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Have Institutional Investors Destabilized Emerging Markets?

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Abstract

In the past few years there has been a large increase in portfolio capital flows into emerging markets, mostly fueled by mutual funds and other institutional investors. Based on a simple variance ratio test, this paper finds that emerging stock markets as a group experienced a sharp increase in autocorrelation in total returns at a time when institutional investors began to significantly expand their holdings in these markets. These results are consistent with the view that institutional investor sentiment toward emerging markets as an asset class can at times play a critical role in determining asset prices, with shifts in sentiment resulting in periods of bubble-like booms and busts and asset price overshooting.

JEL Classification Numbers:
F32, G11, G12, G14, G15

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Contents

Summary

In the past few years, there has been a large increase in portfolio capital flows into emerging markets, mostly fueled by mutual funds and other institutional investors. By increasing the liquidity of these markets and lengthening investor horizons, institutional investors were expected to bring a measure of stock price stability, ensuring that prices more fully reflected fundamentals. What resulted, however, was a dramatic boom in emerging market stock prices followed by a series of collapses. This has led many analysts to conclude that institutional investor sentiment has fueled a series of classic speculative bubbles in emerging market stock prices.

A market prone to bubbles will show a high degree of autocorrelation of total returns. This paper employs a simple variance ratio test on total returns data from the IFC's Emerging Market Data Base to determine whether bubble-like price behavior is evident in emerging stock markets, and to what extent changes in price behavior have coincided with periods of large inflows of portfolio capital by institutional investors. This paper finds that variance ratios calculated on the composite indexes of total returns (the overall index, the Asia index, and the Latin American index) increase profoundly in the period of large capital inflows (1992-95) compared with the earlier period (1989-91), indicating a sharp increase in the degree of autocorrelation of total returns.

In addition, in nearly all cases the estimates of the variance ratios on individual country market indexes are less than the estimates on the composite indexes, implying that the composites themselves have importance beyond the sum of their components. These results are consistent with the view that institutional investors treat developing country stocks as a separate asset class. According to this view, portfolio managers who lack local knowledge about the fundamentals of each developing country stock allocate a portion of their assets toward developing country stocks as a class. Thus then, within that class, spread this allocation over a portfolio of stocks so as to receive the risk/return benefits of the portfolio and at the same time minimize idiosyncratic risk.

Taken together, the results appear to support a view of investor behavior in emerging markets that is at odds with standard portfolio choice analysis and the efficient market hypothesis. According to this view, investor sentiment, in contrast to individual analysis of each asset's fundamentals, can at times play a critical role in determining asset prices, leading to periods of bubble-like booms and busts and asset price overshooting. The implications extend beyond stock prices, affecting views on issues such as the appropriate response to short-term capital inflows, hot money, contagion effects, and exchange rate fluctuations.

I. Introduction

In recent years, the liberalization of developing country stock markets has been followed by large inflows of portfolio capital, mostly from mutual funds and other institutional investors. 1/ By increasing the liquidity of these markets and lengthening investor horizons, institutional investors were expected to bring a measure of stock price stability, ensuring that prices more fully reflected fundamentals. 2/ What resulted, however, was a dramatic boom in emerging market stock prices followed by a series of collapses. This has prompted many market analysts and financial journalists to conclude that when it comes to emerging markets, foreign investors are reckless and ill-informed, often overcome by euphoria and panic and swayed by fashion and herd behavior.

According to this view, the rise and fall of emerging market stock prices had all the symptoms of a classic speculative bubble, fueled by "an avalanche of foreign money" as fund managers "rushed lemming-like to buy anything carrying the emerging market label." As one fund manager put it, "a lot of money was being shifted into emerging markets on the basis of simple ignorance....when the weight of money is driving markets up, even the best informed analyst hesitates to stand in the way." 3/ Likewise, the pressure on emerging market stock prices in the wake of the Mexican peso devaluation in December 1994--the so-called "tequila effect"--was argued to have been caused by a "herd-like overreaction" by "non-specialist institutional investors" to Mexico's financial difficulties. As a result of contagion effects on a number of developing country markets not just in Latin America but in Asia and Europe as well, investor sentiment was commonly regarded as far more negative than warranted by the fundamentals. A view frequently encountered at the time was that "anyone looking for a definition of herd behavior need look no further than the world's emerging markets."

1/ Comprehensive and consistent estimates of institutional investor equity holdings in developing country stock markets have not yet been constructed. However, indirect measures show rapid increases in institutional investor holdings of developing country equities beginning in the early 1990's. Net equity purchases by emerging market mutual funds are estimated to have increased by several times beginning in 1992 (see Chapter II of IMF (1995a)). Similarly, emerging market capitalization as a share of world capitalization nearly doubled between 1990 and 1993, corresponding to a sharp increase in industrialized country investment flows into emerging markets (see Chapter IV of IMF (1995b)).

2/ See Feldman and Kumar (1994).

3/ While similar views were reported in a wide range of financial publications, references in this paper are taken from various issues of The Economist, The Financial Times, The Wall Street Journal, and Emerging Markets Week.

While the view that all institutional investors in emerging markets are irrational trend-chasers might be extreme, even investors which are said to consider "fundamentals" often appear to base portfolio decisions on essentially backward-looking criteria. An initial period of rising stock prices led many fund managers to regard emerging market investments as a sensible avenue for portfolio diversification. Based on analysis of historic returns and covariances one could, it was argued, significantly improve the risk-return characteristics of one's portfolio by increasing holdings of emerging market stocks. 1/ Of course as more fund managers diversified, emerging market stock prices rose, further improving the measured rate of return of emerging market assets and strengthening the arguments for additional diversification. This self-reinforcing process, characterized as the "fashion for diversification," might well have played a role in the explosion of foreign capital into emerging market investments. 2/

Similarly, the general collapse in asset prices in the wake of the Mexican peso devaluation was said to have led portfolio managers to "reassess" the risk-return benefits of their emerging market holdings. The resulting "flight to quality" produced further price reductions and, it might be argued, further reassessments. Stated differently, investors

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1/ See Bekaert and Urias (1995) for a partial discussion of the large literature on the diversification benefits of emerging markets. A good example of the backward-looking nature typical of this analysis appears in a recent Financial Times column (December 4, 1995). The analyst argues that:

> Despite the ups and downs of emerging markets there is a strong theoretical case for including them in global portfolios based on the likelihood of a worthwhile return for the risk incurred. An optimum portfolio of 80 percent of the FT/S&P World Index plus 20 percent of the IFCII [emerging markets index] should return about two-and-a-half percent more a year than the World Index, but with slightly lower volatility.

