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Stock Market Openings: Experience of Emerging Economies*

I. Introduction

The 1994 Mexican currency crisis and the recent turmoil in East Asian financial markets have prompted many academics and politicians to question the desirability of free flow of capital for emerging economies. They cite Chile's and China's success with restraints on capital flows. Even highly respected economists such as Joseph Stiglitz of the World Bank and Paul Krugman of MIT have championed capital controls as a way of coping with the financial crisis.[1] Perhaps heeding their advice, Malaysia closed its financial markets to foreign investors in September 1998. Around the same time, Taiwan announced that it was reconsidering its plans for full liberalization of capital flows in light of Asia's financial crisis.[2]

In contrast, economists such as Merton Miller (1998) reason that markets are not open enough. They argue that instead of limiting access to the markets, markets should be made more open by

This article is an exploratory examination of the benefits and risks associated with opening of stock markets. Specifically, we estimate changes in the level and volatility of stock returns, inflation, and exchange rates around market openings. We find that stock returns increase immediately after market opening without a concomitant increase in volatility. Stock markets become more efficient as determined by testing the random walk hypothesis. We find no evidence of an increase in inflation or an appreciation of exchange rates. If anything, inflation seems to decrease after market opening as do the volatility of inflation and volatility of exchange rates.

removing existing controls. Similarly, economists at the International Monetary Fund, such as Stanley Fischer and Michael Mussa, believe that currencies must be allowed to float so that markets, not governments, determine currency values. These economists are against any controls on capital flows. In fact, the Filipino central bank governor and the Philippine president declared that they will not restrain capital flows. Chile, long held up as the model of success with capital controls, eliminated a key capital restraint known as *encaje* because it caused a large increase in the borrowing cost for Chilean companies.[3]

The calls for capital controls also seem to be at odds with the move in recent years toward capital market liberalization by emerging economies. With the dissolution of the Soviet Union and a general decline in the number of centrally planned economies, politicians in developing countries could no longer ignore the global movement toward free markets. Partly to incorporate elements of market capitalism into their own economies and partly to satisfy their need for new capital, many countries have allowed a free flow of capital across their borders, including participation by foreign investors in their stock markets. Thus, before emerging economies reverse recent liberalization measures and implement regulatory restraints on capital flows, it is useful to consider the effects of such changes.

We hope to contribute to this debate on capital controls by examining the experience of emerging economies when they allow foreign investors to participate in their stock markets. Allowing foreign investment in domestic stock markets can be viewed as a removal of or reduction in constraints. By studying the effects of stock market openings, we also hope to provide insights into the opportunity cost of imposing capital constraints.

For emerging economies, there are several potential benefits of opening stock markets to foreign investors. Opening markets represent an important opportunity to attract foreign capital to finance economic growth. It also hastens the development of equity markets, which, as Boyd and Smith (1996) show theoretically and Levine and Zervos (1996, 1998) show empirically, is positively related to long-run economic growth. Furthermore, by comparing countries with differences in the development of financial markets, Rajan and Zingales (1998) find that development of financial markets facilitates economic growth by reducing the cost of external finance. Foreign equity flows result in global diversification that has other benefits for emerging economies. In Obstfeld's (1994) model, international risk sharing through global diversification results in improved resource allocation. Further, global diversification and stock market integration generate large steady-state welfare gains.[4]

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3. Torres (1998). *Encaje* required 10% of foreign capital to be kept on deposit at the central bank.
4. For evidence on stock market integration, see Bekaert and Harvey (1995), Harvey (1995), and Korajczyk (1996).

In addition, foreign investors will demand transparency and improved disclosure rules that are crucial for improved allocational efficiency of capital. They will also demand accountability of management and shareholder rights in order to protect themselves against expropriation of wealth by controlling investors. A convincing and satisfactory response to these demands will decrease the risk of holding stocks, which, in turn, will lower the cost of capital.[5]

To policy makers of emerging economies, however, these benefits must be weighed against various uncertainties associated with the opening of markets. One issue of major concern is the movement of so-called hot money, that is, an international flow of funds allegedly highly sensitive to differences in interest rates, expectations of future economic growth, and expected returns from holding securities. Given the sensitivity of these investments, even a small shock to the economy can lead to a volatile change in fund flows, which exacerbates the shock and destabilizes the domestic economy. In addition, market opening means an exposure to foreign influence. If foreign stock prices are for some reason more volatile than domestic stock prices, domestic prices may also become more volatile. A greater volatility in stock prices would make investors more averse to holding stocks and lead them to demand a higher risk premium, which implies a higher cost of capital and less investment.

