the minimum-variance portfolio, you do not need the mean (see Roll 1977, equation A.14)). That is, the allocation is not affected by mismeasurement of the mean. The 16 percent target strategy, however, needs an estimate of the mean. As a result, if the forecast of the return is poor, the 16 percent strategy will suffer. The minimum-variance strategy will be relatively immune to a misspecification of the mean. It now makes sense to examine the specification of the mean.

Predictability of returns

A number of world and local information variables are used to forecast the returns on the 41 equity markets. Each variable is known at time $t - 1$ when the forecast takes place. The world variables include a constant, the lagged world return, the lagged return on a 10-country currency index,⁷ the lagged MSCI world dividend yield, the lagged MSCI earnings-price ratio, and the lagged Eurodollar rate. The local information variables include the lagged country equity return in local currency terms, the lagged change in the country's foreign exchange rate per U.S. dollar, the lagged country dividend, and the lagged country earnings-price ratio. For the emerging economies, the last two information variables are only available beginning in 1985. As a result, these two variables do not enter the regression forecasts until 1985.

The results of the dollar regressions show that in the overall sample, 14 of the 21 developed economies exhibit significant predictability. In nine of these economies, the local information variables help predict the equity returns. A multivariate test of the predictability suggests that we can reject the hypothesis that the expected returns are constant at the 99 percent level of confidence.

For the predictability of returns among the 20 emerging markets, regressions are significant in 12 of them. In addition, local information (lagged return, lagged FX) is important in five of these economies. There are nine emerging markets whose R^2 s exceed 10 percent. This

contrasts with only four developed markets with R^2 above 10 percent. The multivariate test of predictability provides a strong rejection (99.9 percent level of confidence) of the hypothesis that the expected emerging returns are constant.

For the most recent sample, returns are predictable in 15 of the 21 developed economies. For the emerging markets, 13 of 20 regressions are significant. Local information is important in five developed economies. The local information (which now also includes a lagged dividend yield and a lagged earnings-price ratio) is important in 9 of the 20 emerging market regressions. In 18 of the regressions, the R^2 s exceed 10 percent. Indeed, in 11 of the regressions, the R^2 s exceed 20 percent. The message is that the emerging returns are predictable—and more so than the developed economy returns.

The performance of conditional asset allocation strategies

Figure 3 draws the conditional mean-variance frontiers from 1980.12 to 1992.06. These frontiers are based on expected returns from the regression model (4). For the economies with all the conditioning variables the full-period coefficient estimates are used for the expected returns. For the economies which are missing the dividend yield and earnings-price ratios before 1985. Two models are estimated. The first model omits the dividend yield and earnings-price ratio, and fitted values are obtained through 1984.12. The second model uses the most recent data and the full set of conditioning variables, and the fitted values are obtained from 1985.01 through 1992.06.

All panels of Figure 3 dramatically contrast with figure 1. The mean-variance frontiers shift across to a lower volatility range and upward to a higher expected return range. In almost every case, the parabola opens up indicating a wider range of investment opportunities. The frontiers are truncated between the annualized expected returns of -30 percent and 70 percent.

Comparing panels A (developed markets) and panels B (developed and emerging) for the 1981-85 period, the shape of the frontiers looks similar. However, the frontiers have been shifted to the lower volatility range in panel B. The more dramatic differences appear in the 1986-92 graphs. When emerging markets are added to the mean-variance problem, the frontier flattens out and moves to the lower standard deviation range. Even when the 20 percent cap on the emerging markets is binding (in panel C), this flattening out is evident.

Figure 4 plots the investment weights for the minimum

volatility and the 16 percent target volatility strategies. Similar to Figure 2, when there is no constraint on the weight of the emerging markets in the portfolio, the investment weight assigned to emerging markets increases through time. By 1992, the optimizer tells us to invest only 10 percent of our portfolio in developed country stocks. When the problem is rerun with the 20 percent cap on emerging markets, the constraint is binding from 1981.

The weights depicted in Figure 4 for the 16 percent target volatility strategy are more variable, but follow similar patterns to the ones experienced in Figure 2. There is a huge reweighting to emerging markets beginning in 1986. Over time, when the participation in emerging markets is not constrained, the investment weights increase in these markets. By the last optimization, all investment is placed in emerging markets. The move to emerging markets is also evident in the constrained optimization. By 1986, the 20 percent cap is always binding.

Performance measures of the portfolio strategies with conditional asset allocation show that the mean (annualized) return when only developed markets are included is 16.99 percent, with a volatility of 15.14 percent. Similar to the unconditional strategy, when emerging markets are added to the problem, the mean return increases to 17.97 percent and the volatility plunges to 11.66 percent. Also similar to the unconditional strategy, when the emerging markets are capped at 20 percent the returns increase to 18.87 percent and the volatility increases to 14.05 percent—still more than a full percentage point below the case where we are restricted to only developed markets' equities. The Sharpe ratios for the three strategies are 0.55, 0.80, and 0.72.

The conditional minimum volatility and the unconditional strategy have striking similarities. The results are similar because, as mentioned earlier, the minimum-variance portfolio weights do not directly depend on the expected returns vector. The results are not exactly the same for two reasons. First, the problem is different than the one examined in Roll (1977) because of the no short-sales constraint. Second, and more importantly, the mean enters the problem indirectly through the variance-covariance matrix. In the unconditional problem, we use the unconditional variances and covariances. In the conditional problem, we use the average conditional variance and the average conditional covariance. The extent to which the conditional second moment measures differ from their unconditional counterparts will determine the degree of difference in the investment weights.

In the target 16 percent volatility strategy, the expected returns play a critical role. In the unconditional strategies, the historical average returns are used as the expected returns and the performance of this strategy is inferior to the minimum-variance strategy. For example, in the unconditional minimum-variance strategy with developed and capped emerging markets, the average expected volatility is 9.52 percent, producing a return of 17.02 percent. In contrast, in the unconditional 16 percent target volatility (whose average expected volatility is actually 16.19 percent), the return is only 12.09 percent. By taking on almost double the volatility, your returns go down. This might seem surprising. As noted earlier, the intuition behind this result, however, has to do with the expected returns.

The average historical mean is not a very good forecast of the expected returns in most economies. In the minimum-volatility strategy, we get around the forecasting problem. In the target volatility strategies, however, you must use a forecasting model. The results of the performance measures under conditional asset allocation suggest that implementing an asset allocation model using historical means as forecasts for the expected returns could have disastrous consequences.

The performance measures for the 16 percent volatility strategy use the regression forecasts for the expected returns. The average expected returns for the developed economy sample are 29.94 percent with a volatility of 18.33 percent.⁸ When the emerging markets are added to the problem, the returns leap to 54.96 percent, however, the realized volatility jumps to 24.40 percent. When the emerging markets are constrained to a 20 percent portfolio weight, the annual return is 39.30 percent, with a volatility of 19.89 percent. The Sharpe ratio for the strategy with the emerging markets capped at 20 percent is 1.53. This compares to a ratio of 1.16 if the investor is restricted to only developed markets; 0.23 for the strategy that does not use conditioning information.

The year-by-year returns of the six different investments that use conditioning information are also calculated. For the minimum-volatility strategy, the returns are similar to those obtained with unconditional asset allocation in that losses are sustained in the first and last years. However, for the 16 percent volatility strategy, the returns are much different from the unconditional ones. In the exercise with both developed and capped emerging markets, there is only one year with a small negative return (1982, -0.49 percent). All other years have positive returns, with returns for five years in excess of 30 percent.

The returns implied by the conditional asset allocation suggests that the main benefit of investment in emerging markets comes from the predictability of the emerging market returns. This predictability, combined with the low correlations within emerging markets and with developed markets, enhances portfolio performance.

Implicit in the mean-variance analysis are the assumptions that investors prefer higher expected returns and that the risk (which investors dislike) of the portfolio is captured by the overall variance. It is useful to characterize the risk of the individual markets. Indeed, in implementing portfolio optimization, it is commonplace to add constraints to limit exposure to certain types of risk. The problem that we face, in particular, is how do we characterize the risk of the emerging markets?

Risk Exposure of Emerging Markets

Single factor models

If an efficient benchmark portfolio exists, then the risk of the individual market is measured by the covariance with the efficient benchmark. The expected return on that market would be exactly linear in the efficient benchmark (Roll 1977 and Ross 1977). If the benchmark is not efficient (and even if it is very close to efficient), there may be no relation between the covariance and the expected returns.⁹

One potential benchmark is the MSCI world market portfolio in excess of the 30-day Eurodollar deposit rate. Cumby and Glen (1990), Harvey (1991), Harvey and Zhou (1993), and Ferson and Harvey (1994) fail to reject the mean-variance efficiency of this portfolio within the set developed economies' assets. Harvey (1993a) shows that it is unlikely that this benchmark will adequately characterize the expected returns on emerging country assets.

The one-factor model is estimated for both the developed and emerging markets. The loading on MSCI world market portfolio is significantly different from zero in each of the developed economies.¹⁰ In the emerging markets, only seven economies (Greece, Korea, Malaysia, Mexico, the Philippines, Portugal, and Thailand) have significant betas. In addition, only one of the economies has a beta greater than unity (Portugal 1.168); so it is unlikely that there is a strong relation between expected returns and this risk exposure.

In the more recent subperiod, the results are similar. Only six emerging markets have betas that are significantly different from zero. Only a single country has a beta greater

than one and two economies have negative betas. The R^2 s of these regressions range from zero (in 13 economies) to 20 percent (Malaysia). Even if returns are calculated in local-currency terms, the significance is not altered.

The inability of the single-factor model to characterize the emerging returns is a result of the MSCI portfolio being inefficient relative to the set of assets examined. Indeed, the low or negative betas are expected from the low and negative correlations that many of the emerging markets have with the developed market. The MSCI world market portfolio is really a developed world market portfolio.

The betas used in estimating the model assume that the risk is constant throughout the period examined. Five-year rolling correlation measures of the country returns and the MSCI excess returns are plotted, with and without the October 1987 observation. The results depict some interesting changes in the correlations. In Brazil, correlations have increased from zero in the early 1980s to 25 percent by 1992. There is no significant pattern in any of the other South American economies. The Mexican correlations, however, have increased from zero in 1986 to 30 percent by 1991. In the East Asian economies, the correlations have been progressively increasing, reaching 40 percent in Korea, 60 percent in Malaysia, 40 percent in the Philippines, 15 percent in Taiwan (China), and 40 percent in Thailand. The correlation of India has been uniformly decreasing through time. The Greek and Portuguese correlations have reached 25 percent and 50 percent respectively by 1992.

The time-variation in the correlations suggest that the sensitivity of many emerging markets to the MSCI world portfolios is increasing. While there is only limited ability of the betas to explain the expected return variation across different economies (the cross-sectional adjusted R^2 is only 4 percent in the overall period),¹¹ it appears as if this cross-sectional R^2 may increase from the beginning of the sample to the end of the sample.

Foreign exchange exposure

The inclusion of a foreign exchange factor is motivated by the work of Solnik (1974), Sercu (1980), Stulz (1981), and Adler and Dumas (1983). The models presented in these papers provide an explicit role for exchange risk. I simplify the exchange risk into a single factor which represents the investment return on a portfolio of local deposits in 10 developed economies in excess of the 30-day Eurodollar rate. The index is developed and analyzed in

Harvey (1993b).

For developed market returns, the betas on the exchange investment index are significantly different from zero in 12 of 21 economies in the overall period. The factor has marginal explanatory power in eight of the 20 emerging markets (Greece, India, Jordan, Malaysia, Mexico, Pakistan, Taiwan (China), and Zimbabwe). In eight other economies, however, the R^2 of the two-factor regressions is zero.

In the most recent subperiod, the marginal explanatory power of the foreign exchange risk factor is not substantially altered. There are eight economies with t-statistics greater than 1.5 on the exchange portfolio. This portfolio has some ability to explain returns in Argentina and Chile, as well as Thailand.

The significance of the foreign exchange risk factor in developed markets is not altered if the returns are calculated in local-currency terms. Indeed, 17 of the 21 developed markets have significant exposures in local-currency terms. In addition, the explanatory power in the emerging markets is unchanged. Only seven of the 20 economies have significant exposure to this factor when returns are measured in local-currency terms.

Five-year rolling correlations between the country returns and the foreign exchange portfolio are also plotted. These measures are not the same as betas because the correlation with the world market portfolio is not being controlled for. However, the results reveal interesting similarities to the correlation measures of the country returns and the MSCI excess returns. In general, there is a tendency for the correlations to increase in absolute magnitude during the last seven years of the sample. This is the case in the South American economies and Mexico. The correlations are zero in the East Asian economies, with the exception of Thailand. The correlation of the foreign exchange index and Greece is about 30 percent in 1992, and has risen to more than 50 percent for Portugal.

Again, although foreign exchange exposure does not explain the average returns¹² (measured over the entire sample, the cross-sectional R^2 is 7 percent), the graphs indicate that the cross-sectional relation may be strengthening through time.

Multifactor models

Three additional factors are examined: the return on a portfolio of crude oil less the Eurodollar deposit rate, the growth in OECD industrial production, and the rate of OECD inflation. The risk exposures for the five-factor model

are calculated.

In the overall sample of 21 developed economies, eight have significant exposure to oil, two have exposure to industrial production growth, and five have significant exposure to inflation. The adjusted R^2 of these regressions range from 3 percent to 71 percent.

The inclusion of these additional factors does not help explain the emerging market returns. Of the 20 economies, five have significant oil exposure. In four of these economies (Colombia, Jordan, the Philippines, and Taiwan (China)), the exposure is negative, indicating decreasing returns when oil prices rise. In Venezuela the exposure is positive, as it is (albeit insignificantly) in Mexico and Nigeria. Only three of the emerging economies have significant exposure to world industrial production and four economies have significant loadings on world inflation. The adjusted R^2 of the five-factor regressions range from zero (in six economies) to 25 percent in Malaysia.

The five-year rolling correlations with the final three factors are plotted. In most developed economies, the oil exposure is negative. Even producers like the United Kingdom and Canada have zero or negative exposure. In the emerging markets, there are a number of different patterns. For example, the Mexican exposure, while positive in the early 1980s, is now negative. It appears as if that economy's dependence on the state of the U.S. economy is more important than their oil holdings. India has a strange positive correlation with oil increasing from zero in 1987 to about 35 percent by 1992. Thailand's correlation has dramatically changed from 35 percent in the early 1980s to -35 percent by 1992.

The correlations between the growth in industrial production and the inflation rate are also plotted. In seven of the emerging markets, the correlation with OECD industrial production has increased through time. In the other 13 markets, there are no detectable patterns over time. In addition, there are no obvious trends in the correlation with OECD inflation across all the emerging markets.

While the addition of the three factors increases the ability to explain the cross-section of expected returns (adjusted R^2 rises to 10 percent), much is left unexplained.¹³ There are two ways to interpret these results. In one sense, the combination of the five prespecified factors can be considered a portfolio. The inability of the factor loadings as a group to explain the cross-section of average returns suggests that this portfolio is inefficient.

One can also view the results within the context of market integration. In an integrated global market place,

the same exposure to risk in two different economies commands the same reward. The lack of a cross-sectional relation between the risk loadings and return performance could be symptomatic of market segmentation. As markets become more integrated, one would expect higher cross-sectional correlation of risk exposures and expected returns.

Lack of integration opens up the possibility that equities are inefficiently priced in some emerging markets. Interestingly, the global investment manager may not care. The manager likes the opportunity of purchasing securities at a price lower than the implied value in an integrated world economy.

The notions of underpricing and overpricing are vague, without explicit reference to an asset pricing model. To give an example, in many of the emerging markets there is a clear relation between average returns and volatility (see Harvey 1993a). In a globally integrated economy, covariance—not variance—is priced. Global investors can enhance their portfolio performance by taking on a high variance/high expected return emerging asset. The enhancement results from the extremely high contribution to portfolio expected return per unit of covariance (not variance). This opportunity is further attenuated by the significant degree of predictability in many of these emerging markets.

Conclusions

The idea of this study is to examine the impact of emerging equity markets on global investment strategies. Recently a number of researchers have documented the low correlations between emerging equity returns and developed market returns. In an active portfolio strategy, this means that the opportunity set has become larger: higher expected returns can be gained at lower volatility.