It would not be a gross exaggeration to characterize investors who act on this sort of advice as "trend chasers."

2/ Given the difficulties in assessing the economic gains from trade liberalization, privatization, and other efficiency enhancing policies adopted by many of these countries at the time, it would not be surprising if institutional investors looked to past performance for evidence of future prospects. Krugman (1995) goes one step further in arguing that in light of the uncertainty of the benefits of these policies, the speculative bubble in financial markets reinforced (and was in turn reinforced by) a similar "bubble" in policy making circles. According to this process, policy makers rallied around the "Washington Consensus" towards liberalization because markets were rewarding these policies so spectacularly, and markets were willing to supply so much capital because they saw as unstoppable the move toward policy reform.

interested in portfolio diversification may have regarded emerging market stocks as an asset class, as distinct from t-bills or industrial country stocks, where the class' "fundamentals" are in effect its perceived risk-return characteristics in relation to the investor's existing portfolio. If, as a result, enough investors use past performance of emerging market stocks as a major factor in their portfolio decisions, these decisions may become self-reinforcing, and investor behavior may at times seem a lot like herd behavior.

Whatever the underlying reasons for this sort of "trend-chasing" behavior, or "positive feedback trading" as it is referred to in the literature, its effect is destabilizing, possibly resulting in asset price overshooting, bubble-like booms and busts, and other irrational market outcomes. The process by which this can take place is well-known. 1/ A shift in investor sentiment away from a given asset, for example, will decrease its price. If investors interpret this decrease as portending a trend, they will sell, pushing prices down further. Normally, long-sighted investors, commonly referred to as arbitragers, would step in and buy up the undervalued asset, offsetting the downward pressure on prices. But the risk of potentially large short-term losses should the price continue to fall limits the arbitrager's willingness to counteract widespread shifts in sentiment. Moreover, in the presence of positive feedback trading, arbitragers might actually find it advantageous to go along with the shifts in sentiment in the short run even if they expect these shifts to be reversed at some point in the future.

It is this dynamic that many analysts have in mind when they refer to speculative bubbles in emerging markets. While some investors no doubt employ positive feedback investment strategies, it is another matter to argue that this behavior is so widespread among institutional investors that their presence actually destabilizes emerging stock markets. This paper uses a simple test to determine whether bubble-like price behavior is evident in emerging stock markets, and asks to what extent changes in price behavior have coincided with the period of large inflows of portfolio capital by institutional investors.

II. Asset Price Bubbles and the Variance Ratio Test

A market prone to bubbles is said to be inefficient--that is, prices will not always fully reflect all relevant information. A simple and robust test of market efficiency is the variance ratio test. The variance ratio operates on the simple proposition that a stock price which reflects all

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1/ For a summary discussion of asset price bubbles and noise traders, see Chapter V of IMF (1995b). For a theoretical description of positive feedback trading, see De Long, et.al. (1990). See also Shleifer and Summers (1990), for broader applications of the noise trader approach to finance.

available information about fundamentals will follow a random walk (i.e., the current price will be the best forecast of future prices). 1/ In the case of a random walk, actual future prices of a stock remain on average within a range which widens linearly over time. Therefore, the variance of the rate of return will increase proportionately with the length of the period the asset is held; if σ_T is the variance of the rate of return when an asset is held for T weeks, and σ_1 is the variance when the asset is held one week, then

$$VR \equiv \frac{[\frac{\sigma_T}{T}]}{\sigma_1} = 1$$

If instead this ratio is greater than one, price increases (declines) today would signal further price increases (declines) in the future. In this case, the variance of the rate of return will increase disproportionately faster than the length of the period the asset is held. This is equivalent to saying that the variance ratio measures the autocorrelation of excess

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1/ This is generally known as the "Random Walk Hypothesis," which itself is a variant of the "weak form" of the Efficient Market Hypothesis (see Fama, 1991). According to weak-form efficiency, a market is efficient if investors cannot earn abnormal profits on the basis of an analysis of past price patterns. Under certain theoretical conditions, price deviations from the random walk do not by themselves imply market inefficiency, but can result from factors such as shifting risk premia which are consistent with efficient markets. As argued in Section II.2, however, the measured deviations from the random walk for emerging markets as a whole appear many times larger than can be reasonably accounted for by shifts in the variance of risk premia.

rates of return or, in other words, whether the expected future rate of return is positively (or negatively) related to past excess rates of return. 1/

1. Variance ratio estimates for developing country stock markets

Emerging markets might be observed to be inefficient for a number of reasons other than bubble-like price-setting behavior. Illiquidity, transactions costs, and imperfect information can all lead to market inefficiencies. For this reason, an analysis of changes in the variance ratio might reveal more about the impact of institutional investors on emerging markets than a focus on the level. To evaluate whether institutional investors may have had a stabilizing or destabilizing influence on developing country stock markets, the change in the variance ratio in these markets is examined between two periods--the first, from 1989 through 1991, when developing country stock markets were undergoing liberalization and opening their markets to foreign investors, and the second, from 1992 through 1995, broadly corresponding to the period when institutional investors began to significantly expand their holdings of developing country securities. 2/ If the main consequences of greater institutional investor presence were, as was widely expected, greater market liquidity and longer investor horizons, the variance ratio would be expected to decline between the first period (1989-91) and the second period (1992-95).

The opposite in fact appears to have been the case, at least for developing countries as a whole and for Latin American and Asian stock markets taken together. Data for total returns come from the Emerging

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1/ Variance ratios of less than one reflect negative autocorrelation of excess returns. The variance ratio has several properties which make it particularly desirable for testing the presence of bubbles or other asset market inefficiencies. Since the variance ratio requires only a minimum of structural assumptions, it is robust to many specification errors common to bubbles tests. It does not, for example, require that the variance of an asset's rate of return be stable over time--that is, estimates of the standard errors of the variance ratio are heteroskedasticity-robust. By focusing on the appropriate behavior of an asset's price rather than the appropriate level, the variance ratio avoids the specification errors occurring in tests which depend on correctly identifying and measuring an asset's fundamentals. The variance ratio test is also robust to changes or asymmetries in the structure of autocorrelation, which are particularly likely if bubbles are present. This property gives the test more power to detect erratic serial dependence than tests which require structurally stable autocorrelation. See Lo and MacKinlay (1988) for a complete discussion of the variance ratio test.