Some policy makers also believe that the economy cannot be left alone to react to unpredictable market forces and requires their guidance for controlled growth. For instance, capital inflows may cause the domestic currency to appreciate in real terms. For export-oriented economies, an appreciation of exchange rates may threaten the country's competitive position in the global marketplace. The government of such an economy may also worry that there may not be enough investment opportunities to absorb the inflow of money and that the ensuing excess capital will fuel inflation.[6]

This article examines changes in the economy that occur when a country liberalizes foreign portfolio investment so that foreign investors can more freely participate in the emerging stock markets. We estimate changes in the level and volatility of stock prices, exchange rates, and inflation rates around market openings. Briefly, we find that stock returns increase immediately after market opening but fall subsequently. There is no accompanying increase in the volatility of stock returns. We also find that stock markets tend to become more efficient, as determined by testing the random walk hypothesis. When we exam-

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5. Disclosure in reporting is one of the two measures of financial development employed by Rajan and Zingales (1998).

6. A good example is Argentina, where capital inflows both increased inflation and strengthened the currency. For a discussion of the Argentine experience, see Rodriguez (1981) and Obstfeld (1985).

ine changes in inflation and exchange rates around market openings, we find neither an increase in inflation nor an appreciation in exchange rates. While the results vary across countries, on average, the evidence herein suggests that market openings have favorable effects on the emerging economies.

The article is organized as follows. After discussing the sample of emerging countries in Section II, Section III examines the effects of liberalization on the domestic stock market, including changes in stock returns, stock price volatility, and the incidence of rejection of the random walk hypothesis around market openings. Section IV focuses on inflation, changes in exchange rates, and the volatility of both. Section V contains the summary and concluding remarks.

II.   Sample Description

Our sample consists of the emerging stock markets that are followed by the International Finance Corporation (IFC) in its Emerging Markets DataBase.[7] The number of countries covered by the IFC has continued to increase as the stock markets in other countries develop. As of September 1996 (the last month for which we have data available), there were 27 countries in the database. However, seven of those countries were recently added for which we do not have sufficient data for analysis. We study the remaining 20 countries. A similar sample is used in many other studies of emerging markets.[8]

The 20 countries in our sample are listed in the appendix. The appendix contains the market opening date, the maximum level of foreign participation allowed, and information relating to the process of liberalization for each country. The market opening dates reported in the appendix are important because much of the analysis in the article evaluates changes that took place around market openings. Recognizing the importance of these dates, many different sources have been consulted to ascertain and confirm the validity of opening dates.[9] One of the markets (Nigeria) is still considered closed, and another market (Malaysia) has been open to foreign investment in financial securities much before the availability of stock return data. Therefore, the sample of countries available for analysis around market openings drops to 18 from the original 20.

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7. Emerging stock markets are defined by the International Finance Corporation to consist of stock markets in developing countries (low- and middle-income economies).

8. Aggarwal, Inclan, and Leal (1995); Bekaert and Harvey (1995, 1997); Buckberg (1995); Claessens, Dasgupta, and Glen (1995); Harvey (1995); Korajczyk (1996); and DeSantis and Imrohoroglu (1997).

9. See the appendix for a list of sources. Bekaert and Harvey (1999) have also documented the major political and economic events in the sample countries; most of that information is consistent with the information used in this study.

Some caveats regarding the opening dates are in order. First, market opening is a gradual process and the dates reported represent only the most significant liberalization of the market. Therefore, changes measured around these dates will understate the true effect of market openings. Second, these are the actual opening dates, not the announcement dates. Since the announcement is typically made before the actual opening and the stock prices are likely to react to the announcement, the effects detected around the actual opening dates are due to foreign participation and to resolution of uncertainty regarding market opening. To control for the possibility of liberalization announcements affecting stock returns and exchange rates, the year prior to the actual opening is excluded from the analysis. Third, stock market liberalization is often accompanied by other economic reforms, such as relaxation of product market controls, trade liberalization, and privatization. These economic reforms will also affect the economic variables we examine in this article.[10]

While the focus in this article is on removal of restrictions on capital flows into the domestic market, there are often restrictions on capital flows out of the country. If domestic investors are allowed to own foreign securities prior to removal of restrictions on capital inflows, then the effect of the liberalization may differ as compared to the effect in countries where capital outflows are restricted. Thus, we distinguish market openings that are preceded by unrestricted capital outflows from those that had restrictions on outflows. Information related to restrictions on residents for owning foreign securities is given in the appendix for each country. There are four countries (Indonesia, Mexico, Taiwan, and Venezuela) where residents were allowed to own foreign securities prior to market opening as we have defined it.[11]