Portfolio simulations are presented to verify that the low correlations produce superior out-of-sample portfolio allocations. The out-of-sample allocation is important because portfolio programs usually produce weights that are *ex post* optimal. There is no guarantee that these weights will work with data outside the program (in the future). Strategies that include emerging equity markets, however, consistently outperform strategies that are limited to developed markets.

While the low correlations with developed markets are important, the most striking advantage of investing in emerging markets relates to their predictability. Regression models are presented that show that the returns in a number

of the emerging markets are predictable based on both global and country-specific information variables. When these regression forecasts are combined with a portfolio optimizer, the simulated portfolio performances sharply improve.

The final question is what are the risks of investing in emerging equity markets. In real world portfolio selection, investment weights are chosen subject to a number of constraints, such as the elimination of short-sales, caps on long positions in any market, and limits on the portfolio exposure to certain sources of risk. For the last constraint, estimates of each market's risk exposure is needed. These risk constraints eliminate the possibility of choosing a portfolio with a higher expected return than, say the Standard and Poor's 500, and the same volatility—but with an oil beta of -3.00 (compared to the S&P 500 oil beta of -0.30).

Five sources of risk are examined: the world market equity return, the return on a foreign currency index, the change in the price of oil, world industrial production growth, and the world inflation rate. Only a handful of emerging economies have significant betas on these factors. For example, only one of 20 emerging markets have a beta against the world market portfolio that exceeds unity.

One implication of the risk analysis is that many of the emerging markets are not well integrated into the global economy. The time-series evidence suggests, however, that a number of economies are becoming increasingly integrated. Models that allow for time-varying conditional integration of world capital markets are explored in Harvey (1993c).

On a more practical side, as long as the emerging market is investable, the portfolio manager may not care whether or not the market is integrated. Lack of integration can present opportunities for investors. Assets with high expected returns can be purchased at cheaper prices than comparable assets in developed economies. In addition, the lack of significant risk loadings to a standard set of global factors suggests risk target constraints would not be binding for the emerging equity markets.

Notes

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1. Harvey (1993b) studies the international asset allocation problem and argues that the portfolio selection should include currency portfolios (in the form of local deposits or loans). The solution to the quadratic program will deliver the optimal asset allocation as well as the optimal currency hedges.

2. See for example, Gibbons and Ferson (1985), Keim and Stambaugh (1986), Fama and French (1988, 1989), Harvey (1989, 1991), Ferson and Harvey (1991, 1993), Campbell and Hamao (1992), and Harvey (1993a). Harvey (1992) compares the performance of linear models to general nonlinear alternatives and finds that linear models perform as well as nonlinear models in out-of-sample evaluations.

3. Harvey (1989) and Solnik (1993) examine the out-of-sample forecasts of the linear regression models and find that their performance compares favorably to the in-sample forecasts.

4. When monthly data are used, there are five emerging economies that have significant correlation with the U.S. return. With annual data, only one country has significant correlation (at the 5 percent level of significance).

5. For comparison over the same period, the MSCI world return was 14.32 percent with a standard deviation of 15.45 percent. The MSCI U.S. return was 14.96 percent with a standard deviation of 15.92 percent.

6. Based on the average 30-day Eurodeposit rate over the 1980.12 to 1992.06 period of 8.7 percent.

7. See Harvey (1993b) for details on the construction of this index.

8. These results are consistent with Solnik's (1993) study of eight developed markets over the 1971.01 to 1990.08 period. His unconditional asset allocation produced returns of 18.2 percent with a standard deviation of 17.5 percent. Using the conditional means and the unconditional variances and covariances, the returns increased to 24.6 percent, with a volatility of 20.4 percent.

9. See Roll and Ross (1993).

10. Note that the table presents regressions of returns, not excess returns, on the MSCI world market portfolio. As a result, many of the intercepts are significantly different from zero.

11. In contrast, the adjusted R^2 of the regression of the 21 developed country average returns on their betas is 30 percent.

12. For the 21 developed economies, the cross-sectional adjusted R^2 is 37 percent.

13. For the 21 developed economies, the adjusted R^2 is 29 percent.

Comments

Arjun Divecha

There are two parts to this paper: the predictability of future

returns in emerging markets and the ability to forecast the risk of markets by using a global asset model.

The first part compares the use of unconditional (purely

historical) data to forecast means, standard deviations and covariances between markets with the use of conditional forecast data.

It shows that historical variances and covariances between markets are a good proxy for future variances and covariances, a result that we have found in our work. As a consequence, the minimum-variance strategy Harvey investigates works well.

On the other hand, historical means as a proxy for future means have no predictive power. These results conform to the theory that it is much easier to forecast second moments than first moments of any distribution.

The conditional strategy relies on forecasting mean returns to economies, based on very simple variables, both global and local. These conditional means are then used to forecast mean, variance, and covariance between the markets. In this case, Harvey finds that the conditional means have forecasting power in both developed and emerging markets, with much greater power in emerging markets.

This result confirms our expectation that emerging markets are less efficient than developed markets, and so can be modeled more easily.

The main conclusion that be reached is that it makes sense to spend time on models that forecast mean returns in emerging markets, but that there is little point in spending time forecasting variances and covariances since historical data perform well.

The second part of the paper shows that a single-factor model does not work well in explaining market movements. A five-factor global model does not work very well either. One should not conclude that factor models will not work well in explaining market movements, but that perhaps other factors may also work and that more research needs to be done. Our work shows that when country, currency, and industry factors are taken into account, forecastability increases. The inability to form a model is one sign that emerging markets are efficient and that therefore there is scope for country funding.

Table 1

Means, standard deviations and autocorrelations of international equity returns

Country	Start	Arith. mean	Geo. mean	Std. dev.	ρ_1	ρ_2	ρ_3	ρ_4	ρ_{12}	ρ_{24}
Morgan Stanley Capital International Developed U.S. dollar returns 1976.01-1992.06										
Australia	76.01	15.95	12.17	26.34	0.02	-0.13	-0.04	0.03	-0.10	0.01
Austria	76.01	16.20	12.31	24.21	0.14	0.02	0.03	0.10	0.01	0.06
Belgium	76.01	16.03	15.80	20.97	0.07	0.07	-0.03	0.05	-0.01	0.03
Canada	76.01	12.44	10.36	19.80	-0.02	-0.07	0.06	-0.02	-0.11	0.08
Denmark	76.01	14.98	13.13	19.08	-0.07	0.06	0.05	0.07	-0.18	0.07
Finland	88.01	-9.66	-12.17	22.15	0.09	-0.33	-0.07	-0.00	0.03	0.42
France	76.01	17.78	14.51	25.26	0.02	-0.02	0.10	0.06	-0.10	0.01
Germany	76.01	15.17	12.73	21.81	-0.04	-0.01	0.12	0.10	-0.08	0.00
Hong Kong	76.01	25.45	19.25	33.86	0.02	-0.05	-0.12	-0.12	-0.06	-0.00
Ireland	88.01	12.61	9.72	24.28	-0.19	-0.11	-0.12	0.18	-0.25	0.64
Italy	76.01	14.68	11.11	26.84	0.18	-0.03	0.08	0.07	0.07	0.03
Japan	76.01	17.97	15.20	23.36	0.01	-0.03	0.04	0.08	0.12	0.07
Netherlands	76.01	18.95	17.30	17.83	-0.06	-0.09	0.05	-0.04	0.01	-0.04
New Zealand	88.01	-1.98	-5.18	26.12	-0.04	-0.09	-0.07	-0.14	-0.10	0.05
Norway	76.01	16.60	12.49	28.41	0.12	-0.04	0.09	-0.04	-0.02	-0.02
Singapore/Malaysia	76.01	16.72	13.06	26.21	0.03	0.02	-0.10	0.06	-0.05	0.04
Spain	76.01	10.32	7.32	24.47	0.11	0.00	-0.04	0.11	-0.03	0.12
Sweden	76.01	18.65	15.87	23.24	0.08	0.00	0.05	-0.01	0.01	-0.02
Switzerland	76.01	14.18	12.37	18.74	0.05	0.00	-0.02	0.01	-0.03	0.07
United Kingdom	76.01	19.20	16.50	22.90	-0.01	-0.09	-0.08	-0.00	-0.14	0.03
United States	76.01	14.27	13.00	15.46	-0.01	-0.06	-0.08	-0.04	-0.02	0.06

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U.S. dollar returns 1976.01-1992.06

Argentina	76.01	71.66	27.02	105.06	0.05	0.06	0.12	-0.05	-0.10	-0.02
Brazil	76.01	22.69	4.71	60.83	0.03	-0.04	-0.04	-0.08	0.03	0.01
Chile	76.01	38.65	30.80	39.84	0.17	0.26	-0.02	-0.04	0.09	0.06
Colombia	85.01	45.60	40.27	32.57	0.49	0.16	-0.02	-0.13	0.03	-0.11
Greece	76.01	9.75	3.82	36.77	0.12	0.18	0.04	-0.05	-0.05	0.04
India	76.01	21.45	17.86	26.87	0.09	-0.10	-0.04	-0.06	-0.09	-0.03
Indonesia	90.01	-6.29	-12.35	34.95	0.30	0.24	-0.12	-0.11	0.19	-0.13
Jordan	79.01	10.14	8.53	18.04	0.00	0.02	0.18	0.01	-0.02	-0.00
Korea	76.01	20.02	15.15	31.97	0.01	0.07	0.03	-0.02	0.12	0.03
Malaysia	85.01	13.56	9.81	26.90	0.05	0.08	-0.07	-0.02	-0.10	0.11
Mexico	76.01	30.44	19.02	45.00	0.25	-0.08	-0.04	0.04	-0.01	0.01
Nigeria	85.01	2.18	-6.36	37.20	0.09	-0.13	-0.22	0.03	-0.08	-0.02
Pakistan	85.01	25.65	23.21	22.38	0.27	-0.24	-0.18	0.19	0.13	-0.09
Philippines	85.01	51.16	43.23	38.79	0.33	0.02	0.07	0.13	0.06	-0.06
Portugal	86.02	40.85	29.00	51.43	0.27	0.03	-0.02	0.27	0.03	0.42
Taiwan	85.01	39.93	25.37	54.06	0.06	0.04	-0.06	0.05	0.13	-0.11
Thailand	76.01	21.55	18.11	25.69	0.12	0.16	-0.01	-0.12	0.05	-0.04
Turkey	87.01	47.89	22.04	76.71	0.24	0.10	0.20	0.26	-0.16	-0.08
Venezuela	85.01	37.92	26.23	47.52	0.27	0.18	0.08	0.02	-0.06	-0.21
Zimbabwe	76.01	10.16	4.33	34.30	0.13	0.15	0.24	0.17	-0.04	-0.03

Table 1 (continued)

Country	Start	Arith. mean	Geo. mean	Std. dev.	ρ_1	ρ_2	ρ_3	ρ_4	ρ_{12}	ρ_{24}
Morgan Stanley Capital International: Developed U.S. dollar returns 1985.01-1992.06										
Australia	85.01	20.94	16.23	28.48	-0.04	-0.06	-0.06	-0.06	-0.17	0.02
Austria	85.01	32.75	27.53	31.50	0.14	-0.05	-0.03	0.12	-0.03	0.02
Belgium	85.01	28.93	26.09	23.23	0.06	-0.10	0.03	-0.10	0.03	0.00
Canada	85.01	10.89	9.46	16.57	0.02	-0.09	-0.04	-0.08	-0.12	0.15
Denmark	85.01	22.41	19.99	21.63	-0.21	-0.03	-0.04	0.08	-0.14	-0.06
Finland	88.01	-9.66	-12.17	22.15	0.09	-0.33	-0.07	-0.00	0.03	0.42
France	85.01	27.66	24.30	25.16	0.00	0.01	0.13	0.10	-0.13	0.03
Germany	85.01	24.17	20.60	26.13	-0.02	-0.01	0.11	0.15	-0.10	-0.04
Hong Kong	85.01	32.36	27.11	29.58	-0.08	-0.11	-0.00	-0.12	-0.12	-0.02
Ireland	88.01	12.61	9.72	24.28	-0.19	-0.11	-0.12	0.18	-0.25	0.64
Italy	85.01	22.29	18.73	26.76	0.22	0.07	0.15	0.16	-0.00	0.01
Japan	85.01	17.78	13.90	27.91	0.04	0.03	0.03	0.07	0.14	0.10
Netherlands	85.01	23.07	21.52	16.47	-0.06	-0.09	0.11	0.00	0.04	0.12
New Zealand	88.01	-1.98	-5.18	26.12	-0.04	-0.09	-0.07	-0.14	-0.10	0.05
Norway	85.01	19.85	15.74	28.09	0.08	0.03	0.01	-0.11	-0.05	-0.06
Singapore/Malaysia	85.01	16.31	12.08	27.52	0.03	0.03	-0.13	0.13	-0.14	0.14
Spain	85.01	28.17	24.38	27.00	0.14	-0.09	-0.11	0.04	-0.08	0.08
Sweden	85.01	24.85	21.81	23.82	0.17	-0.05	-0.15	-0.05	0.07	0.04
Switzerland	85.01	21.74	19.46	20.81	0.05	-0.00	-0.04	0.04	-0.06	0.07
United Kingdom	85.01	23.13	20.23	23.48	-0.10	-0.14	-0.04	0.04	-0.11	0.05
United States	85.01	16.88	15.32	15.96	0.02	-0.08	-0.10	-0.16	-0.04	0.08

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U.S. dollar returns 1985.01-1992.06

Argentina	85.01	87.65	38.13	115.85	-0.03	-0.00	0.12	-0.17	-0.08	0.10
Brazil	85.01	35.60	6.43	77.19	0.01	0.04	-0.07	-0.12	0.01	-0.01
Chile	85.01	53.45	48.79	27.61	0.27	-0.10	-0.34	-0.27	0.09	-0.06
Colombia	85.01	46.80	40.27	32.57	0.49	0.16	-0.02	-0.13	0.03	-0.11
Greece	85.01	37.80	27.35	47.98	0.10	0.17	-0.02	-0.16	-0.14	-0.02
India	85.01	26.92	20.85	35.29	0.15	-0.11	-0.08	-0.04	-0.14	-0.06
Indonesia	90.01	-6.29	-12.35	34.95	0.30	0.24	-0.12	-0.11	0.19	-0.13
Jordan	85.01	7.83	6.23	17.99	-0.05	-0.06	0.19	-0.10	0.15	-0.18
Korea	85.01	22.90	18.39	30.23	-0.02	0.20	0.03	0.20	0.12	0.18
Malaysia	85.01	13.56	9.81	26.90	0.05	0.08	-0.07	-0.02	-0.10	0.11
Mexico	85.01	55.90	41.81	48.13	0.30	-0.18	-0.29	-0.06	0.07	-0.07
Nigeria	85.01	2.18	-6.36	37.20	0.09	-0.13	-0.22	0.03	-0.08	-0.02
Pakistan	85.01	25.65	23.21	22.38	0.27	-0.24	-0.18	0.19	0.13	-0.09
Philippines	85.01	51.16	43.23	38.79	0.33	0.02	0.07	0.13	0.06	-0.06
Portugal	86.02	40.85	29.00	51.43	0.27	0.03	-0.02	0.27	0.03	0.42
Taiwan	85.01	39.93	25.37	54.06	0.06	0.04	-0.06	0.05	0.13	-0.11
Thailand	85.01	31.26	26.38	29.73	0.13	0.04	-0.07	-0.28	-0.06	-0.01
Turkey	87.01	47.89	22.04	76.71	0.24	0.10	0.20	0.26	-0.16	-0.08
Venezuela	85.01	37.92	26.23	47.52	0.27	0.18	0.08	0.02	-0.06	-0.21
Zimbabwe	85.01	28.05	22.86	32.06	0.26	0.31	0.26	0.31	-0.11	0.03

Table 1 (continued)