2/ See Section I for references on the timing of portfolio capital inflows. The results in Sections II.1 and II.2 are robust with regard to moderate changes in the cutoff date between the two periods.

Markets Data Base (EMDB) compiled by the International Finance Corporation (IFC). Chart 1 plots the U.S. dollar total returns (price plus dividend) investable overall composite index and indexes for Latin American and Asian markets, as well as indexes for each country considered. Table 1 shows variance ratios calculated on these indexes based on a 16-week holding period; asymptotic t-statistics are shown to indicate whether the variance ratio is statistically different from one. For the composite indexes (the overall index, the Asia index, and the Latin American index) variance ratios are not significantly different from one for the period 1989-91. However, the variance ratios increase profoundly for the period after 1991. Moreover, the increase in the variance ratio for the composite indexes persists even if the timing of the two periods is shifted by several quarters, and remains apparent for variance ratios calculated over a wide range of holding periods. 1/

As an indication of what the size of the increase means in economic terms, a variance ratio greater than two implies that excess rates of return increase (or decrease) in an accelerating manner--that is, a positive excess return this period would lead, on average, to an even larger excess return next period. In the period 1992-95, the variance ratio of the composite index increases to an average of 3.74, indicating the sort of accelerating and collapsing price behavior generally associated with speculative bubbles. 2/

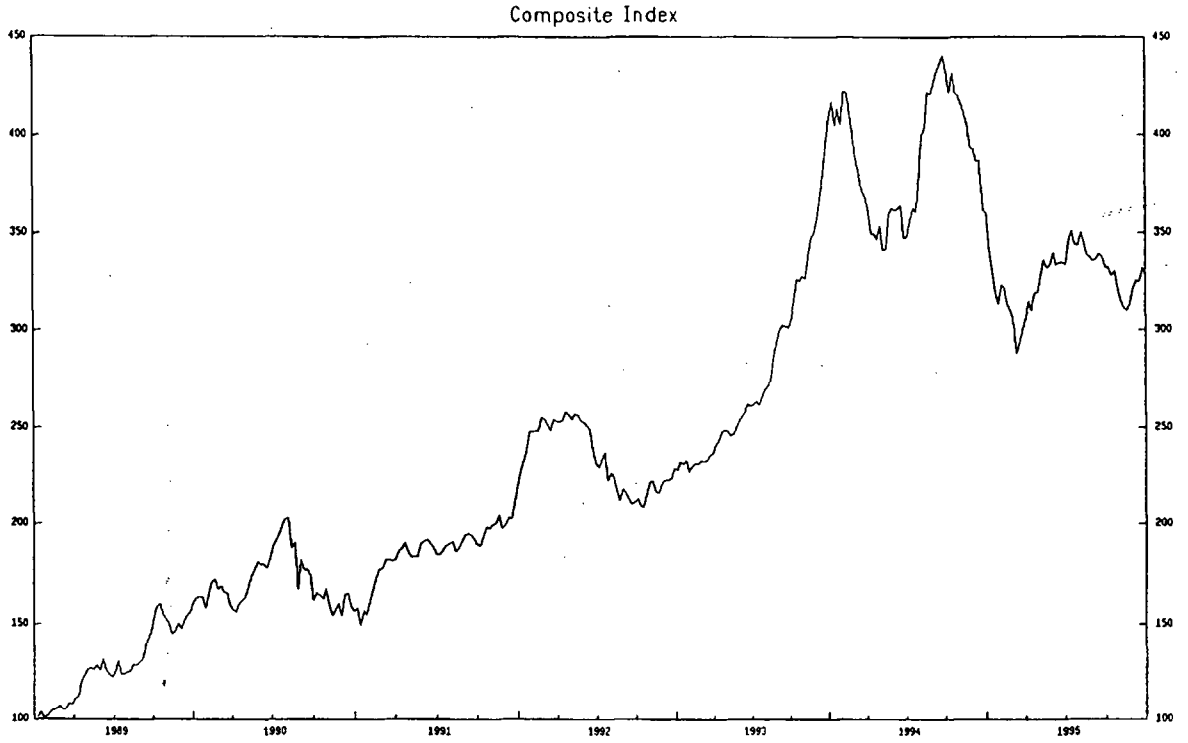
1/ Chart 2 shows the variance ratio for the composite index recalculated over different holding periods, from 2-weeks to 32-weeks. The chart shows that the variance ratio in the early sample period (1989-91) does not differ statistically from one for any of the holding periods. In contrast, the variance ratio for the later sample period (1992-95) is significantly different from one for all holding periods. Since the results are robust to the length of the holding period, only the results for holding periods of 16 weeks are presented in full detail.