The database contains a monthly total return index for each market based on a representative set of stocks followed by the IFC, and adjusted for all distributions and stock splits.[12] The country indices allow computation of monthly return data up to September 1996. However, start of data differs by country. Monthly returns are available from January 1976 for nine countries (Argentina, Brazil, Chile, Mexico, India, Korea, Thailand, Greece, and Zimbabwe), from January 1985 for seven countries (Colombia, Venezuela, Malaysia, Pakistan, the Philip-

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10. Henry (1998) controls for economic reforms and still finds a qualitatively similar effect of market liberalization on stock returns.

11. In three of the four countries, residents had been allowed to own foreign securities prior to the start of stock data (Indonesia, Mexico, and Venezuela).

12. The Emerging Markets DataBase of the International Finance Corporation (1975–) has a survivorship bias in the early part of the data (pre 1981). Although the data start from December 1975 for many countries, the companies were selected in 1981 when the Emerging Markets DataBase was established. Thus, better performing firms are likely to be selected for the period when the data are back-filled (see Harvey 1995). Fortunately, our analysis does not require use of pre-1981 data.

pines, Taiwan, and Nigeria), and from January 1979 for Jordan, February 1986 for Portugal, January 1987 for Turkey, and January 1990 for Indonesia.

To evaluate the impact of market liberalization on selected economic variables, we have chosen a long period, a total period of 10 years (5 years before market opening and 5 years after market opening), for our analysis. We believe this period is long enough to capture the effects related to market liberalization. Any changes in the economic variables that occur after that period are unlikely to be attributable to market openings.[13]

III.   The Impact on Domestic Stock Markets

In this section, we investigate the effect of market openings on stock market returns, volatility, and market efficiency. The data are drawn from the Emerging Markets DataBase as explained above.

A.   Stock Returns

To examine the effect of market opening on domestic stock markets, we compute and compare stock returns before market opening with the stock returns following market opening. The month of market opening is defined as month 0. Relative months -1, -2, and $+1$ represent 1 month before opening, 2 months before opening, and 1 month after market opening.

The stock returns for each country can be measured using a single reference currency, such as the U.S. dollar or the local currency. The advantage of using a local currency return is that the effect on the stock market can be measured from a local perspective rather than from a foreign perspective. For intercountry comparisons and from foreign investors' perspective, however, dollar returns are better to use because no transformation of local returns is required. For instance, the excess dollar returns can be computed from raw dollar returns by subtracting the 3-month Treasury-bill rate. But it is difficult to do the same for local currency returns for two reasons. First, risk-free rates are not available for all countries on a monthly basis because many countries do not issue risk-free debt or do not have active secondary markets.

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13. An alternative would be to use all of the data available for the sample countries, in some cases those for as much as 20 years. However, this would result in using different amounts of data from different countries, which would tend to assign a higher weight to the country with more data because that country would appear in the analysis more often. It would also increase noise in the data as factors unrelated to market liberalization would affect the results. To guard against the possibility of extraneous factors affecting our results owing to the already long sample period chosen, we also report year-by-year comparisons in the relevant economic variables.

Second, excess local currency returns may vary due to differences in the level of inflation; a 6% excess return based on a risk-free rate of 7% would be considered quite different from an excess return of 6% based on a risk-free rate of 100%. Using the excess dollar returns will partially mitigate the problems associated with different levels of inflation across countries. For these reasons, we use excess dollar returns instead of local returns. Excess dollar returns are used in most studies of emerging markets—see Bekaert (1995); Buckberg (1995); Claessens, Dasgupta, and Glen (1995); and Harvey (1995).

An excess dollar return is computed as the change in the market index expressed in U.S. dollars as reported by the IFC minus the monthly riskless rate based on the 3-month Treasury-bill rate. These excess dollar returns and standard deviations are reported for all 20 countries from the start date of data availability for each country to September 1996 in table 1.[14]

The mean excess returns range from 0.12% per month to 4.32% per month. By and large, the higher monthly returns are associated with higher risk. Assuming U.S. stocks have a monthly excess return of about 0.5%, most of the emerging stock markets generate a monthly excess return greater than that level, which is consistent with the popular view that emerging stock markets generally have provided higher returns albeit associated with higher risk.