Country	Start	Arith. mean	Geo. mean	Std. dev.	ρ_1	ρ_2	ρ_3	ρ_4	ρ_{12}	ρ_{14}
Morgan Stanley Capital International-Developed Local currency returns 1976.01-1992.06										
Australia	76.01	18.00	15.32	21.93	0.06	-0.18	-0.06	0.13	-0.08	0.04
Austria	76.01	11.48	9.23	21.40	0.22	-0.02	-0.07	0.10	0.01	0.02
Belgium	76.01	13.98	14.29	18.11	0.20	-0.02	-0.15	-0.06	0.03	-0.09
Canada	76.01	13.03	11.36	17.78	-0.00	-0.05	0.06	-0.01	-0.07	0.09
Denmark	76.01	14.36	12.83	17.23	0.11	0.05	0.14	0.16	-0.11	0.04
Finland	88.01	-8.29	-10.97	23.18	0.15	-0.14	0.05	0.02	0.09	0.39
France	76.01	17.84	15.35	21.96	0.07	-0.06	0.00	0.08	-0.08	-0.02
Germany	76.01	10.96	9.23	18.28	0.07	-0.06	0.08	0.05	-0.04	-0.06
Hong Kong	76.01	27.64	21.84	32.74	-0.00	-0.04	-0.04	-0.13	-0.07	-0.03
Ireland	88.01	11.52	8.67	24.11	0.04	-0.13	-0.10	0.27	-0.15	0.43
Italy	76.01	17.58	14.29	25.80	0.15	-0.01	0.08	0.05	0.07	0.04
Japan	76.01	11.49	9.85	17.96	-0.01	0.07	-0.02	0.01	0.06	0.10
Netherlands	76.01	16.13	14.63	16.82	0.03	-0.05	0.00	-0.08	0.09	-0.05
New Zealand	88.01	2.20	-0.95	25.99	-0.09	-0.04	-0.00	-0.15	-0.02	-0.01
Norway	76.01	16.69	12.91	27.13	0.15	-0.08	0.09	-0.06	0.05	-0.03
Singapore/Malaysia	76.01	13.85	10.44	25.21	0.07	0.03	-0.10	0.04	-0.03	0.04
Spain	76.01	12.50	10.11	21.81	0.15	0.01	-0.11	0.08	0.02	0.09
Sweden	76.01	19.86	17.23	22.50	0.21	0.05	0.04	0.05	0.07	0.02
Switzerland	76.01	9.73	8.48	15.48	0.13	-0.01	-0.12	-0.09	-0.02	0.01
United Kingdom	76.01	18.85	16.86	19.25	0.01	-0.14	-0.08	-0.00	-0.07	-0.00
United States	76.01	14.27	13.00	15.46	-0.01	-0.06	-0.08	-0.04	-0.02	0.06

International Finance Corporation-Emerging
Local currency returns 1976.01-1992.06

Argentina	76.01	228.93	155.60	147.94	0.18	0.20	0.12	-0.01	-0.02	-0.11
Brazil	76.01	155.90	124.26	79.54	0.16	0.23	0.15	0.17	0.20	0.11
Chile	76.01	61.44	53.35	39.06	0.17	0.29	0.00	-0.00	0.15	0.06
Colombia	85.01	71.92	65.55	32.52	0.48	0.14	-0.04	-0.16	0.04	-0.15
Greece	76.01	19.24	13.82	34.76	0.11	0.15	0.01	-0.10	-0.06	0.02
India	76.01	28.85	24.90	28.20	0.11	-0.09	-0.07	-0.08	-0.02	-0.04
Indonesia	90.01	-1.36	-7.44	35.15	0.29	0.24	-0.12	-0.10	0.20	-0.14
Jordan	79.01	16.04	14.51	17.35	0.08	0.05	0.14	-0.02	-0.02	0.01
Korea	76.01	22.90	18.12	31.37	-0.05	0.06	0.01	-0.05	0.13	0.04
Malaysia	85.01	13.91	10.23	26.53	0.06	0.07	-0.10	-0.02	-0.06	0.12
Mexico	76.01	62.35	52.45	42.35	0.34	0.00	0.03	0.12	0.06	0.07
Nigeria	85.01	35.93	34.76	12.03	0.11	-0.04	-0.01	0.11	0.10	-0.14
Pakistan	85.01	32.30	29.70	22.49	0.27	-0.25	-0.16	0.21	0.13	-0.08
Philippines	85.01	54.61	46.26	40.40	0.28	-0.03	0.03	0.15	0.04	-0.09
Portugal	86.02	37.67	25.89	51.32	0.27	0.03	-0.07	0.31	0.08	0.52
Taiwan	85.01	32.82	18.94	52.80	0.05	0.03	-0.09	0.02	0.13	-0.12
Thailand	76.01	22.80	19.42	25.37	0.12	0.16	-0.01	-0.12	0.05	-0.06
Turkey	87.01	88.53	61.93	76.89	0.18	0.08	0.13	0.22	-0.15	-0.07
Venezuela	85.01	63.78	55.07	40.26	0.37	0.21	0.19	0.20	-0.04	-0.27
Zimbabwe	76.01	22.15	16.71	33.04	0.10	0.13	0.25	0.21	-0.05	-0.02

Table 1 (continued)

Country	Start	Arith. mean	Geo. mean	Std. dev.	ρ_1	ρ_2	ρ_3	ρ_4	ρ_{12}	ρ_{14}
Morgan Stanley Capital International-Developed Local currency returns 1985.01-1992.06										
Australia	85.01	20.74	17.56	22.93	-0.02	-0.05	-0.08	0.03	-0.09	0.14
Austria	85.01	22.56	17.93	30.55	0.21	-0.05	-0.11	0.08	-0.02	-0.04
Belgium	85.01	19.04	16.74	21.12	0.20	-0.05	-0.19	-0.11	-0.01	-0.19
Canada	85.01	9.34	8.15	15.06	0.02	-0.07	-0.01	-0.09	-0.10	0.17
Denmark	85.01	13.02	11.30	18.41	-0.00	-0.07	0.10	0.14	-0.11	-0.02
Finland	88.01	-8.29	-10.97	23.18	0.15	-0.14	0.05	0.02	0.09	0.39
France	85.01	18.68	15.92	23.12	0.13	-0.03	0.12	0.05	-0.11	-0.08
Germany	85.01	13.87	10.96	23.70	0.09	-0.06	0.06	0.05	-0.05	-0.20
Hong Kong	85.01	32.80	26.96	31.45	-0.13	-0.10	-0.01	-0.12	-0.10	0.01
Ireland	88.01	11.52	8.67	24.11	0.04	-0.13	-0.10	0.27	-0.15	0.43
Italy	85.01	15.00	11.87	25.24	0.20	0.11	0.11	0.05	-0.03	-0.10
Japan	85.01	7.33	4.71	22.93	0.01	0.11	-0.01	0.02	0.10	0.07
Netherlands	85.01	13.38	11.86	16.87	0.14	-0.06	0.01	-0.19	0.08	-0.09
New Zealand	88.01	2.20	-0.95	25.99	-0.09	-0.04	-0.00	-0.15	-0.02	-0.01
Norway	85.01	14.08	10.16	27.36	0.16	-0.07	0.02	-0.19	0.01	-0.07
Singapore/Malaysia	85.01	12.25	8.11	27.22	0.09	0.04	-0.10	0.11	-0.09	0.14
Spain	85.01	19.88	16.55	25.51	0.24	-0.08	-0.20	-0.01	-0.05	0.09
Sweden	85.01	18.30	15.33	23.73	0.24	-0.00	-0.21	-0.09	0.08	0.00
Switzerland	85.01	13.14	11.04	20.09	0.13	-0.00	-0.13	-0.13	-0.07	-0.14
United Kingdom	85.01	15.81	13.66	20.06	-0.01	-0.19	-0.01	0.03	-0.07	-0.06
United States	85.01	16.88	15.32	16.96	0.02	-0.08	-0.10	-0.16	-0.04	0.08

International Finance Corporation-Emerging
Local currency returns 1985.01-1992.06

Argentina	85.01	286.32	183.65	187.75	0.15	0.21	0.11	-0.05	-0.02	-0.10
Brazil	85.01	247.09	191.35	100.36	0.03	0.21	0.04	0.06	0.12	0.00
Chile	85.01	66.94	61.99	26.49	0.29	-0.08	-0.31	-0.27	0.09	-0.06
Colombia	85.01	71.92	65.55	32.52	0.48	0.14	-0.04	-0.16	0.04	-0.15
Greece	85.01	42.40	32.25	47.19	0.09	0.16	-0.03	-0.18	-0.10	-0.02
India	85.01	38.92	31.88	37.90	0.15	-0.10	-0.11	-0.09	-0.04	-0.08
Indonesia	90.01	-1.36	-7.44	35.15	0.29	0.24	-0.12	-0.10	0.20	-0.14
Jordan	85.01	14.20	12.69	17.38	0.06	-0.04	0.18	-0.16	0.14	-0.13
Korea	85.01	22.11	17.79	29.62	-0.09	0.17	0.00	0.18	0.11	0.18
Malaysia	85.01	13.91	10.23	26.53	0.06	0.07	0.10	-0.02	-0.06	0.12
Mexico	85.01	93.65	78.90	49.33	0.37	-0.04	-0.13	0.03	0.01	0.09
Nigeria	85.01	35.93	34.76	12.03	0.11	-0.04	0.11	0.10	0.10	-0.14
Pakistan	85.01	32.30	29.70	22.49	0.27	-0.25	-0.16	0.21	0.13	-0.08
Philippines	85.01	54.61	46.26	40.40	0.28	-0.03	0.03	0.15	0.04	-0.09
Portugal	86.02	37.67	25.89	51.32	0.27	0.03	-0.07	0.31	0.08	0.52
Taiwan	85.01	32.82	18.94	52.80	0.05	0.03	-0.09	0.02	0.13	-0.12
Thailand	85.01	30.32	25.44	29.76	0.05	0.03	-0.09	0.02	0.13	-0.12
Turkey	87.01	88.53	61.93	76.89	0.18	0.08	0.13	0.22	-0.15	-0.07
Venezuela	85.01	63.78	55.07	40.26	0.37	0.21	0.19	0.20	-0.04	-0.27
Zimbabwe	85.01	43.35	38.52	30.26	0.26	0.19	0.33	0.32	-0.05	-0.08

Table 2.

Performance of Unconditional Asset Allocation

Universe	Cumulative return	Mean return (annualized)	Standard deviation (annualized)	Target standard deviation	Minimum	Maximum
Strategy: Choose minimum variance portfolio 1980.01-1992.06						
Developed Countries	185.13	16.09	15.39	11.67	-26.86	11.97
Developed/Emerging	188.02	16.35	11.63	7.28	-17.81	9.52
Developed/Emerging 20% cap	195.83	17.02	14.02	9.52	-24.47	10.42
Strategy: Choose 16% target standard deviation 1980.01-1992.06						
Developed Countries	151.65	13.19	19.55	16.36	-19.57	15.33
Developed/Emerging	155.03	13.48	19.92	16.45	-26.50	15.90
Developed/Emerging 20% cap	139.04	12.09	20.62	16.19	-24.21	16.51

Table 3.

Year by Year Performance of Unconditional Asset Allocation

Year	Choose minimum variance			Choose 16% target volatility		
	Developed	Developed & Emerging	Developed & Emerging 20% cap	Developed	Developed & Emerging	Developed & Emerging 20% cap
1981	-1.9332	-5.8538	-1.5499	-6.2356	-23.3392	-20.7102
1982	0.8317	0.3747	0.3981	-3.6568	-23.4568	-13.9760
1983	12.2457	10.0341	13.9112	36.9509	4.9805	30.9939
1984	7.2767	6.0327	9.2840	-16.7749	-8.9142	-9.4428
1985	56.5858	40.7396	56.3789	39.8942	39.3193	48.2431
1986	36.8876	42.3205	40.4262	42.9618	38.6935	40.1231
1987	11.6598	18.3254	17.0627	12.9281	10.4430	11.3117
1988	2.5815	16.0257	16.4784	0.2752	42.5182	7.0637
1989	35.0131	6.8899	33.9682	5.7194	32.6840	3.7173
1990	-8.1129	15.4861	9.3853	-15.6928	-18.2218	-24.6766
1991	16.6039	9.0909	11.8393	15.1794	33.0941	2.7832
1992	-4.5100	-11.4477	-13.7578	0.1006	7.2258	3.6175

Table 4.
(continued)

Table 4.
The Predictability of Equity Returns in 41 Markets

Country	R ²	χ^2 exclude world+local	p-value	χ^2 exclude local	p-value
Morgan Stanley Capital International-Developed U.S. dollar returns 1985.01-1992.06					
Australia	0.0969	30.0899	0.0004	11.6884	0.0198
Austria	0.0685	18.5160	0.0296	5.0965	0.2775
Belgium	0.0824	21.5683	0.0104	14.8084	0.0051
Canada	0.0537	16.3042	0.0608	4.8662	0.3013
Denmark	0.0697	15.5670	0.0765	11.0490	0.0260
Finland	0.2745	21.2087	0.0118	9.7654	0.0446
France	0.0308	7.7162	0.5630	1.7546	0.7808
Germany	0.0791	10.1133	0.3414	6.6232	0.9604
Hong Kong	0.0496	10.4053	0.3187	1.9411	0.7466
Ireland	0.4671	88.9026	0.0000	57.8435	0.0000
Italy	0.1807	34.4400	0.0001	2.6009	0.6267
Japan	0.0600	17.8114	0.0374	6.8707	0.1429
Netherlands	0.0554	17.3084	0.0441	7.4280	0.1149
New Zealand	0.2179	17.4210	0.0425	7.5000	0.1117
Norway	0.0486	12.2896	0.1975	11.5200	0.0213
Singapore/Mal	0.0983	8.7292	0.4628	5.6864	0.2238
Spain	0.0654	14.3225	0.1113	8.1982	0.0846
Sweden	0.0632	15.3896	0.0813	9.5828	0.0481
Switzerland	0.0540	12.0788	0.2089	3.1628	0.5310
United Kingdom	0.0776	10.7854	0.2907	4.7282	0.3163
United States	0.0728	22.5848	0.0072	14.4031	0.0061
Multivariate ^a		126.000	0.0100		
International Finance Corporation-Emerging U.S. dollar returns 1976.01-1992.06					
Argentina	0.0342	2.6172	0.9180	1.1322	0.5677
Brazil	0.0265	7.2237	0.4060	0.2091	0.9007
Chile	0.0888	19.9249	0.0057	1.2440	0.5369
Colombia	0.3288	33.0864	0.0000	6.8561	0.0325
Greece	0.0767	18.9863	0.0082	0.8291	0.6606
India	0.0216	7.9333	0.3385	0.9654	0.6171
Indonesia	0.1762	5.6432	0.5820	3.2310	0.1988
Jordan	0.0304	8.8132	0.2663	2.3151	0.3143
Korea	0.0171	5.0276	0.6566	2.1087	0.3484
Malaysia	0.0643	7.5920	0.3699	1.2999	0.3221
Mexico	0.1271	21.5000	0.0031	3.7523	0.1532
Nigeria	0.0921	14.5476	0.0423	9.9339	0.0070
Pakistan	0.0861	4.9193	0.6698	1.3140	0.5184
Philippines	0.1733	24.2832	0.0010	9.5362	0.0085
Portugal	0.1990	22.4999	0.0021	2.9879	0.2245
Taiwan	0.1032	15.6400	0.0286	0.3925	0.8218
Thailand	0.0594	21.7953	0.0028	0.2623	0.8771
Turkey	0.1896	16.0865	0.0245	0.7141	0.6997
Venezuela	0.1422	17.2424	0.0159	8.4279	0.0148
Zimbabwe	0.1027	29.8314	0.0001	6.2750	0.0434
Multivariate ^b		83.0000	0.0010		

^aTest results for 18 MSCI countries (Finland, Ireland and New Zealand are not included since their data starts in 1987).
^bTest results are for nine IFC countries: Argentina, Brazil, Chile, Greece, India, Korea, Mexico, Thailand, and Zimbabwe. The data for the other emerging markets begins later.

Table 5.

Performance of Conditional Asset Allocation

Universe	Cumulative return	Mean return (annualized)	Standard deviation (annualized)	Target standard deviation	Minimum	Maximum
Strategy: Choose minimum variance portfolio 1980.01-1992.06						
Developed Countries	195.42	16.99	15.14	11.12	-25.86	12.86
Developed/Emerging	206.63	17.97	11.66	6.92	-16.05	9.86
Developed/Emerging 20% cap	215.47	18.87	14.05	9.01	-22.10	12.07
Strategy: Choose 16% target standard deviation 1980.01-1992.06						
Developed Countries	344.36	29.94	18.33	16.23	-16.25	12.37
Developed/Emerging	632.04	54.96	24.40	16.23	-23.03	25.87
Developed/Emerging 20% cap	488.67	39.30	19.89	15.99	-18.67	19.27

Table 6.