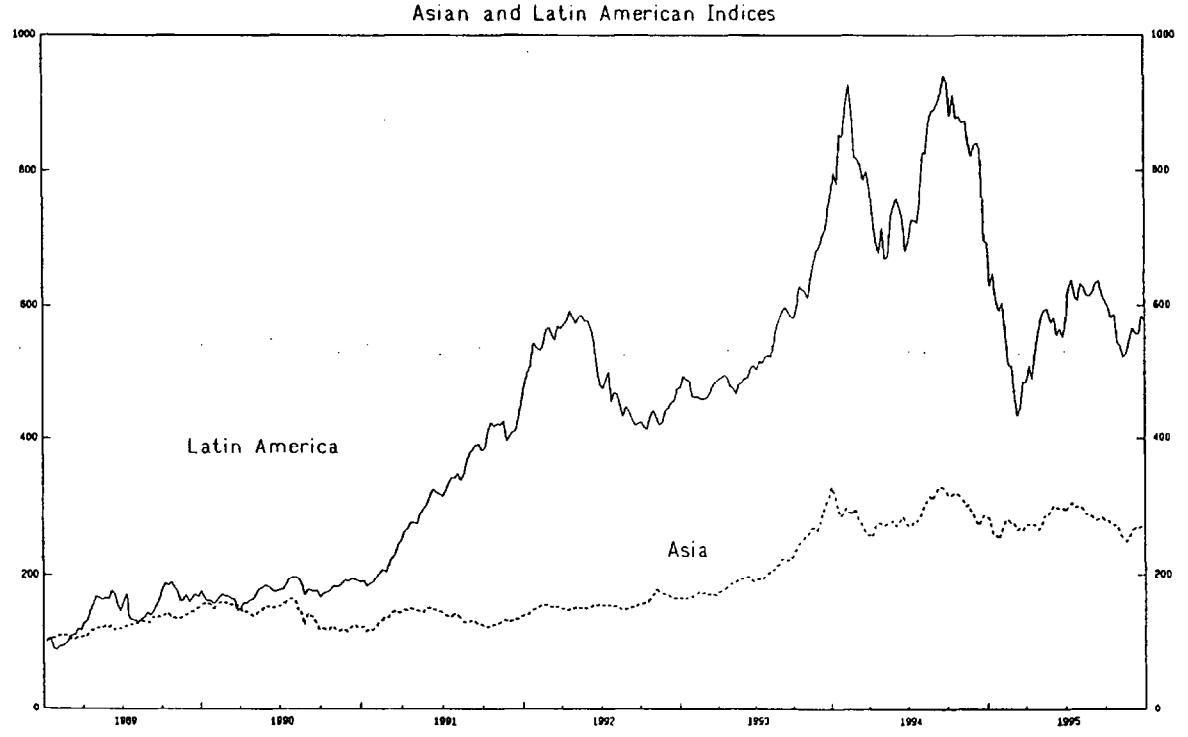
2/ Moreover, this increase is many times more than can be reasonably accounted for solely by an increase in the variance of the risk premium on emerging market stocks. Even in the extreme, where deviations from a random walk are caused entirely by shifting risk premia, the variance of the risk premium on emerging market stocks based on uncertainty about long term prospects would have to have increased several times between the two periods in order to produce such a large shift in the variance ratio observed for emerging markets as a whole. One would expect such an increase to be reflected, at least partially, in the variance of other indicators of country risk. Indicators such as secondary market prices for emerging market debt claims, for example, do not appear to have experienced major increases in variance.

Chart 1

Total Returns in Developing Country Stock Markets

(IFC weekly U.S. dollar investable total returns index, December 1988=100)



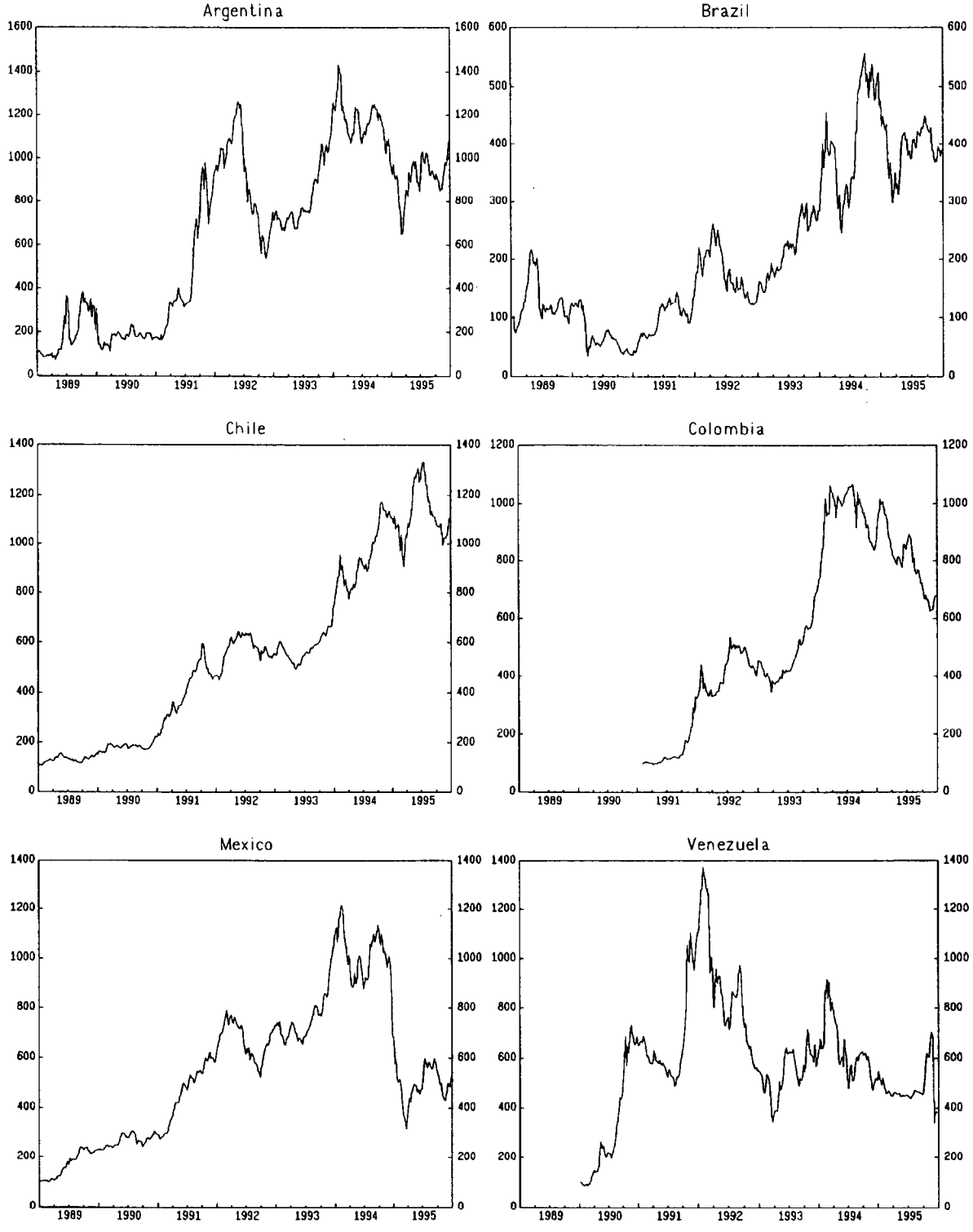


Source: International Finance Corporation (IFC), Emerging Markets Data Base.