To assess the effect of market opening on stock returns, the mean excess returns are plotted in figure 1 for 15 countries for a period of 10 years (±60 months) around the month of market opening.[15] Relative month 0 refers to the month of market opening as defined in the appendix. In addition to the mean excess return, we also compute a 12-month moving average. Due to the high volatility of monthly returns, it is easier to read the 12-month moving average graphs (the solid line) than the mean excess return graphs. Looking at the individual markets, it is easy to see that the returns are higher soon after market liberalization in Brazil, Colombia, Greece, Pakistan, the Philippines, Turkey, Vene-

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14. It should be noted that the returns reported in table 1 are arithmetic averages, not geometric returns. Some would argue that, because of the volatile nature of emerging markets (many large negative returns and many large positive returns), the arithmetic returns will overstate the true return. Others, like Fama (1998), disagree. However, for our purposes the difference is not important as we do not rely on the mean level of returns for our results; rather we focus on the significance of the change in returns.

15. We require that countries have at least 6 months of data before market opening and 6 months of data after market opening for comparison. Based on these criteria, five countries are excluded from the sample because Nigeria was closed as of 1998; Malaysia opened before December 1984, the first month for which data are available for Malaysia; Indonesia opened in September 1989, 3 months before the first set of data is available for Indonesia; Jordan opened in January 1978, 12 months before the availability of the first return; and Portugal has only 4 months of preopening data available.

TABLE 1   **Descriptive Statistics of Monthly Excess Dollar Returns (January 1976–September 1996)**

| | | Excess Dollar Returns | | |
Country	Start Date of Monthly Data	Number of Months	Mean (%)	Standard Deviation (%)
Argentina	January 1976	249	4.32	27.51
Brazil	January 1976	249	1.52	16.48
Chile	January 1976	249	2.23	10.83
Colombia	January 1985	141	2.34	8.87
Greece	January 1976	249	.12	9.74
India	January 1976	249	.80	8.02
Indonesia	January 1990	81	.26	8.78
Jordan	January 1979	213	.21	4.96
Korea	January 1976	249	.92	8.89
Malaysia	January 1985	141	.88	7.61
Mexico	January 1976	249	1.52	12.62
Nigeria	January 1985	141	1.28	15.12
Pakistan	January 1985	141	.76	7.21
Philippines	January 1985	141	2.84	10.32
Portugal	February 1986	128	1.98	12.03
Taiwan	January 1985	141	2.19	14.20
Thailand	January 1976	249	1.18	7.80
Turkey	January 1987	117	2.86	20.03
Venezuela	January 1985	141	1.67	13.76
Zimbabwe	January 1976	249	.71	9.80

NOTE.—An excess dollar return is the monthly dollar return minus the monthly riskless rate based on the 3-month Treasury-bill rate. A monthly dollar return is the change in the market index expressed for U.S. dollar investors as reported in the Emerging Markets DataBase of the International Finance Corporation (1975–). The index is adjusted for all distributions and stock splits.

zuela, and Zimbabwe. In the remaining countries, there is no discernible change in returns around market openings. The increase in returns probably reflects an increase in stock prices due to the additional demand created by foreign investors.