Year by Year Performance of Conditional Asset Allocation

Year	Choose minimum variance			Choose 16% target volatility		
	Developed	Developed & Emerging	Developed & Emerging 20% cap	Developed	Developed & Emerging	Developed & Emerging 20% cap
1981	1.3018	-5.8184	-0.1670	3.8185	5.6710	32.9145
1982	0.2946	1.4066	3.5112	7.6095	0.6140	-0.4905
1983	15.4399	14.8893	17.1995	31.3091	9.5892	7.0840
1984	5.7125	4.9569	6.9219	40.0834	36.2280	36.8765
1985	58.8476	51.0906	60.0647	93.9195	87.8920	94.8233
1986	41.2669	42.5400	44.6026	46.0220	73.6191	49.9663
1987	10.8734	1.6883	0.4706	15.9580	59.0413	6.3606
1988	0.3374	17.0633	17.7711	7.1674	44.6962	6.7234
1989	34.2864	7.2271	33.1377	36.6910	69.4644	59.6868
1990	-7.5366	19.0070	12.6248	-2.5873	65.4862	7.0179
1991	16.8578	5.4892	7.9483	7.0525	132.8474	59.9122
1992	-4.2582	-12.9065	-8.6191	-2.6816	4.8951	7.7893

Table 7.

One factor model loadings for 41 equity markets

Country	Start	Intercept	T-ratio	$\beta(\text{wrdrret})$	T-ratio	\bar{R}^2
Morgan Stanley Capital International-Developed U.S. dollar returns 1976.01-1992.06						
Australia	76.01	0.009	1.912	0.889	4.796	0.239
Austria	76.01	0.011	2.171	0.488	3.726	0.082
Belgium	76.01	0.011	3.334	0.886	9.502	0.377
Canada	76.01	0.006	2.093	0.932	10.328	0.464
Denmark	76.01	0.010	2.869	0.675	8.295	0.263
Finland	88.01	-0.008	-1.109	0.667	3.912	0.219
France	76.01	0.010	2.475	1.081	11.681	0.387
Germany	76.01	0.009	2.442	0.812	7.629	0.292
Hong Kong	76.01	0.017	2.627	0.998	5.015	0.181
Ireland	88.01	0.010	1.465	1.047	6.546	0.470
Italy	76.01	0.008	1.758	0.857	7.689	0.213
Japan	76.01	0.010	2.954	1.159	11.045	0.521
Netherlands	76.01	0.012	4.877	0.874	13.545	0.527
New Zealand	88.01	-0.002	-0.192	0.452	2.247	0.059
Norway	76.01	0.009	1.859	1.029	7.511	0.276
Singapore/Malaysia	76.01	0.010	2.073	0.941	5.475	0.271
Spain	76.01	0.005	1.162	0.821	7.220	0.236
Sweden	76.01	0.012	2.981	0.858	8.061	0.286
Switzerland	76.01	0.008	2.867	0.874	12.096	0.460
United Kingdom	76.01	0.011	3.362	1.099	15.002	0.488
United States	76.01	0.008	4.176	0.840	13.898	0.626
International Finance Corporation-Emerging U.S. dollar returns 1976.01-1992.06						
Argentina	76.01	0.061	2.752	-0.180	-0.430	-0.004
Brazil	76.01	0.017	1.397	0.407	1.287	0.005
Chile	76.01	0.032	3.776	0.120	0.571	-0.003
Colombia	85.01	0.037	3.599	0.145	0.763	-0.006
Greece	76.01	0.006	0.883	0.381	2.117	0.019
India	76.01	0.018	3.242	-0.024	-0.175	-0.005
Indonesia	90.01	-0.004	-0.249	0.126	0.311	-0.031
Jordan	79.01	0.008	1.902	0.159	1.548	0.012
Korea	76.01	0.014	2.286	0.549	3.686	0.058
Malaysia	85.01	0.005	0.700	0.738	3.542	0.199
Mexico	76.01	0.022	2.416	0.764	3.107	0.057
Nigeria	85.01	0.000	0.004	0.222	1.031	-0.001
Pakistan	85.01	0.021	3.022	0.052	0.355	-0.010
Philippines	85.01	0.036	3.188	0.770	2.827	0.099
Portugal	86.02	0.027	1.780	1.168	4.807	0.148
Taiwan	85.01	0.028	1.644	0.687	1.629	0.034
Thailand	76.01	0.016	2.989	0.379	1.940	0.041
Turkey	87.01	0.039	1.459	0.216	0.524	-0.013
Venezuela	85.01	0.035	2.271	-0.382	-1.119	0.007
Zimbabwe	76.01	0.008	1.053	0.214	1.151	0.003

Table 7. (continued)

Country	Start	Intercept	T-ratio	$\beta(\text{wrdrct})$	T-ratio	\bar{R}^2
Morgan Stanley Capital International-Developed Local currency returns 1985.01-1992.06						
Australia	85.01	0.012	1.601	0.658	2.252	0.218
Austria	85.01	0.016	1.641	0.324	1.322	0.020
Belgium	85.01	0.010	1.904	0.739	4.781	0.330
Canada	85.01	0.003	0.784	0.613	5.354	0.451
Denmark	85.01	0.007	1.314	0.529	5.248	0.219
Finland	88.01	-0.007	-0.817	0.398	1.908	0.058
France	85.01	0.009	1.545	0.872	7.277	0.386
Germany	85.01	0.006	0.928	0.704	3.659	0.235
Hong Kong	85.01	0.020	2.127	0.856	2.833	0.196
Ireland	88.01	0.009	1.176	0.831	4.625	0.294
Italy	85.01	0.006	1.016	0.774	5.002	0.251
Japan	85.01	-0.002	-0.552	1.070	9.574	0.596
Netherlands	85.01	0.007	1.428	0.560	3.843	0.296
New Zealand	88.01	0.002	0.167	0.421	2.076	0.050
Norway	85.01	0.006	0.732	0.743	3.578	0.194
Singapore/Malaysia	85.01	0.004	0.447	0.816	2.910	0.240
Spain	85.01	0.009	1.507	0.961	5.885	0.385
Sweden	85.01	0.009	1.489	0.766	4.224	0.280
Switzerland	85.01	0.005	1.007	0.733	5.085	0.360
United Kingdom	85.01	0.007	1.375	0.825	6.596	0.460
United States	85.01	0.008	2.136	0.755	7.334	0.542
International Finance Corporation-Emerging Local currency returns 1856.01-1992.06						
Argentina	85.01	0.251	4.012	-1.505	-1.370	0.007
Brazil	85.01	0.201	6.645	0.555	0.826	-0.003
Chile	85.01	0.053	6.470	0.305	1.391	0.026
Colombia	85.01	0.059	5.764	0.137	0.727	-0.006
Greece	85.01	0.033	2.274	0.267	0.893	-0.002
India	85.01	0.035	2.998	-0.353	-1.503	0.013
Indonesia	90.01	-0.000	-0.010	0.147	0.361	-0.030
Jordan	85.01	0.011	2.120	0.092	0.648	-0.004
Korea	85.01	0.013	1.657	0.618	3.597	0.110
Malaysia	85.01	0.006	0.764	0.708	3.314	0.187
Mexico	85.01	0.070	4.777	0.958	2.664	0.094
Nigeria	85.01	0.030	8.160	-0.065	-1.055	-0.003
Pakistan	85.01	0.027	3.847	0.022	0.153	-0.011
Philippines	85.01	0.039	3.401	0.775	2.651	0.091
Portugal	86.02	0.026	1.636	0.950	3.558	0.094
Taiwan	85.01	0.022	1.324	0.674	1.634	0.034
Thailand	85.01	0.020	2.151	0.596	1.986	0.100
Turkey	87.01	0.073	2.706	0.183	0.426	-0.014
Venezuela	85.01	0.055	4.067	-0.232	-0.721	-0.002
Zimbabwe	85.01	0.036	4.020	-0.017	-0.092	-0.011

Table 7. (continued)

Country	Start	Intercept	T-ratio	$\beta(\text{wrdrret})$	T-ratio	\bar{R}^2
Morgan Stanley Capital International-Developed U.S. dollar returns 1985.01-1992.06						
Australia	85.01	0.012	1.285	0.712	2.212	0.163
Austria	85.01	0.023	2.359	0.514	2.359	0.061
Belgium	85.01	0.017	3.386	0.943	7.358	0.448
Canada	85.01	0.004	0.947	0.664	5.494	0.437
Denmark	85.01	0.013	2.348	0.719	6.363	0.297
Finland	88.01	-0.008	-1.109	0.667	3.912	0.219
France	85.01	0.015	2.702	1.053	11.200	0.478
Germany	85.01	0.013	2.013	0.887	5.603	0.310
Hong Kong	85.01	0.020	2.224	0.856	2.839	0.222
Ireland	88.01	0.010	1.465	1.047	6.546	0.470
Italy	85.01	0.011	1.743	0.958	6.569	0.347
Japan	85.01	0.004	0.726	1.344	7.892	0.636
Netherlands	85.01	0.013	3.980	0.753	9.188	0.572
New Zealand	88.01	-0.002	-0.192	0.452	2.247	0.059
Norway	85.01	0.009	1.219	0.958	5.503	0.313
Singapore/Malaysia	85.01	0.007	0.825	0.878	3.257	0.273
Spain	85.01	0.014	2.619	1.168	9.792	0.511
Sweden	85.01	0.013	2.498	0.946	6.396	0.429
Switzerland	85.01	0.011	2.531	0.892	9.678	0.502
United Kingdom	85.01	0.011	2.314	1.075	14.202	0.573
United States	85.01	0.008	2.136	0.755	7.334	0.542
International Finance Corporation-Emerging U.S. dollar returns 1985.01-1992.06						
Argentina	85.01	0.078	2.117	-0.604	-0.908	-0.004
Brazil	85.01	0.024	1.049	0.740	1.516	0.014
Chile	85.01	0.042	4.966	0.274	1.165	0.016
Colombia	85.01	0.037	3.599	0.145	0.763	-0.006
Greece	85.01	0.028	1.955	0.383	1.354	0.006
India	85.01	0.025	2.274	-0.292	-1.417	0.008
Indonesia	90.01	-0.004	-0.249	0.126	0.311	-0.031
Jordan	85.01	0.005	0.994	0.128	1.000	0.003
Korea	85.01	0.014	1.671	0.651	3.751	0.118
Malaysia	85.01	0.005	0.700	0.738	3.542	0.199
Mexico	85.01	0.040	2.686	0.808	2.180	0.067
Nigeria	85.01	0.000	0.004	0.222	1.031	-0.001
Pakistan	85.01	0.021	3.022	0.052	0.355	-0.010
Philippines	85.01	0.036	3.188	0.770	2.827	0.099
Portugal	86.02	0.027	1.780	1.168	4.807	0.148
Taiwan	85.01	0.028	1.644	0.687	1.629	0.034
Thailand	85.01	0.021	2.239	0.640	2.194	0.118
Turkey	87.01	0.039	1.459	0.216	0.524	-0.013
Venezuela	85.01	0.035	2.271	-0.382	-1.119	0.007
Zimbabwe	85.01	0.023	2.363	0.071	0.336	-0.010

Table 8.

Two factor model loadings for 41 equity markets

Country	Start	Intercept	T-ratio	$\beta(\text{wrdrret})$	T-ratio	$\beta(\text{g10fx})$	T-ratio	\bar{R}^2
Morgan Stanley Capital International-Developed U.S. dollar returns 1976.01-1992.06								
Australia	76.01	0.010	1.970	0.918	4.279	-0.128	-0.523	0.237
Austria	76.01	0.010	2.162	0.271	1.684	0.941	5.156	0.213
Belgium	76.01	0.011	3.393	0.740	6.890	0.635	5.075	0.457
Canada	76.01	0.007	2.195	1.001	11.537	-0.299	-2.737	0.481
Denmark	76.01	0.009	2.880	0.551	6.893	0.540	4.552	0.331
Finland	88.01	-0.008	-1.057	0.710	4.161	-0.195	-0.649	0.212
France	76.01	0.010	2.461	0.920	9.536	0.697	4.940	0.452
Germany	76.01	0.008	2.476	0.628	4.723	0.800	5.479	0.410
Hong Kong	76.01	0.017	2.634	1.013	4.352	-0.064	-0.212	0.177
Ireland	88.01	0.010	1.445	1.036	5.776	0.052	0.235	0.460
Italy	76.01	0.008	1.718	0.799	7.122	0.253	1.374	0.217
Japan	76.01	0.010	2.962	1.063	9.987	0.418	3.316	0.548
Netherlands	76.01	0.012	4.914	0.805	11.123	0.300	3.413	0.551
New Zealand	88.01	-0.002	-0.163	0.478	2.578	-0.120	-0.343	0.043
Norway	76.01	0.009	1.841	0.999	6.722	0.129	0.667	0.274
Singapore/Malaysia	76.01	0.010	2.167	1.011	5.187	-0.303	-1.232	0.279
Spain	76.01	0.005	1.110	0.741	5.472	0.350	2.074	0.251
Sweden	76.01	0.012	2.972	0.848	7.510	0.043	0.329	0.283
Switzerland	76.01	0.008	2.971	0.729	8.170	0.629	5.967	0.559
United Kingdom	76.01	0.011	3.342	1.042	12.187	0.249	2.108	0.496
United States	76.01	0.009	5.157	0.955	17.179	-0.499	-7.692	0.718
International Finance Corporation-Emerging U.S. dollar returns 1976.01-1992.06								
Argentina	76.01	0.061	2.783	-0.036	-0.089	-0.621	-0.995	-0.006
Brazil	76.01	0.018	1.451	0.561	1.711	-0.667	-1.501	0.010
Chile	76.01	0.031	3.752	0.065	0.265	0.240	0.782	-0.005
Colombia	85.01	0.035	3.432	0.103	0.562	0.238	0.754	-0.011
Greece	76.01	0.006	0.824	0.230	1.107	0.655	2.391	0.043
India	76.01	0.018	3.230	-0.136	-0.956	0.489	2.444	0.020
Indonesia	90.01	-0.002	-0.089	0.180	0.434	-0.351	-0.483	-0.059
Jordan	79.01	0.008	1.972	0.075	0.702	0.356	2.296	0.044
Korea	76.01	0.015	2.326	0.627	3.995	-0.339	-1.407	0.063
Malaysia	85.01	0.010	1.510	0.865	4.643	-0.726	-3.012	0.272
Mexico	76.01	0.023	2.603	1.003	3.862	-1.036	-2.692	0.100
Nigeria	85.01	-0.002	-0.187	0.159	0.808	0.360	1.239	-0.002
Pakistan	85.01	0.017	2.728	-0.040	-0.276	0.524	2.295	0.041
Philippines	85.01	0.038	3.398	0.819	2.934	-0.282	-0.916	0.094
Portugal	86.02	0.028	1.754	1.185	5.071	-0.108	-0.252	0.137
Taiwan	85.01	0.037	2.298	0.937	2.426	-1.426	-3.344	0.102
Thailand	76.01	0.016	3.060	0.409	1.753	-0.132	-0.501	0.039
Turkey	87.01	0.037	1.387	0.155	0.345	0.445	0.475	-0.026
Venezuela	85.01	0.032	2.115	-0.461	-1.303	0.451	1.301	0.005
Zimbabwe	76.01	0.007	1.002	0.072	0.368	0.619	2.508	0.028

Table 8. (continued)