Chart 1 (cont.)

Total Returns in Developing Country Stock Markets

(IFC weekly U.S. dollar investable total returns index, December 1988=100)

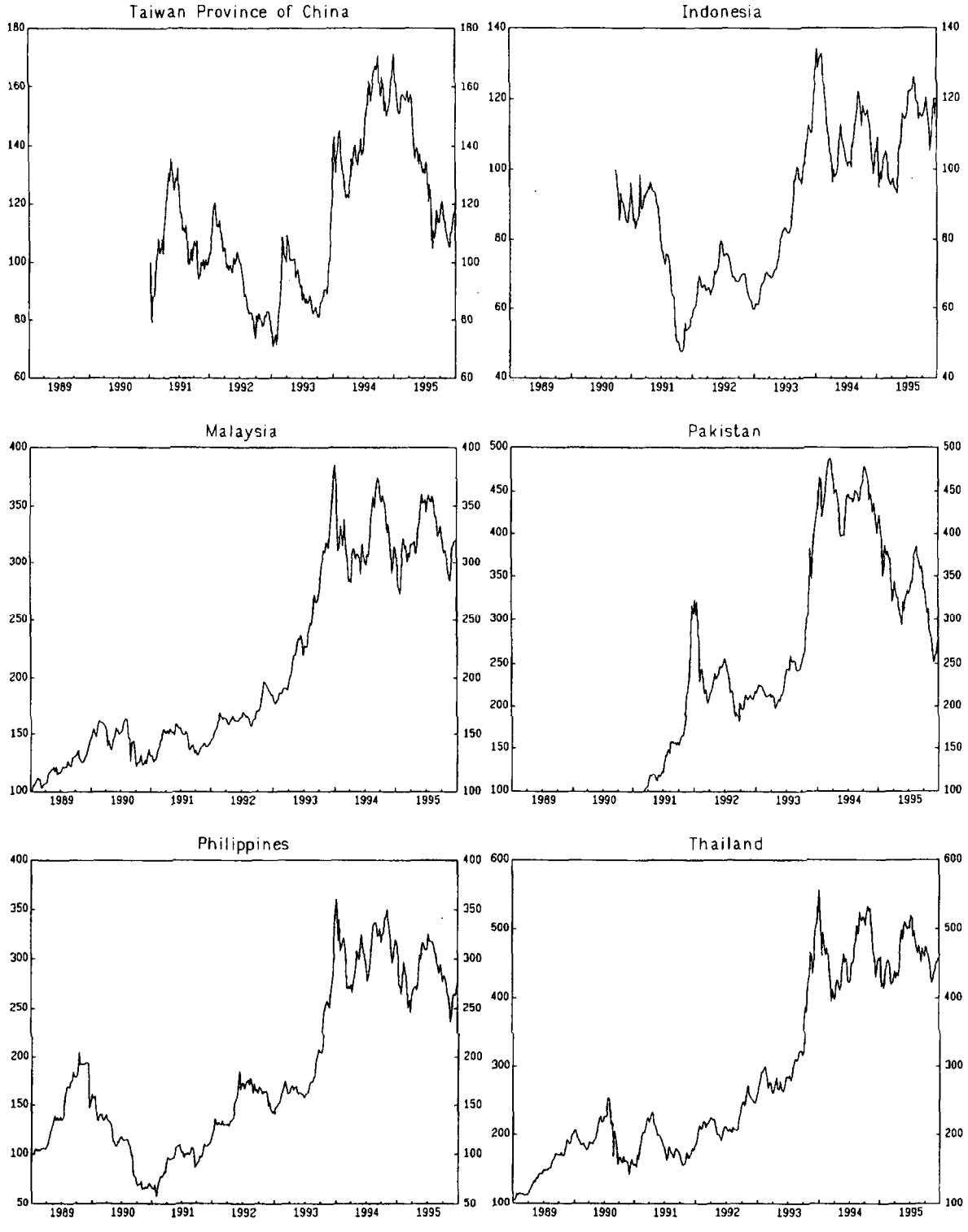


Source: International Finance Corporation (IFC), Emerging Markets Data Base.

Chart 1 (cont.)

Total Returns in Developing Country Stock Markets

(IFC weekly U.S. dollar investable total returns index, December 1988=100)