The returns are averaged across different markets by relative month for which individual country returns are available. This average return is plotted under the title ''All Markets.'' Now the increase in return is clearly evident in the period following market opening. The return increases for about 12 months and then begins to fall to the preopening level. By month +24, the return seems to have returned to the preopening level. Another aggregate plot is under the title ''Restricted Markets,'' which refers to markets where residents could not invest in foreign securities. The interpretation of the restricted markets plot is no different from the interpretation of the all markets plot. If we look at the individual country plots of the three countries excluded from the restricted markets' plot (the fourth country, Indonesia, has insufficient data), we find that Mexico and Taiwan show no change in returns
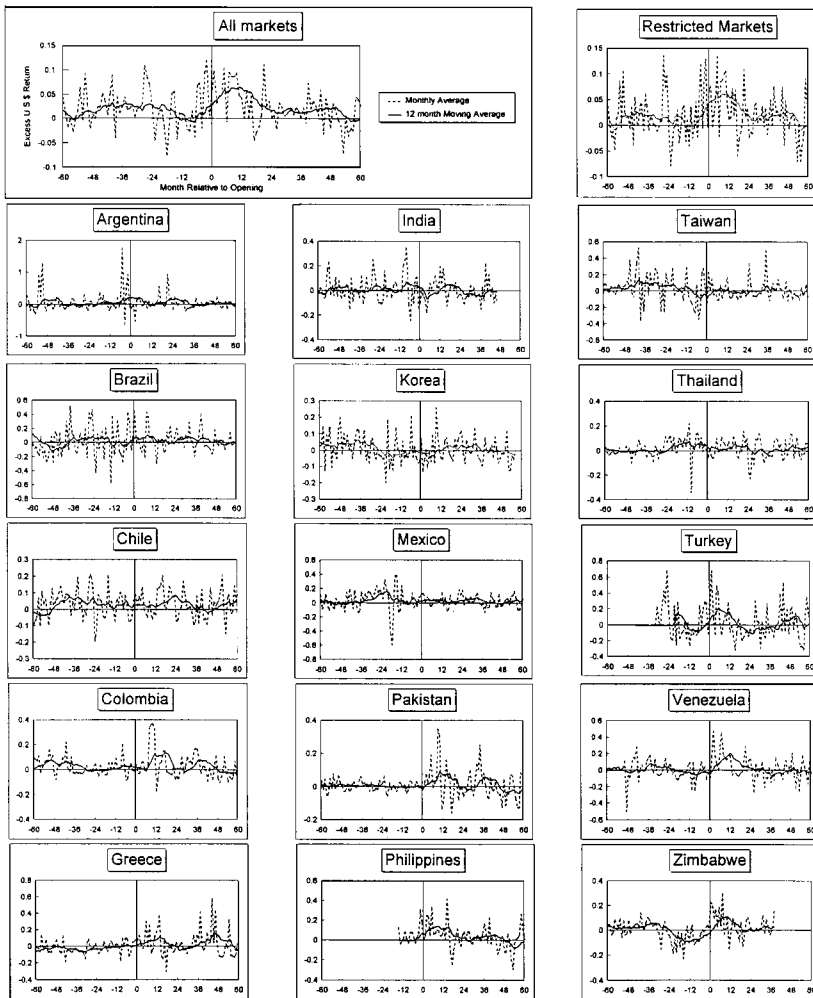
FIG. 1.—Excess U.S. dollar returns around market openings

around market opening, while Venezuela seems to display an effect similar to that of the restricted markets.[16]

16. One explanation for the similarity of the all markets and restricted markets plots is the relatively small difference in the sample of all markets and restricted markets. As indicated above, the all markets sample consists of 15 countries while the restricted markets sample consists of 12 countries. Another explanation might relate to the home country bias: although it is optimal for investors to invest in foreign securities, they do so only partially (see French and Poterba 1991; Cooper and Kaplanis 1994; and Baxter and Jermann 1997). Therefore, the freedom to invest in foreign securities does not motivate domestic investors to take full advantage of risk diversification provided by foreign securities. Why

TABLE 2   **Changes in Stock Returns, Inflation, and Exchange Rates around Market Openings**

Description	Return/Rate prior to Market Opening		Return/Rate after Market Opening		Change in the Return Rate	
	Mean (%)	Standard Deviation (%)	Mean (%)	Standard Deviation (%)	Change (%)	z-Statistic
Stock returns all markets*	2.05	4.04	2.26	3.88	.21	.26
Stock returns all markets, excluding 24 months*	1.97	3.75	1.21	3.23	−.76	−1.19
Inflation rate in low inflation markets†	1.67	.54	1.39	.41	−.28	−3.22
Change in nominal exchange rates in low inflation markets†	−1.44	.29	−.75	.27	.69	13.39
Change in real exchange rates in low inflation markets†	−2.66	.53	−1.67	.33	.99	12.34

NOTE.—Estimates are obtained for a portfolio of all the countries over a period of ±60 months around the month of market opening. Market opening dates are given in the appendix. Row 2 of the table reports stock returns after excluding 24 months centered on the month of market opening. It is better to exclude this period for comparison as changes may take place because of the uncertainty created by market opening.

* The following countries are not included: Jordan and Malaysia (no data before opening), Nigeria (closed as of 1998), and Indonesia and Portugal (insufficient data before opening).

† The following countries are not included: Malaysia (no data before opening), Nigeria (closed as of 1998) and Taiwan (no data in the International Financial Statistics of the International Monetary Fund 1997). Low inflation markets exclude Argentina and Brazil, both of which experienced inflation exceeding 10% per month.

In all of the subsequent analysis, we compare the results for all markets with results for restricted markets and find no perceptible difference between the two. Consequently, we drop discussions concerning the restricted versus nonrestricted markets from the remainder of this article.