Country	Start	Intercept	T-ratio	$\beta(\text{wrdrct})$	T-ratio	$\beta(\text{gl0fx})$	T-ratio	\bar{R}^2
Morgan Stanley Capital International-Developed U.S. dollar returns 1985.01-1992.06								
Australia	85.01	0.015	1.912	0.785	2.329	-0.421	-1.125	0.178
Austria	85.01	0.019	1.898	0.400	1.642	0.648	2.238	0.097
Belgium	85.01	0.013	2.767	0.856	5.951	0.495	3.196	0.494
Canada	85.01	0.007	1.891	0.738	6.865	-0.423	-3.133	0.504
Denmark	85.01	0.008	1.601	0.600	5.811	0.675	4.574	0.399
Finland	88.01	-0.008	-1.057	0.710	4.161	-0.195	-0.649	0.212
France	85.01	0.011	1.953	0.963	8.661	0.513	2.691	0.519
Germany	85.01	0.009	1.402	0.781	4.268	0.608	2.862	0.364
Hong Kong	85.01	0.023	2.764	0.919	2.869	-0.363	-1.081	0.230
Ireland	88.01	0.010	1.445	1.036	5.776	0.052	0.235	0.460
Italy	85.01	0.008	1.424	0.896	6.359	0.357	1.650	0.359
Japan	85.01	0.001	0.241	1.270	7.578	0.424	2.324	0.658
Netherlands	85.01	0.012	3.799	0.715	7.113	0.221	2.011	0.588
New Zealand	88.01	-0.002	-0.163	0.478	2.578	-0.120	-0.343	0.043
Norway	85.01	0.010	1.365	0.976	5.174	-0.104	-0.419	0.307
Singapore/Malaysia	85.01	0.011	1.668	1.002	3.819	-0.707	-2.528	0.340
Spain	85.01	0.012	2.264	1.121	8.839	0.268	1.554	0.517
Sweden	85.01	0.013	2.642	0.953	6.479	-0.039	-0.253	0.423
Switzerland	85.01	0.008	1.999	0.827	7.471	0.374	2.732	0.533
United Kingdom	85.01	0.008	1.878	1.014	10.646	0.345	2.129	0.593
United States	85.01	0.012	3.991	0.850	10.001	-0.543	-5.836	0.653
International Finance Corporation-Emerging U.S. dollar returns 1985.01-1992.06								
Argentina	85.01	0.087	2.405	-0.363	-0.598	-1.375	-1.708	0.001
Brazil	85.01	0.028	1.207	0.852	1.729	-0.638	-0.930	0.011
Chile	85.01	0.046	5.499	0.356	1.584	-0.467	-1.551	0.037
Colombia	85.01	0.035	3.432	0.103	0.562	0.238	0.754	-0.011
Greece	85.01	0.026	1.746	0.323	1.030	0.342	0.759	0.001
India	85.01	0.022	2.005	-0.357	-1.629	0.367	1.111	0.009
Indonesia	90.01	-0.002	-0.089	0.180	0.434	-0.351	-0.483	-0.059
Jordan	85.01	0.004	0.632	0.079	0.610	0.282	1.418	0.019
Korea	85.01	0.017	1.916	0.719	3.675	-0.387	-1.330	0.127
Malaysia	85.01	0.010	1.510	0.865	4.643	-0.726	-3.012	0.272
Mexico	85.01	0.054	4.295	1.163	3.511	-2.027	-4.090	0.258
Nigeria	85.01	-0.002	-0.187	0.159	0.808	0.360	1.239	-0.002
Pakistan	85.01	0.017	2.728	-0.040	-0.276	0.524	2.295	0.041
Philippines	85.01	0.038	3.398	0.819	2.934	-0.282	-0.916	0.094
Portugal	86.02	0.028	1.754	1.185	5.071	-0.108	-0.252	0.137
Taiwan	85.01	0.037	2.298	0.937	2.426	-1.426	-3.344	0.102
Thailand	85.01	0.026	3.074	0.764	2.730	-0.709	-2.393	0.173
Turkey	87.01	0.037	1.387	0.155	0.345	0.445	0.475	-0.026
Venezuela	85.01	0.032	2.115	-0.461	-1.303	0.451	1.301	0.005
Zimbabwe	85.01	0.020	2.064	-0.010	-0.046	0.462	1.629	0.002

Table 8. (continued)

Country	Start	Intercept	T-ratio	$\beta(\text{wrdrct})$	T-ratio	$\beta(\text{glofx})$	T-ratio	\bar{R}^2
Morgan Stanley Capital International-Developed Local currency returns 1985.01-1992.06								
Australia	85.01	0.016	2.716	0.757	2.577	-0.566	-1.888	0.279
Austria	85.01	0.020	2.014	0.417	1.780	-0.532	-1.852	0.043
Belgium	85.01	0.015	3.111	0.856	6.659	-0.669	-4.761	0.437
Canada	85.01	0.006	1.959	0.694	7.016	-0.461	-3.774	0.552
Denmark	85.01	0.010	1.935	0.607	6.818	-0.446	-3.149	0.277
Finland	88.01	-0.005	-0.634	0.635	3.706	-1.089	-3.351	0.267
France	85.01	0.013	2.211	0.973	9.654	-0.576	-2.937	0.449
Germany	85.01	0.010	1.555	0.797	4.595	-0.536	-2.561	0.284
Hong Kong	85.01	0.023	2.597	0.910	2.789	-0.306	-0.858	0.197
Ireland	88.01	0.011	1.724	1.067	6.023	-1.082	-5.180	0.488
Italy	85.01	0.011	1.867	0.893	6.164	-0.680	-3.119	0.325
Japan	85.01	0.001	0.193	1.153	8.339	-0.477	-3.132	0.641
Netherlands	85.01	0.013	4.420	0.725	7.999	-0.943	-9.206	0.643
New Zealand	88.01	0.002	0.239	0.498	2.680	-0.355	-1.047	0.050
Norway	85.01	0.013	1.935	0.925	5.496	-1.040	-4.588	0.349
Singapore/Malaysia	85.01	0.010	1.584	0.991	3.934	-1.001	-3.787	0.385
Spain	85.01	0.014	2.603	1.094	8.146	-0.758	-4.103	0.478
Sweden	85.01	0.015	3.036	0.924	6.334	-0.898	-5.767	0.434
Switzerland	85.01	0.011	2.619	0.878	8.885	-0.832	-6.337	0.548
United Kingdom	85.01	0.011	2.772	0.942	10.053	-0.670	-4.862	0.581
United States	85.01	0.012	3.991	0.850	10.001	-0.543	-5.836	0.653
International Finance Corporation-Emerging Local currency returns 1985.01-1992.06								
Argentina	85.01	0.268	4.103	-1.049	-1.076	-2.603	-1.742	0.017
Brazil	85.01	0.203	6.775	0.604	0.909	-0.281	-0.331	-0.013
Chile	85.01	0.056	7.051	0.374	1.771	-0.394	-1.431	0.040
Colombia	85.01	0.057	5.555	0.095	0.520	0.239	0.761	-0.012
Greece	85.01	0.037	2.474	0.368	1.204	-0.580	-1.257	0.003
India	85.01	0.035	2.863	-0.371	-1.522	0.101	0.308	0.002
Indonesia	90.01	0.003	0.166	0.212	0.512	-0.419	-0.588	-0.054
Jordan	85.01	0.011	2.054	0.082	0.587	0.055	0.315	-0.014
Korea	85.01	0.016	1.898	0.685	3.565	-0.381	-1.349	0.119
Malaysia	85.01	0.012	1.891	0.871	4.993	-0.930	-4.098	0.318
Mexico	85.01	0.082	6.166	1.263	3.898	-1.740	-3.686	0.225
Nigeria	85.01	0.032	8.186	-0.035	-0.624	-0.171	-2.015	0.008
Pakistan	85.01	0.024	3.708	-0.044	-0.303	0.381	1.658	0.010
Philippines	85.01	0.040	3.516	0.787	2.758	-0.072	-0.210	0.081
Portugal	86.02	0.032	2.001	1.127	4.796	-1.094	-2.585	0.133
Taiwan	85.01	0.032	1.987	0.921	2.457	-1.413	-3.473	0.104
Thailand	85.01	0.027	3.217	0.755	2.757	-0.912	-3.164	0.197
Turkey	87.01	0.073	2.697	0.182	0.401	0.013	0.014	-0.030
Venezuela	85.01	0.054	4.025	-0.268	-0.794	0.209	0.685	-0.011
Zimbabwe	85.01	0.037	3.903	-0.009	-0.044	-0.048	-0.179	-0.023

Table 9.

Five factor model loadings for 41 equity markets

Country	Start	Intercept	T-ratio	β wrdret	T-ratio	β glOfx	T-ratio	β oilret	T-ratio	β OECD prod	T-ratio	β OECD cpi	T-ratio	\bar{R}^2
MSCI U.S. dollar returns 1976.01-1992.06														
Australia	76.01	0.002	0.188	0.960	4.504	-0.140	-0.594	0.072	1.851	0.269	0.369	1.225	0.739	0.241
Austria	76.01	0.019	2.099	0.255	1.680	0.914	5.015	-0.047	-0.912	0.996	1.694	-2.009	-1.740	0.276
Belgium	76.01	0.020	3.068	0.719	6.665	0.620	4.755	-0.021	-0.894	0.112	0.222	-1.781	-1.812	0.459
Canada	76.01	0.003	0.454	1.030	12.167	-0.313	-2.947	0.053	1.975	0.275	0.645	0.516	0.423	0.487
Denmark	76.01	0.010	1.390	0.545	6.655	0.544	4.526	-0.001	-0.021	-0.277	-0.541	-0.089	-0.086	0.372
Finland	88.01	0.000	0.025	0.777	4.715	-0.258	-0.882	0.062	1.183	-0.118	-0.082	-2.073	-0.494	0.184
France	76.01	0.003	0.336	0.925	9.267	0.710	5.108	-0.043	-1.731	0.605	1.196	1.034	0.792	0.454
Germany	76.01	0.015	1.965	0.609	4.630	0.793	5.387	-0.024	-0.532	0.012	0.020	-1.213	-1.159	0.406
Hong Kong	76.01	0.010	0.738	1.018	4.439	-0.043	-0.142	-0.012	-0.335	-0.147	-0.137	1.395	0.709	0.166
Ireland	88.01	-0.005	-0.301	1.061	6.190	0.039	0.173	-0.013	-0.223	-0.361	-0.304	3.630	1.029	0.438
Italy	76.01	0.018	1.851	0.754	6.982	0.258	1.438	-0.088	-1.861	0.093	0.124	-1.703	-1.093	0.230
Japan	76.01	0.005	0.687	1.046	9.949	0.452	3.724	-0.047	-1.947	-0.495	-1.028	1.025	0.929	0.551
Netherlands	76.01	0.015	3.269	0.820	11.388	0.277	3.107	0.057	3.577	0.018	0.050	-0.633	-0.869	0.563
New Zealand	88.01	0.001	0.047	0.541	2.751	-0.176	-0.550	0.059	1.103	2.501	2.288	-1.462	-2.440	0.035
Norway	76.01	-0.010	-1.021	1.103	7.765	0.097	0.529	0.150	4.729	1.261	1.715	2.971	1.688	0.332
Singapore/Malaysia	76.01	-0.008	-0.508	1.038	5.563	-0.270	-1.134	0.004	0.110	-0.038	-0.051	2.968	1.955	0.282
Spain	76.01	0.011	1.117	0.695	5.162	0.387	2.222	-0.100	-2.222	-0.026	-0.039	-1.071	-0.754	0.271
Sweden	76.01	0.014	1.910	0.829	7.860	0.044	0.332	-0.082	-2.835	0.900	1.472	-0.642	-0.574	0.304
Switzerland	76.01	0.017	3.094	0.712	7.811	0.813	5.691	0.011	0.454	-0.316	-0.895	-1.642	-1.893	0.643
United Kingdom	76.01	0.002	0.328	1.080	12.329	0.262	2.235	0.005	0.223	0.111	0.208	1.589	1.496	0.494
United States	76.01	0.011	2.896	0.953	17.393	-0.505	-7.812	0.016	1.008	-0.188	-0.631	-0.411	-0.757	0.717
IFC U.S. dollar returns 1976.01-1992.06														
Argentina	76.01	0.076	1.541	0.010	0.024	-0.714	-1.152	0.175	1.234	0.553	0.155	-2.997	-0.424	-0.017
Brazil	76.01	0.023	0.836	0.489	1.577	-0.813	-1.347	-0.116	-1.123	-1.428	-0.748	-0.429	-0.112	0.003
Chile	76.01	0.028	1.804	0.028	0.115	0.297	0.978	-0.063	-1.045	-1.578	-1.276	1.338	0.478	-0.009
Colombia	85.01	0.074	3.812	-0.117	-0.681	0.378	1.097	-0.097	-2.109	-3.129	-1.892	-8.701	-2.390	0.049
Greece	76.01	0.022	1.539	0.161	0.773	0.680	2.489	-0.024	-0.411	-2.327	-2.069	-2.047	-1.130	0.053
India	76.01	0.007	0.543	-0.085	-0.606	0.474	2.465	0.058	1.049	0.862	1.177	1.572	0.978	0.021
Indonesia	90.01	0.053	1.511	-0.205	-0.429	-0.107	-0.150	-0.099	-1.051	1.541	0.466	-13.933	-1.834	-0.084
Jordan	79.01	-0.009	-1.086	0.090	0.934	0.412	2.627	-0.063	-2.012	0.267	0.421	3.215	2.107	0.081
Korea	76.01	0.032	2.507	0.600	3.739	-0.379	-1.574	-0.022	-0.410	0.553	0.579	-3.285	-1.394	0.064
Malaysia	85.01	0.006	0.336	0.900	4.882	-0.759	-3.138	0.010	0.254	0.793	0.681	0.845	0.240	0.251
Mexico	76.01	0.039	1.860	1.031	3.805	-1.136	-2.863	0.043	0.752	2.556	1.874	-3.845	-1.356	0.111
Nigeria	85.01	-0.005	-0.173	0.167	0.707	0.373	1.233	0.023	0.599	-0.484	-0.274	0.820	0.155	-0.035
Pakistan	85.01	0.033	2.292	-0.106	-0.670	0.558	2.107	-0.010	-0.237	-0.936	-0.642	-3.717	-1.473	0.027
Philippines	85.01	0.089	3.663	0.607	2.572	-0.248	-0.860	-0.148	-2.972	-0.178	-0.119	-13.076	-2.173	0.173
Portugal	86.02	-0.000	-0.009	1.301	4.959	-0.146	-0.326	0.030	0.622	0.808	0.475	7.162	1.051	0.113
Taiwan	85.01	0.018	0.609	0.859	2.231	-1.300	-2.934	-0.151	-1.718	-1.765	-0.715	5.977	0.776	0.098
Thailand	76.01	0.031	2.769	0.369	1.582	0.151	-0.574	-0.061	-1.222	0.322	0.450	-2.749	-1.671	0.049
Turkey	87.01	0.025	0.367	0.185	0.377	0.416	0.443	0.040	0.263	-1.476	-0.349	3.675	0.252	-0.073
Venezuela	85.01	0.021	0.646	-0.270	-0.869	0.281	0.825	0.169	1.689	3.018	1.166	1.399	0.162	0.020
Zimbabwe	76.01	-0.007	-0.499	0.139	0.714	0.590	2.341	0.041	0.976	2.085	1.876	1.677	0.788	0.035
MSCI U.S. dollar returns 1985.01-1992.06														
Australia	85.01	0.016	0.878	0.844	2.455	-0.476	-1.316	0.082	1.784	0.698	0.823	-0.804	-0.193	0.174
Austria	85.01	0.017	0.952	0.438	1.935	0.554	1.928	-0.063	-0.857	2.808	2.024	-0.729	-0.143	0.114
Belgium	85.01	0.019	1.904	0.845	5.724	0.466	2.932	-0.032	-1.266	0.920	1.378	-1.841	-0.774	0.495
Canada	85.01	0.015	1.970	0.764	6.671	-0.473	-3.378	0.056	2.230	0.718	1.358	-2.632	-1.387	0.531
Denmark	85.01	-0.009	-0.865	0.682	6.173	0.654	4.448	0.007	0.202	0.641	0.703	4.356	1.897	0.400
Finland	88.01	0.000	0.025	0.777	4.715	-0.258	-0.882	0.062	1.183	-0.118	-0.082	-2.073	-0.494	0.184
France	85.01	0.007	0.622	0.955	7.778	0.514	2.680	-0.050	-1.867	0.416	0.452	0.956	0.414	0.516
Germany	85.01	0.009	0.710	0.804	4.311	0.563	2.728	-0.002	-0.036	1.126	0.928	-0.620	-0.202	0.350
Hong Kong	85.01	0.009	0.522	0.977	2.982	-0.418	-1.305	-0.023	-0.642	1.723	1.424	2.731	0.764	0.224
Ireland	88.01	-0.005	-0.301	1.061	6.190	0.039	0.173	-0.013	-0.223	-0.361	-0.304	3.630	1.029	0.438
Italy	85.01	0.039	2.862	0.792	6.350	0.350	1.685	-0.068	-1.514	0.416	0.403	-8.078	-2.612	0.411
Japan	85.01	-0.002	-0.165	1.289	7.582	0.420	2.330	-0.032	-1.223	0.388	0.439	0.777	0.246	0.651
Netherlands	85.01	0.016	2.737	0.754	7.317	0.176	1.659	0.089	4.231	0.523	1.073	-1.514	-1.058	0.627
New Zealand	86.01	0.001	0.047	0.541	2.751	-0.176	-0.550	0.059	1.103	2.501	2.288	-1.462	-2.440	0.035
Norway	85.01	-0.011	-0.682	1.125	6.304	-0.179	-0.752	0.127	3.380	1.086	0.961	4.968	1.183	0.368
Singapore/Malaysia	85.01	0.007	0.396	1.027	3.992	-0.753	-2.747	-0.002	-0.043	0.698	0.576	0.767	0.215	0.319
Spain	85.01	0.025	1.910	1.048	7.834	0.286	1.634	-0.074	-1.731	0.006	0.006	-3.331	-1.149	0.523
Sweden	85.01	0.020	2.028	0.928	7.040	-0.088	-0.524	-0.092	-3.389	1.902	2.012	-2.420	-0.978	0.498
Switzerland	85.01	0.016	1.898	0.823	6.925	0.355	2.444	0.013	0.521	0.304	0.424	-2.083	-0.977	0.522
United Kingdom	85.01	0.002	0.180	1.080	10.028	0.288	1.787	-0.039	1.311	1.198	1.597	1.224	0.667	0.597
United States	85.01	0.016	1.881	0.817	9.842	-0.504	-5.359	0.001	0.074	-1.048	-1.803	-0.614	-0.301	0.658
IFC U.S. dollar returns 1985.01-1992.06														
Argentina	85.01	0.210	2.538	-0.808	-1.270	-1.163	-1.434	0.020	0.161	-6.759	-1.215	-29.898	-1.777	0.009
Brazil	85.01	0.032	0.535	0.898	1.398	-0.459	-0.614	-0.106	-0.765	-3.888	-0.875	0.582	0.038	-0.011
Chile	86.01	0.080	3.357	0.271	1.097	-0.449	-1.397	-0.063	-2.133	0.162	0.125	-3.736	-0.830	0.052
Colombia	85.01	0.074	3.812	-0.117	-0.681	0.378	1.097	-0.097	-2.109	-3.129	-1.892	-8.701	-2.390	0.049
Greece	85.01	0.014	0.473	0.313	0.650	0.541	1.172	-0.080	-0.967	-4.218	-1.679	5.140	0.674	0.007
India	85.01	0.001	0.056	-0.229	-1.031	0.282	0.890	0.057	0.862	1.902	1.218	4.680	0.830	0.001
Indonesia	90.01	0.053	1.511	-0.205	-0.429	-0.107	-0.150	-0.099	-1.051	1.541	0.466	-13.933	-1.834	-0.084
Jordan	85.01	-0.004	-0.362	0.050	0.445	0.325	1							