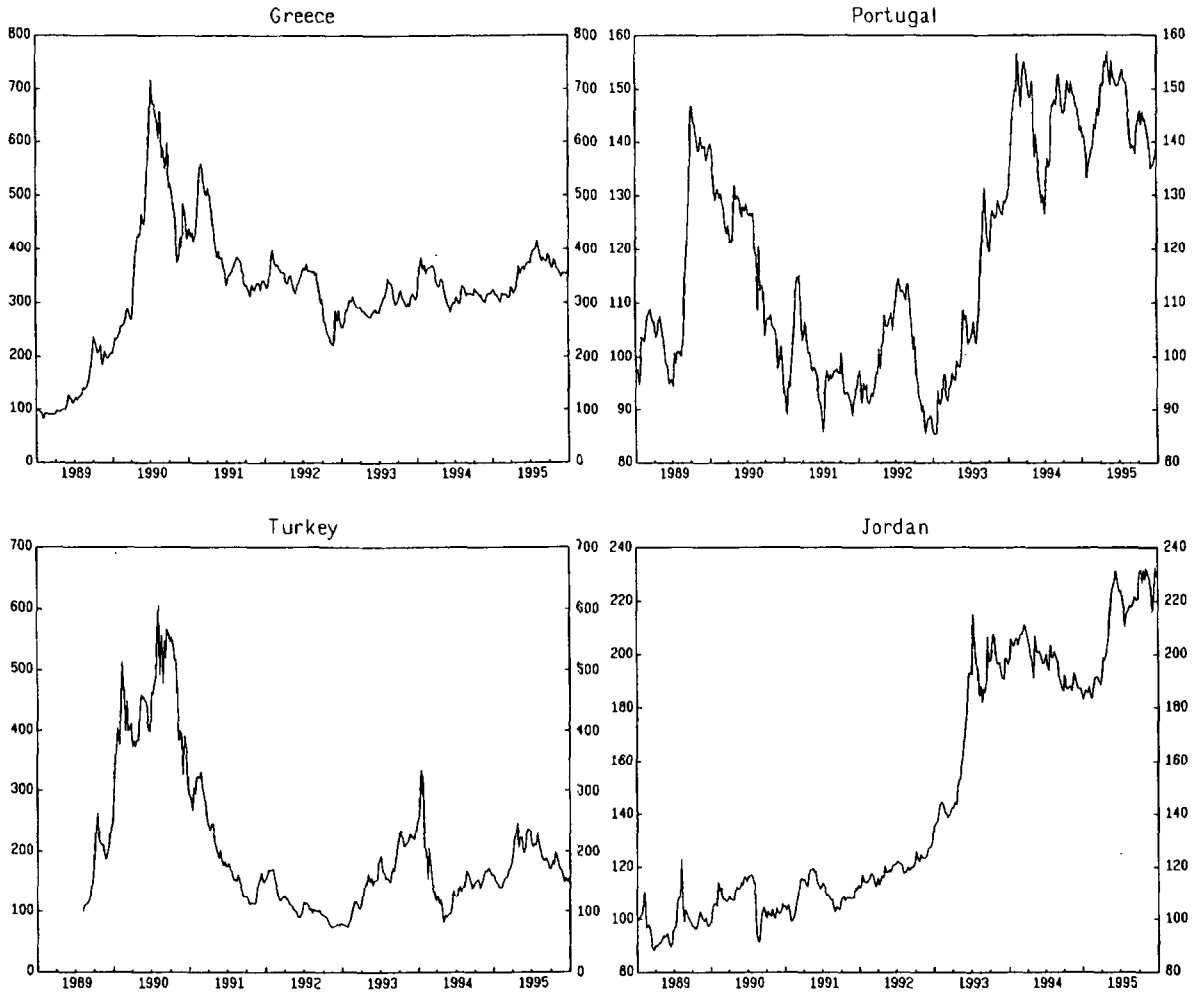


Source: International Finance Corporation (IFC), Emerging Markets Data Base.

Chart 1 (cont.)

Total Returns in Developing Country Stock Markets

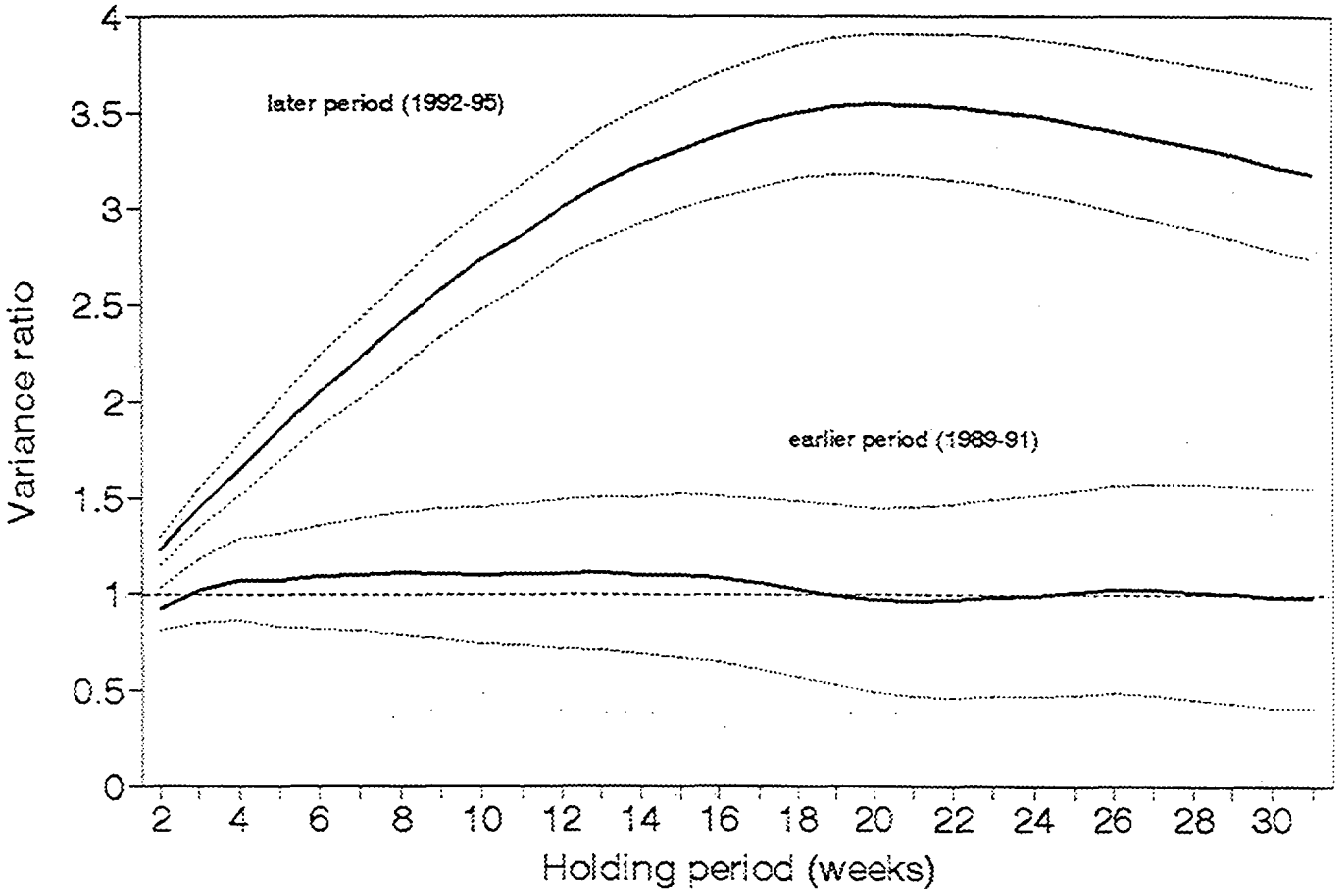
(IFC weekly U.S. dollar investable total returns index, December 1988=100)



Source: International Finance Corporation (IFC), Emerging Markets Data Base.