Table 9.

(continued)

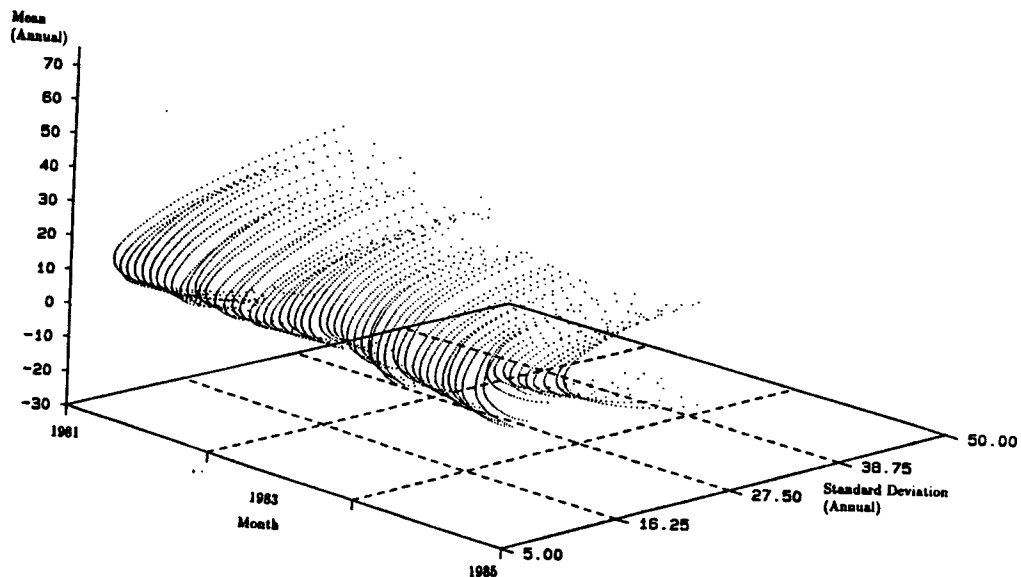
Country	Start	Intercept	T-ratio	β wdrret	T-ratio	β glodr	T-ratio	β oilret	T-ratio	β DECD prod	T-ratio	β OECD rpi	T-ratio	\bar{R}^2
MSCI Local currency returns 1976.01-1992.06														
Australia	76.01	0.006	0.708	0.895	4.794	-0.384	-1.976	0.037	1.334	0.204	0.359	0.928	0.635	0.287
Austria	76.01	0.020	2.286	0.297	2.098	-0.271	-1.542	-0.049	-1.041	0.964	1.690	-2.424	-2.172	0.036
Belgium	76.01	0.024	3.827	0.710	7.149	-0.563	-4.884	-0.022	-1.101	0.307	0.621	-2.414	-2.789	0.328
Canada	76.01	0.004	0.606	0.950	12.730	-0.380	-3.963	0.055	2.494	0.320	0.898	0.573	0.531	0.813
Denmark	76.01	0.011	1.564	0.556	3.739	-0.584	-5.018	-0.005	-0.182	-0.205	-0.403	-0.018	-0.018	0.216
Finland	88.01	0.009	0.486	0.648	3.609	-1.109	-3.409	0.036	0.680	-0.187	-0.127	-3.360	-0.842	0.236
France	76.01	0.007	0.951	0.933	10.306	-0.389	-2.804	-0.045	-1.999	0.581	1.135	0.562	0.458	0.338
Germany	76.01	0.015	2.098	0.643	5.313	-0.367	-2.672	-0.025	-0.626	-0.010	-0.018	-1.532	-1.564	0.244
Hong Kong	76.01	0.011	0.815	0.958	4.239	-0.210	-0.685	-0.017	-0.471	0.154	0.158	1.476	0.749	0.145
Ireland	88.01	-0.003	-0.220	1.107	6.671	-1.108	-5.216	-0.004	-0.068	-0.487	-0.422	3.672	1.107	0.468
Italy	76.01	0.018	1.999	0.801	7.688	-0.747	-4.109	-0.083	-2.009	0.230	0.312	-1.156	-0.771	0.218
Japan	76.01	0.004	0.710	0.935	11.227	-0.432	-4.381	-0.026	-1.113	-0.336	-0.826	0.518	0.619	0.518
Netherlands	76.01	0.017	3.713	0.845	12.456	-0.892	-10.416	0.053	3.321	0.103	0.279	-0.992	-1.432	0.546
New Zealand	88.01	0.009	0.358	0.510	2.692	-0.369	-1.145	0.031	0.616	2.286	1.963	-2.381	-0.413	0.029
Norway	76.01	-0.002	-0.227	1.072	8.040	-0.796	-4.522	0.148	4.143	1.006	1.441	1.939	1.113	0.303
Singapore/Malaysia	76.01	-0.006	-0.609	1.022	5.761	-0.606	-2.753	-0.007	-0.206	0.102	0.139	2.592	1.767	0.294
Spain	76.01	0.018	1.853	0.670	5.057	-0.510	-3.186	-0.099	-2.350	-0.373	-0.834	-1.540	-1.122	0.238
Sweden	76.01	0.018	2.532	0.809	7.993	-0.801	-6.303	-0.068	-3.200	0.689	1.155	-0.896	-0.826	0.309
Switzerland	76.01	0.019	3.820	0.736	8.960	-0.588	-6.224	0.015	0.603	-0.370	-0.934	-2.152	-1.182	0.480
United Kingdom	76.01	0.009	1.634	0.993	12.886	-0.659	-6.890	-0.010	-0.539	0.183	0.398	0.801	0.688	0.497
United States	76.01	0.011	2.896	0.953	17.393	-0.506	-7.812	0.016	1.006	-0.188	-0.631	-0.411	-0.757	0.717
IFC local currency returns 1976.01-1992.06														
Argentina	76.01	0.258	3.776	-0.578	-0.861	-1.404	-1.584	-0.068	-0.325	-0.241	-0.050	-11.187	-1.320	-0.006
Brazil	76.01	0.190	5.506	0.235	0.608	-0.132	-0.229	-0.241	-1.572	-2.785	-1.206	-10.025	-2.194	0.021
Chile	76.01	0.045	3.010	0.099	0.430	0.215	0.737	-0.034	-0.700	-1.463	-1.180	1.468	0.585	-0.011
Colombia	85.01	0.088	4.468	-0.099	-0.552	0.365	1.044	-0.102	-2.205	-2.661	-1.531	-6.844	-1.800	0.028
Greece	76.01	0.032	2.208	0.214	1.055	-0.153	-0.580	-0.028	-0.490	-2.279	-2.111	-2.119	-1.227	0.014
India	76.01	0.020	1.484	-0.111	-0.713	0.144	0.780	0.077	1.218	0.883	1.081	0.402	0.240	-0.002
Indonesia	90.01	0.061	1.721	-0.187	-0.398	-0.171	-0.247	-0.101	-1.058	1.752	0.530	-14.675	-1.928	-0.047
Jordan	79.01	-0.004	-0.467	0.084	0.842	0.147	0.994	-0.063	-1.991	0.194	0.314	3.148	2.150	0.036
Korea	76.01	0.027	2.244	0.618	3.877	-0.427	-1.800	-0.031	-0.575	0.346	0.365	-1.993	-0.878	0.082
Malaysia	85.01	0.013	0.790	0.892	4.992	-0.967	-4.210	0.002	0.042	0.924	0.840	-0.481	-0.151	0.299
Mexico	76.01	0.085	4.736	0.937	3.451	-0.928	-2.493	0.025	0.385	2.359	1.867	-7.313	-3.009	0.127
Nigeria	85.01	0.033	3.785	-0.050	-0.780	-0.162	-1.711	-0.018	-1.271	-0.102	-0.207	-0.392	-0.218	-0.021
Pakistan	85.01	0.038	2.584	-0.111	-0.713	0.424	1.594	-0.012	-0.271	-1.124	-0.772	-3.248	-1.253	-0.005
Philippines	85.01	0.094	3.492	0.554	2.402	-0.026	-0.080	-0.153	-2.593	-0.477	-0.305	-14.096	-2.141	0.163
Portugal	86.02	0.012	0.409	1.223	4.666	-1.143	-2.579	0.022	0.441	1.043	0.603	5.026	0.739	0.103
Taiwan	85.01	0.011	0.363	0.838	2.292	-1.273	-2.998	-0.155	-1.822	-2.045	-0.867	6.525	0.868	0.105
Thailand	76.01	0.034	3.067	0.356	1.545	-0.311	-1.186	-0.065	-1.281	0.299	0.422	-2.977	-1.837	0.053
Turkey	87.01	0.061	0.881	0.197	0.395	0.001	0.001	0.019	0.122	-1.280	-0.306	3.625	0.246	-0.079
Venezuela	85.01	0.041	1.355	-0.153	-0.496	0.122	0.413	0.082	0.795	1.670	0.786	2.618	0.308	-0.026
Zimbabwe	76.01	0.016	1.226	0.153	0.813	0.150	0.623	0.052	1.185	2.102	2.006	-0.598	-0.289	0.006
MSCI Local currency returns 1985.01-1992.06														
Australia	85.01	0.013	0.921	0.777	2.647	-0.566	-1.997	0.031	0.981	-0.220	-0.233	0.872	0.275	0.261
Austria	85.01	0.017	0.977	0.456	2.097	-0.624	-2.151	-0.055	-0.948	2.803	2.076	-0.391	-0.079	0.063
Belgium	85.01	0.020	2.357	0.845	6.293	-0.697	-4.718	-0.032	-1.446	0.899	1.412	-1.808	-0.850	0.439
Canada	85.01	0.013	1.901	0.716	6.882	-0.500	-3.993	0.048	2.579	0.502	1.027	-2.039	-1.302	0.572
Denmark	85.01	-0.008	-0.817	0.673	6.975	-0.474	-3.396	0.004	0.134	0.851	0.958	4.315	2.092	0.285
Finland	88.01	0.009	0.486	0.648	3.609	-1.109	-3.409	0.036	0.680	-0.187	-0.127	-3.360	-0.842	0.236
France	85.01	0.010	0.883	0.966	8.788	-0.585	-3.010	-0.048	-2.046	0.639	0.689	0.411	0.179	0.448
Germany	85.01	0.009	0.695	0.823	4.656	-0.580	-2.819	-0.003	-0.073	1.139	0.964	-0.268	-0.091	0.269
Hong Kong	85.01	0.009	0.454	0.965	2.869	-0.355	-1.029	-0.026	-0.733	1.607	1.308	2.928	0.781	0.186
Ireland	88.01	-0.003	-0.220	1.107	6.671	-1.108	-5.216	-0.004	-0.068	-0.487	-0.422	3.672	1.107	0.468
Italy	85.01	0.040	2.703	0.797	6.678	-0.691	-3.322	-0.059	-1.526	0.462	0.436	-7.883	-2.548	0.375
Japan	85.01	0.002	0.133	1.148	8.523	-0.483	-3.248	-0.018	-0.753	0.289	0.392	-0.308	-0.117	0.631
Netherlands	85.01	0.017	3.064	0.765	8.165	-0.989	-9.803	0.066	3.972	0.577	1.254	-1.384	-1.022	0.677
New Zealand	88.01	0.009	0.358	0.510	2.692	-0.369	-1.145	0.031	0.616	2.286	1.963	-2.381	-0.413	0.029
Norway	85.01	-0.003	-0.216	1.048	6.472	-1.099	-4.996	0.120	3.334	0.679	0.696	3.872	1.004	0.400
Singapore/Malaysia	85.01	0.010	0.561	1.001	4.018	-1.025	-4.065	-0.014	-0.393	0.731	0.624	-0.227	-0.065	0.367
Spain	85.01	0.030	2.157	1.005	7.560	-0.725	-4.019	-0.071	-1.765	-0.405	-0.413	-3.947	-1.320	0.498
Sweden	85.01	0.022	2.332	0.897	7.060	-0.949	-5.722	-0.094	-3.614	1.979	2.117	-2.686	-1.129	0.518
Switzerland	85.01	0.015	1.734	0.897	8.526	-0.871	-6.423	0.019	0.758	0.785	1.093	-1.384	-0.695	0.542
United Kingdom	85.01	0.012	1.413	0.977	9.302	-0.718	-5.277	0.025	1.339	1.006	1.480	-0.588	-0.356	0.580
United States	85.01	0.016	1.881	0.817	9.842	-0.504	-5.359	0.001	0.074	-1.048	-1.903	-0.614	-0.301	0.658
IFC Local currency returns 1985.01-1992.06														
Argentina	85.01	0.282	2.509	-1.453	-1.361	-2.184	-1.708	-0.332	-1.267	-7.976	-0.838	0.060	0.002	-0.003
Brazil	85.01	0.152	2.120	0.414	0.634	0.085	0.088	-0.313	-1.566	-6.135	-1.145	16.484	0.916	-0.002
Chile	85.01	0.074	4.190	0.282	1.193	-0.374	-1.267	-0.081	-1.889	-0.046	-0.039	-4.732	-1.225	0.055
Colombia	85.01	0.088	4.468	-0.099	-0.552	0.365	1.044	-0.102	-2.205	-2.661	-1.531	-6.844	-1.800	0.028
Greece	85.01	0.022	0.767	0.262	0.819	-0.376	-0.799	-0.084	-1.020	-4.292	-1.706	5.989	0.818	0.015
India	85.01	0.014	0.598	-0.232	-0.914	0.010	0.034	0.083	1.069	1.814	1.069	4.582	0.905	-0.003
Indonesia	90.01	0.061	1.721	-0.187	-0.398	-0.171	-0.247	-0.101	-1.058	1.752	0.530	-14.625	-1.928	-0.047
Jordan	85.01	-0.004	-0.347	0.060	0.503	0.113	0.651	-0.073	-1.978	-0				