Chart 2. Variance Ratio Calculated over Different Holding Periods

IFC Investible Composite Index



Dotted lines depict one standard deviation on either side of estimates

Table 1. Variance Ratio Test of Weekly Stock Market Returns, 1989-95 1/

Total Returns Index	Weight in Index 2/	1989-91	1992-95	1989-95
Composite	100	1.08	3.38	2.12
		(0.2)	(7.3)	(4.0)
Latin America	49.7	1.13	2.30	1.81
		(0.3)	(3.7)	(3.0)
Argentina	4.5	0.83	1.39	0.91
		(-0.4)	(1.1)	(-0.2)
Brazil	15.9	1.11	0.97	1.07
		(0.2)	(-0.1)	(0.2)
Chile	2.2	1.72	1.66	1.77
		(2.1)	(1.9)	(3.1)
Colombia	1.8	1.99	1.85	2.51
		(1.3)	(2.5)	(3.8)
Mexico	23.9	1.68	2.55	2.51
		(1.7)	(3.9)	(4.8)
Venezuela	0.5	2.20	0.62	1.41
		(2.5)	(-1.3)	(1.7)
Asia	42.9	1.33	1.96	1.52
		(0.7)	(2.7)	(1.6)
Taiwan Province of China	2.5	1.39	1.42	1.21
		(0.7)	(1.2)	(0.7)
Indonesia	2.4	1.61	1.54	1.82
		(1.3)	(1.8)	(3.0)
Malaysia	22.8	0.96	1.42	1.15
		(-0.1)	(1.2)	(0.5)
Pakistan	0.9	1.28	1.78	2.14
		(0.4)	(2.2)	(3.2)
Philippines	3.5	2.15	1.45	1.76
		(3.3)	(1.4)	(3.2)
Thailand	4.8	1.38	1.47	1.35
		(0.7)	(1.4)	(1.0)
Other				
Greece	1.5	2.19	1.10	1.77
		(3.2)	(0.3)	(2.8)
Portugal	1.6	1.62	1.55	1.48
		(1.5)	(1.7)	(1.9)
Turkey	3.5	1.94	1.44	1.49
		(2.3)	(1.0)	(1.6)
Jordan	0.2	0.56	1.14	0.75
		(-1.1)	(0.4)	(-0.8)

Source: International Finance Corporation; and Fund staff estimates.

1/ Variance ratios with heteroskedasticity-robust asymptotic t-statistics in parenthesis, testing the null hypothesis that the variance ratio equals one (total returns follow a random walk). Variance ratios for developing country stock markets are calculated on the weekly IFC Emerging Market Data Base U.S. dollar Investible Total Returns Indices, based on a holding period of 16 weeks.

2/ Market weights in the IFC Investible Index in November 1994.

2. Emerging market stocks as an asset class

An important fact which emerges from Table 1 is that of the 16 individual country estimates, only those for Mexico, Columbia and Pakistan, and to a lesser extent Chile, Portugal, and Indonesia are sufficiently greater than one to reject the random walk hypothesis for the period 1992-95. In addition, in all cases except Mexico the estimates of the variance ratio on individual markets are less than the estimates on the composite indexes. This result is striking, since if each composite index simply reflected arbitrary groupings of individual assets, the composites would be expected to show less autocorrelation than each of the individual indexes. The results in Table 1, however, imply that the composites themselves have an importance beyond the sum of their components. Similar results were obtained by Lo and MacKinlay (1988) in their variance ratio test on U.S. stock market data, and by Claessens et al (1995) in the case of emerging markets. 1/

The results suggest that investor behavior results in bubble-like price properties for emerging market stocks as a whole, although less so for each individual emerging market security. This apparent paradox is consistent with a widespread view that institutional investors treat developing country stocks as a separate asset class. According to this view, portfolio managers who lack the local knowledge about the fundamentals of each developing country stock allocate a portion of their assets toward developing country stocks as a class, and then within that class, spread this allocation over a portfolio of stocks so as to receive the risk/return benefits of the portfolio and at the same time minimize idiosyncratic risk. 2/ The predominance of investment funds relying on managers who use

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1/ Lo and MacKinlay (1988) found positive statistically significant autocorrelation on overall U.S. stock market index returns and negative (although insignificant) autocorrelation on the returns of individual securities. Claessens et al (1995) find that for emerging markets, the means of the first order autocorrelations for individual stocks were smaller than the first order correlations of the economy-wide indexes. From this, they conclude that "the portfolio-formation process influenced the higher degree of predictability found for the index and portfolio rates of return."

2/ In the words of one analyst, "most investment managers regard emerging markets like venture capital holdings--you have to spread your money around because you can't be sure which ones will do well and which ones will collapse."

"balanced expertise" rather than on specialist managers, and the proliferation of "dedicated funds" support this view of investor behavior. 1/

In addition to anecdotal evidence, Buckberg (1996) finds more systematic evidence supporting the practice of portfolio allocation by asset class. According to standard asset pricing models, investors chose their portfolio by evaluating each asset's risk characteristics individually in relation only to the variance of total returns of the world portfolio. For emerging market stock returns data over the period 1989-95, Buckberg tests this standard one-factor model against a two-factor asset pricing model which, in addition to the world portfolio, includes a measure of returns on a broad portfolio of emerging market stocks. By rejecting the one-factor model in favor of the two-factor model in most cases, particularly for the sub-period 1992-95, she is able to conclude that investors seem to be following a two-step portfolio allocation process--first determining what share of their portfolio to invest in developing country markets, and then allocating those funds across these markets.

This sort of investor behavior could help to explain the sharp increase in bubble-like booms and busts in emerging market prices corresponding to the period of large institutional investor capital inflows. Portfolio managers who, for whatever reason, perceived their portfolio of emerging market stocks to be performing less well than expected might decide to sell their holdings. Rather than shifting their holdings from one emerging market asset to another they would, treating emerging markets as an asset class, shift their portfolio out of emerging markets altogether. Given the size of institutional investor holdings relative to emerging market capitalization, it is not difficult to imagine how relatively small shifts in investor sentiment could produce large swings in emerging market prices, producing bubble-like behavior at the level of the asset class, while at the same time allowing the shifts in sentiment to be distributed among the developing country stocks in such a way that the price indexes for each country appear to follow (more or less) a random walk.