Figure 1

Unconditional asset allocation

A. Developed markets: no short sales

**Mean Variance Surface
Developed Markets (no short sales)
December 1980 - December 1985**



**Mean Variance Surface
Developed Markets (no short sales)
January 1986 - June 1992**

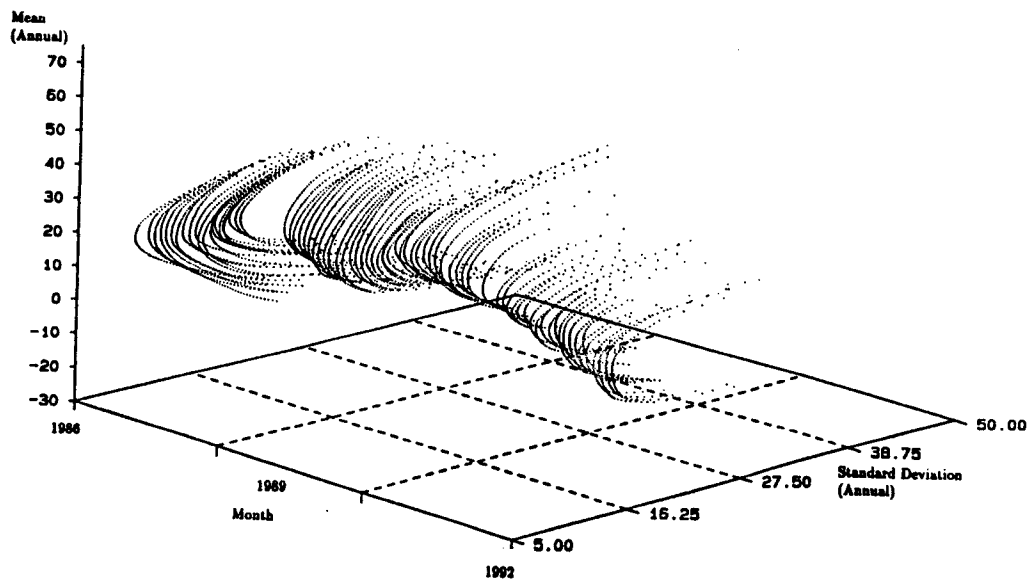
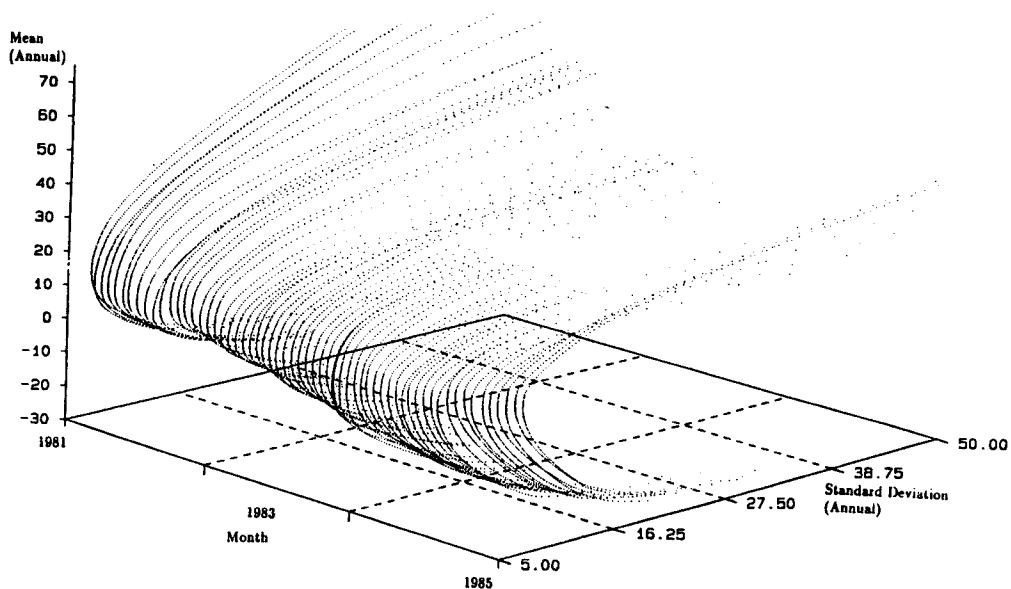


Figure 1 (continued)

B. Developed and emerging markets: no short sales

**Mean Variance Surface
Developed and Emerging Markets (no short sales)
December 1980 - December 1985**



**Mean Variance Surface
Developed and Emerging Markets (no short sales)
January 1986 - June 1992**

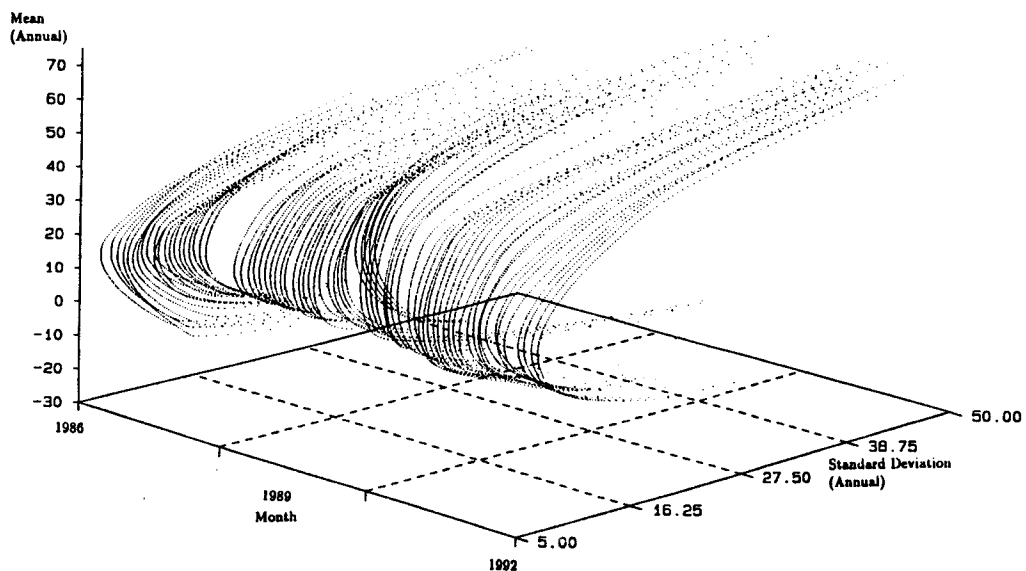
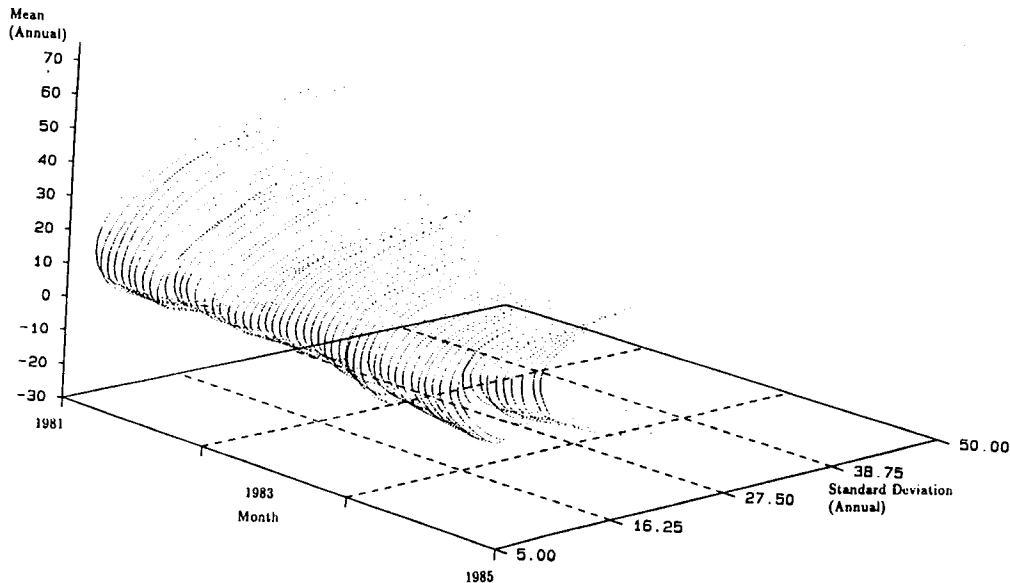


Figure 1 (continued)

C. Developed and emerging markets (20% cap): no short sales

Mean Variance Surface
Developed and Emerging Markets (no short sales, 20% cap on emerging)
December 1980 - December 1985



Mean Variance Surface
Developed and Emerging Markets (no short sales, 20% cap on emerging)
January 1986 - June 1992

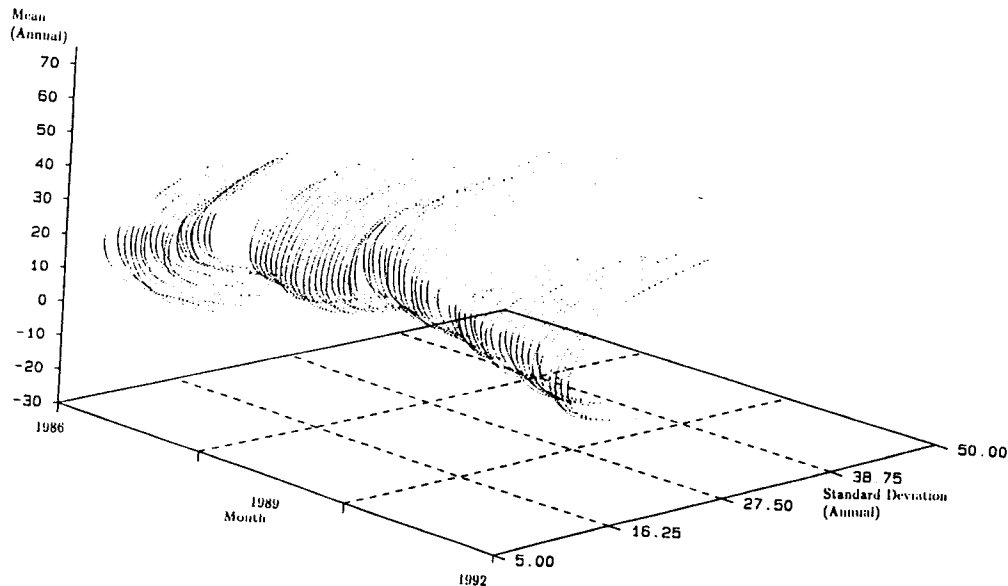
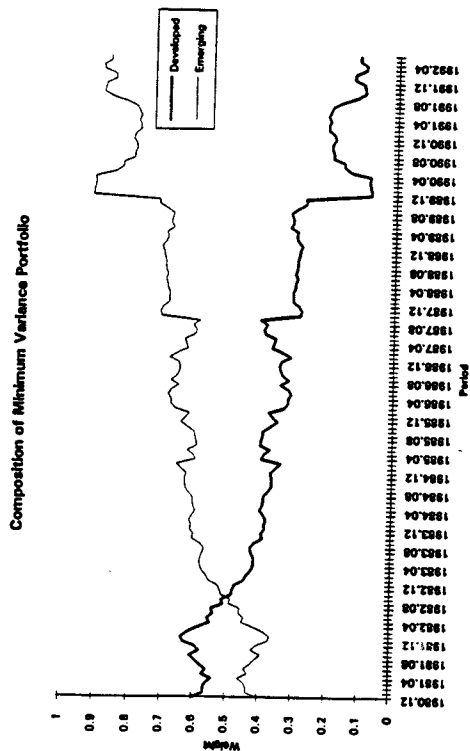
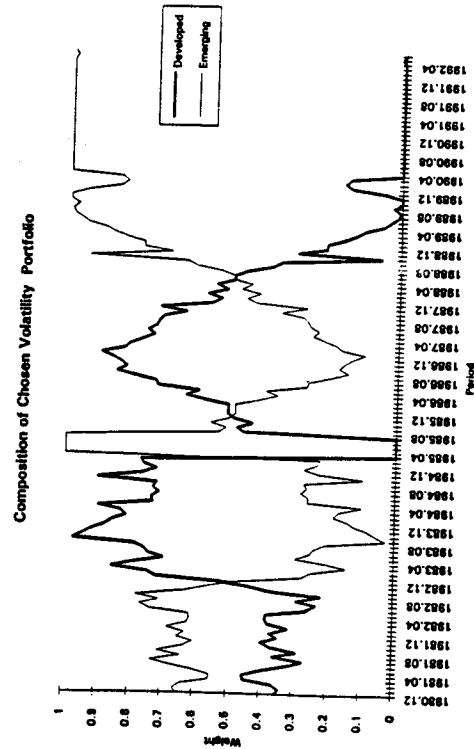


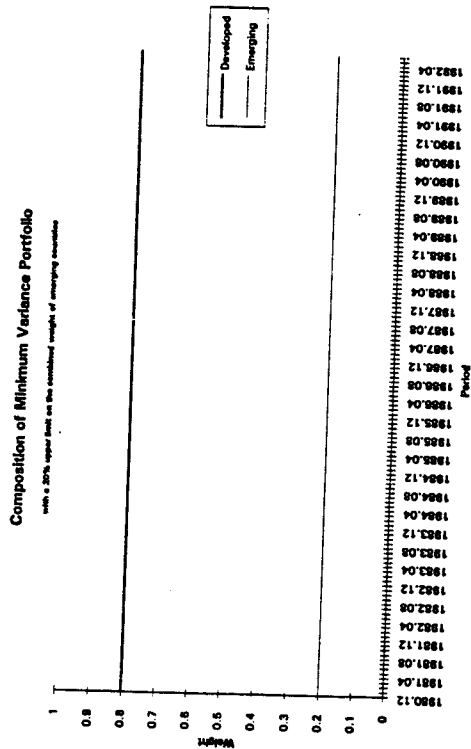
Figure 2
Unconditional allocation investment weights



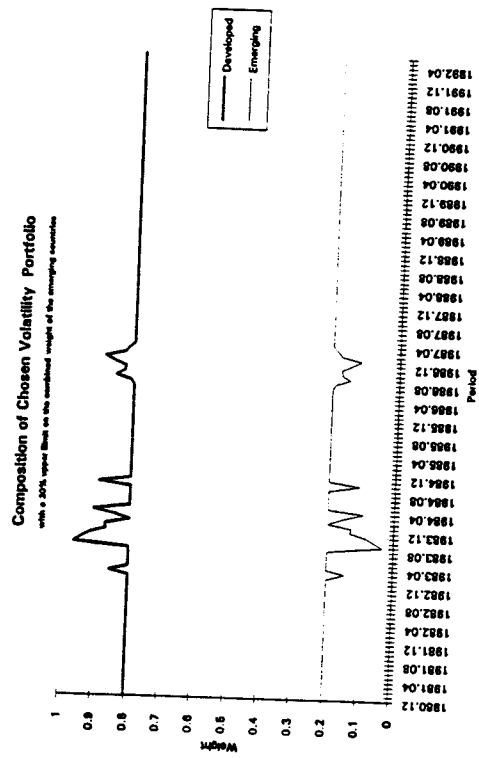
Rolling unconditional means are used for predicting the mean.



The chosen volatility is 10% annualized and rolling unconditional means are used for predicting the mean.



Rolling unconditional means are used for predicting the mean.