1/ The predominance of funds using managers who employ "balanced expertise," according to which a manager spreads his portfolio over several asset classes, is said to arise because of the difficulty in comparing the performance of a "specialist" in one asset class with the performance of specialists in another classes. In contrast, it is relatively easy to compare the performance of a balanced manager with the performance of other balanced managers. As a result, however, balanced expertise is said to involve a kind of herd instinct, where no manager strays too far from the mainstream asset allocation for fear of producing results below the median.

III. Additional Observations

In summary, the evidence appears to support a view of investor behavior in emerging markets which is at odds with standard portfolio choice analysis and the efficient market hypothesis. According to this view, investor sentiment, in contrast to individual analysis of each asset's fundamentals, can at times play a critical role in determining asset prices, leading to periods of bubble-like booms and busts and asset price overshooting. The implications extend beyond stock prices, affecting views on issues such as the appropriate response to short-term capital inflows, hot money, contagion effects, and exchange rate fluctuations.

Some caveats are in order, however. Although the data appear to support the destabilizing influence of institutional investors, this should not lead one to conclude that these investors ought to be excluded from emerging markets. Put differently, a failure to reject the hypothesis that emerging markets were efficient for the earlier period (1989-91) does not imply that emerging markets were in fact efficient. If earlier restrictions on foreign ownership suppressed stock prices at levels much lower than justified by their underlying fundamentals, institutional investors may have improved efficiency by driving up prices, although with the side-effect of simultaneously subjecting these markets to the destabilizing influence of shifts in investor sentiment. 1/ Were this the case, the opening of stock markets and subsequent entry of institutional investors could have replaced large stable structural inefficiencies with smaller, albeit less-stable behavioral inefficiencies.

Another question arises regarding the persistence of destabilizing investor behavior. One might argue that as institutional investors learn about emerging markets, the volatility of their enthusiasm will subside. The Mexican peso crisis in December 1994 was said to have produced a fundamental change in investor behavior, causing investors to be more selective and discriminating among emerging market stocks. Investors, analysts argue, have now "learned" that many emerging market assets are fundamentally different from one another, in no way a single "asset class." If so, prices might show a different pattern in the wake of the Mexican peso crisis than in the period prior. To shed light on this question, Table 2 compares variance ratios between two sub-periods, one corresponding to the time leading up to and including the peso crisis (1992-94) and the other since the crisis (1995). Table 2 shows that for each of the composite indexes, the variance ratios decline significantly toward one in the period

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1/ Claessens and Rhee (1993), for example, find that for most of the developing country markets they examined, barriers to access by foreigners had a negative impact on the price-earnings ratio of stocks.

Table 2. Variance Ratio Test of Weekly Stock Market Returns, 1992-95 1/

Total Returns Index	Weight in Index 2/	1992-95	1992-94	1995
Composite	100	3.38	2.87	1.23
		(7.3)	(5.3)	(0.4)
Latin America	49.7	2.30	1.73	0.97
		(3.7)	(2.0)	(-0.0)
Argentina	4.5	1.39	1.66	0.44
		(1.1)	(1.6)	(-0.9)
Brazil	15.9	0.97	0.92	0.44
		(-0.1)	(-0.2)	(-0.8)
Chile	2.2	1.66	1.58	2.31
		(1.9)	(1.4)	(1.9)
Colombia	1.8	1.85	1.73	1.24
		(2.5)	(1.9)	(0.5)
Mexico	23.9	2.55	1.37	1.19
		(3.9)	(0.9)	(0.3)
Venezuela	0.5	0.62	0.95	0.38
		(-1.3)	(-0.2)	(-1.3)
Asia	42.9	1.96	1.87	1.38
		(2.7)	(2.0)	(0.7)
Taiwan Province of China	2.5	1.42	1.58	0.48
		(1.2)	(1.4)	(-0.8)
Indonesia	2.4	1.54	1.94	0.98
		(1.8)	(2.7)	(-0.0)
Malaysia	22.8	1.42	1.37	1.42
		(1.2)	(0.9)	(0.8)
Pakistan	0.9	1.78	1.67	1.98
		(2.2)	(1.5)	(1.8)
Philippines	3.5	1.45	1.39	1.22
		(1.4)	(1.0)	(0.4)
Thailand	4.8	1.47	1.46	1.10
		(1.4)	(1.2)	(0.2)
Other				
Greece	1.5	1.10	1.14	1.70
		(0.3)	(0.3)	(1.2)
Portugal	1.6	1.55	1.62	1.51
		(1.7)	(1.8)	(0.9)
Turkey	3.5	1.44	1.61	1.43
		(1.0)	(1.2)	(0.7)
Jordan	0.2	1.14	1.25	1.27
		(0.4)	(0.5)	(-0.5)

Source: International Finance Corporation; and Fund staff estimates.

1/ Variance ratios with heteroskedasticity-robust asymptotic t-statistics in parenthesis, testing the null hypothesis that the variance ratio equals one (total returns follow a random walk). Variance ratios for developing country stock markets are calculated on the weekly IFC Emerging Market Data Base U.S. dollar Investible Total Returns Indices, based on a holding period of 16 weeks.

2/ Market weights in the IFC Investible Index in November 1994.

after the crisis. 1/ Although the crisis is still too recent to offer suitably reliable results, it seems that for emerging markets as a whole, prices have recently been less prone to positive feedback trading than in the pre-crisis period 1992-94.

1/ This final result should be treated with caution. As the sample period is subdivided, one increasingly runs the risk of understating the degree of auto-correlation of returns. To see this, consider the extreme example that total returns are abnormally high throughout the first sub-period and abnormally low in the second. The variance ratio for the period as a whole would be large and positive, while the ratios for each sub-period could be equal to one. The reason is that the variance ratio for each sub-period calculates the persistence of abnormal returns relative to the average return for the sub-period. In this case, the auto-correlation of returns within each sub-period might be low, while the auto-correlation for the whole period might be high. This may explain why in the case of Mexico, the variance ratios do not differ significantly from one for either sub-period, while at the same time being significantly greater than one for the period 1992-95 as a whole.

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