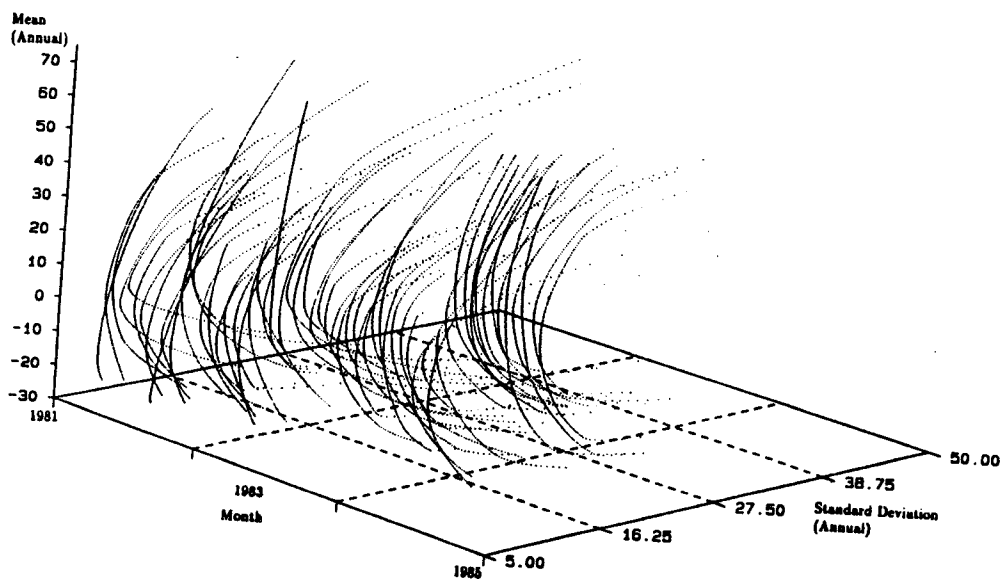
The chosen volatility is 10% annualized and rolling unconditional means are used for predicting the mean.

Figure 3

Conditional asset allocation

A. Developed markets: no short sales

**Conditional Mean Variance Surface
Developed Markets (no short sales)
December 1980 - December 1985**



**Conditional Mean Variance Surface
Developed Markets (no short sales)
January 1986 - June 1992**

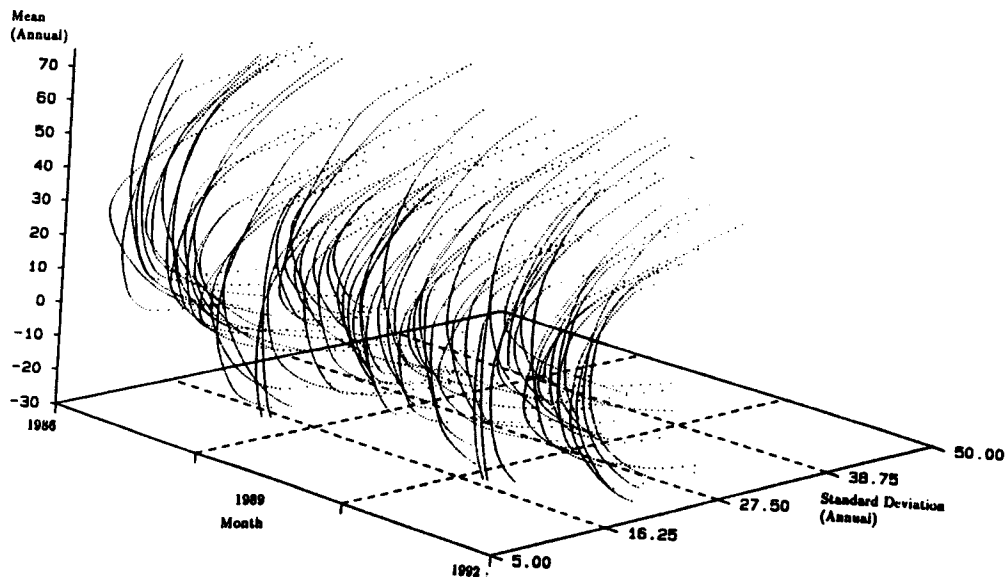
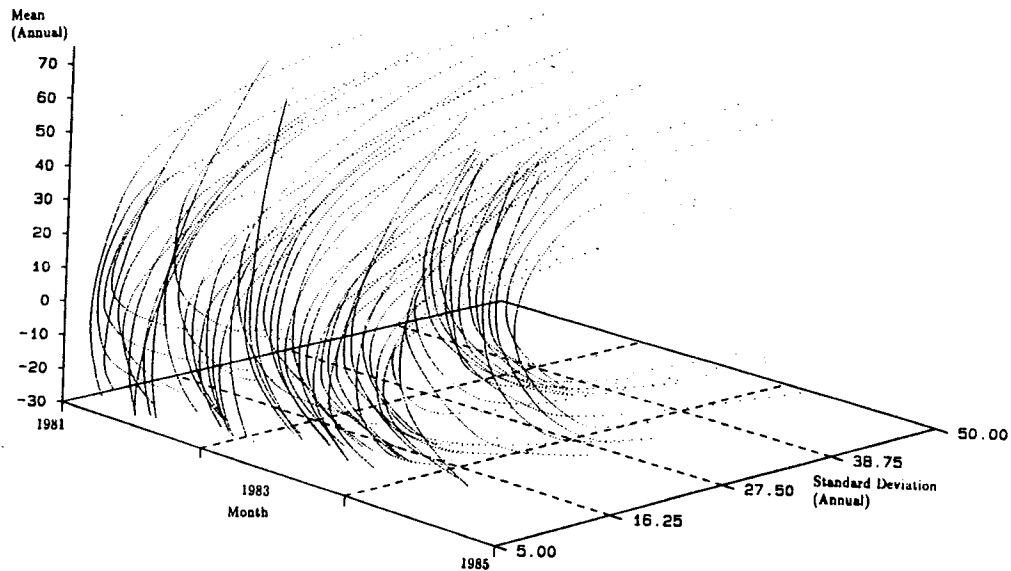


Figure 3 (continued)

B. Developed and emerging markets: no short sales

**Conditional Mean Variance Surface
Developed and Emerging Markets (no short sales)
December 1980 - December 1985**



**Conditional Mean Variance Surface
Developed and Emerging Markets (no short sales)
January 1986 - June 1992**

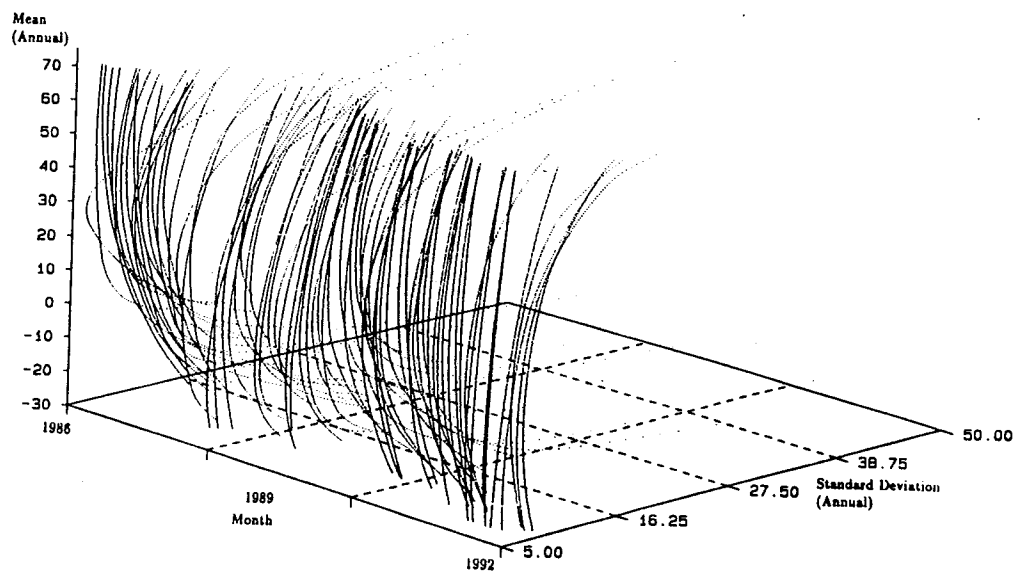
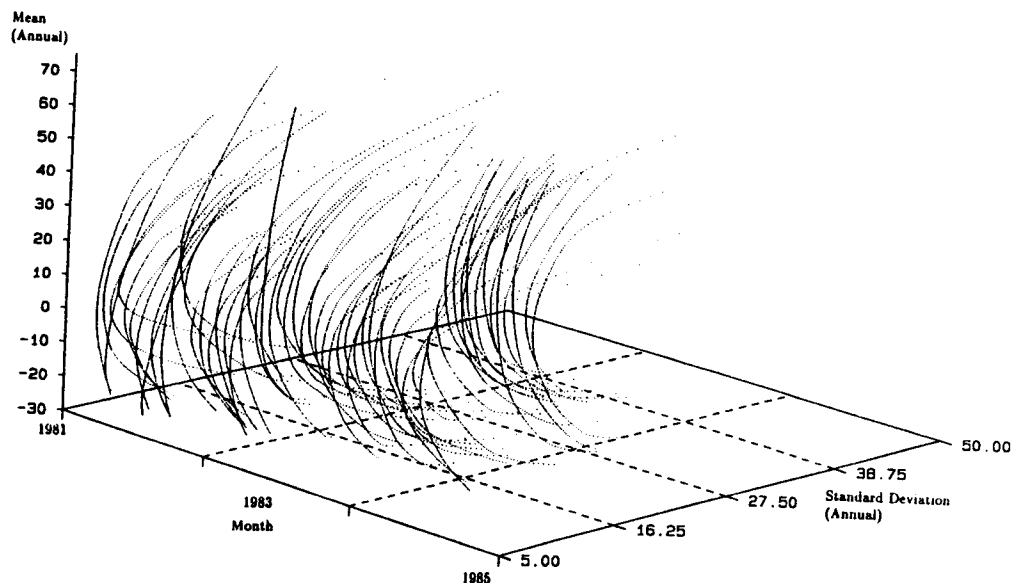


Figure 3 (continued)

C. Developed and emerging markets (20% cap): no short sales

Conditional Mean Variance Surface
Developed and Emerging Markets (no short sales, 20% cap on emerging)
December 1980 - December 1985



Conditional Mean Variance Surface
Developed and Emerging Markets (no short sales, 20% cap on emerging)
January 1986 - June 1992

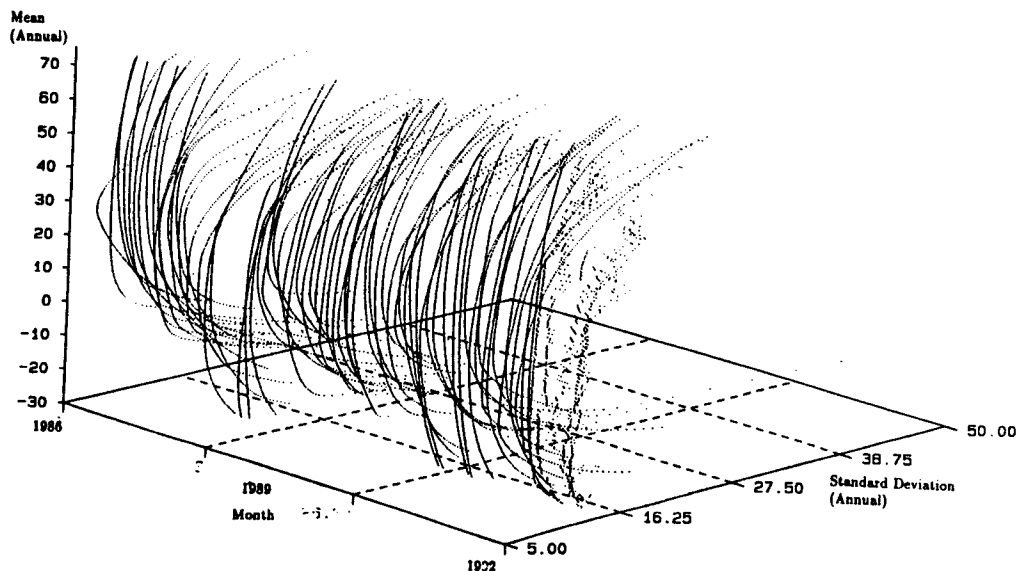
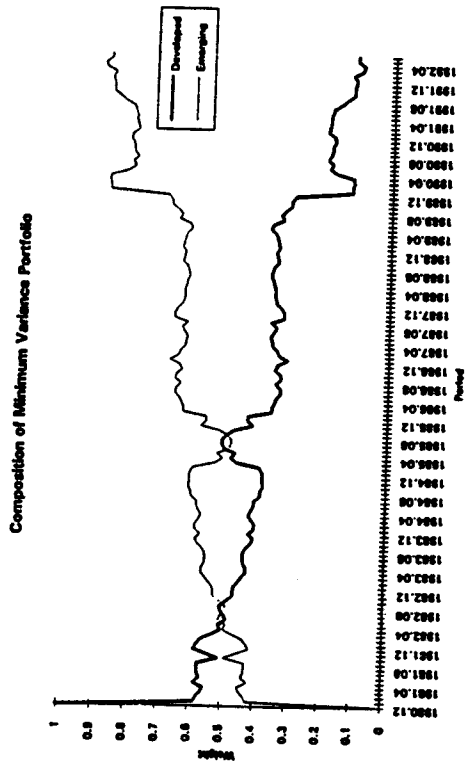
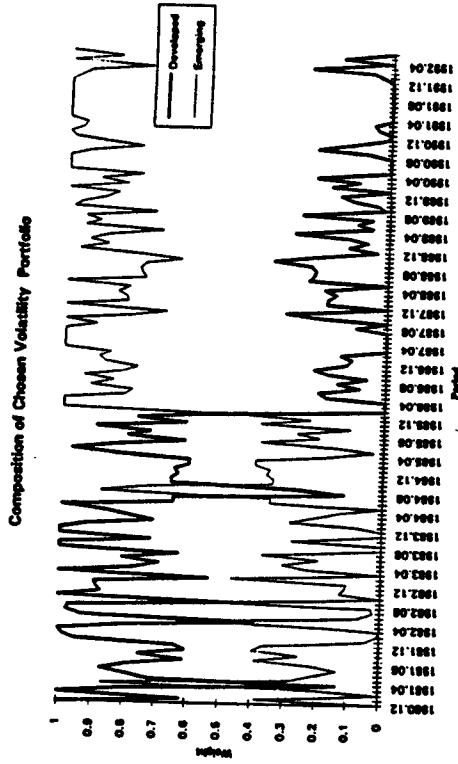


Figure 4
Conditional allocation investment weights

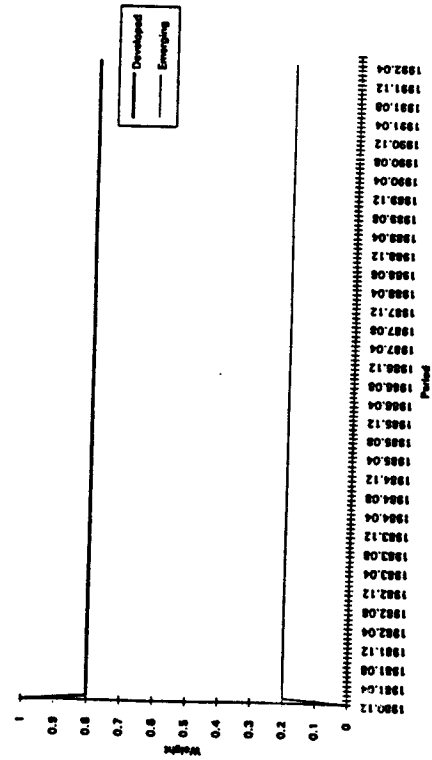


Conditional means are used for predicting the mean.

The chosen volatility is 10% annualized and conditional means are used for predicting the mean.

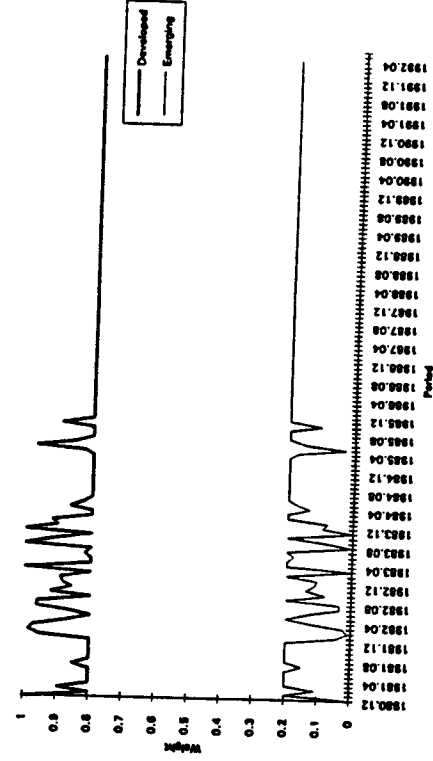


Composition of Minimum Variance Portfolio



Conditional means are used for predicting the mean.

Composition of Chosen Volatility Portfolio



The chosen volatility is 10% annualized and conditional means are used for predicting the mean.