We report the average pre– and post–market opening returns for a portfolio of 15 countries in the first two rows of table 2. Unlike figure 1, the first row of the table does not show the intertemporal changes in stock returns around market openings; that is, the increase in returns immediately after market opening is masked by the subsequent lower returns. Indeed, the second row of the table, which excludes returns for 1 year after opening, shows a decrease in the return from 1.97%

then should the opening of emerging stock markets induce foreign investors to invest in the emerging markets in a significant way? The answer lies in the relative size of these markets. The market capitalization of developed markets was more than eight times the capitalization of all emerging markets as of December 1996, and hence a small fraction of a developed market, if invested in an emerging market, would have constituted a large fraction of the emerging market.

to 1.21%. The decrease, though statistically insignificant, is consistent with the notion that domestic firms are able to access lower cost funds from international investors owing to the benefit of diversification. The result is consistent with Bekaert and Harvey (1999), who find that increases in equity flows are associated with a lower cost of capital. Similarly, Henry (1998) finds that liberalizing countries experience an upward revaluation of the domestic stocks, which reflects a reduction in the cost of equity capital.

To test more closely for changes in stock returns around market openings, excess dollar returns for a calendar month prior to opening are compared with the same calendar month postopening. Because of the anticipation of market opening and preopening announcements, the data for 1 year prior to opening are excluded.[17] The month-by-month comparison is made for each country, giving us a total of 170 country-month observations. For the 12 months after market opening (relative month +1 to +12), the returns are compared with the 12 months before market opening (relative month −13 to −24). Similarly, the second year after opening (relative month +13 to +24) is compared with the second year prior to market opening (relative month −13 to −24), the third year after opening (relative month +25 to +36) is compared with the third year prior to market opening (relative month −25 to −36), and so forth. In this manner, we can identify trends. If there is a trend, then as the observation period around market opening widens, we should see the changes increase or decrease monotonically.

Three statistical tests are conducted. The parametric test gives an estimate of the size of the average effect of market openings on changes in stock returns. Nonparametric tests are also used since the emerging market returns are nonnormal (see Claessens, Dasgupta, and Glen 1995). The first nonparametric test employs the binomial test (see Brown and Warner 1980) given by equation (1) to determine whether the percent of postopening returns greater than preopening returns is significantly different from 50%:

$$z = \frac{|P - 0.5| - (0.5/N)}{0.5/\sqrt{N}}, \tag{1}$$

where P is the actual proportion of positive changes in returns, and N is the total number of observations for that event window. The last term in the numerator is a continuity correction since (1) is a continuous approximation of a discrete distribution. The expression z is positive when $p > .5$ and negative otherwise. The second nonparametric test is a simple sign test of no difference between the preopening and postopening returns.

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17. A 1-year period is chosen so that comparison can be made by calendar month.

   The results are presented in panel A of table 3 for the 15 countries with pre- and postopening data.[18] The overall impression is that, on average, the stock returns increase soon after opening of markets and this is followed by subsequent decreases in returns that are sometimes significant. The initial increase in returns suggests that stock prices increase initially due to greater demand for the domestic securities. The subsequent decrease in returns is consistent with the hypothesis that domestic firms are able to access lower cost funds from international investors. If expected returns (stock prices) decrease (increase) as a result of market integration, then the long-run average returns should be lower after market opening.[19] Stulz (1997), Bekaert and Harvey (1998, 1999), and Henry (1998) also find evidence consistent with a reduction in the cost of capital.

B.   Stock Return Volatility

If integration with the world markets makes the equilibrating process more efficient for stocks in emerging markets, it is reasonable to expect a drop in stock return volatility and a concomitant drop in expected returns. One may argue, however, that foreign investors are quick to react to changes in short-term economic outlook in emerging economies, making unrestricted capital flows very volatile. This volatility of capital flows may increase the volatility of the stock market.

   To explore this issue, we examine changes in stock return volatility around market openings. Recent research has demonstrated that stock return volatility is not time-invariant (see Schwert 1989). In particular, periods of extreme volatility are concentrated in time, that is, high volatility is followed by periods of high volatility. To account for the level of volatility in a previous period, we employ the autoregressive conditional heteroskedasticity model (ARCH), developed by Engle (1982), and variants thereof such as the generalized autoregressive conditional heteroskedasticity model (GARCH), developed by Bollerslev (1986). While volatility estimation is difficult, an evaluation of volatility forecasting techniques seems to suggest that the ARCH class of models

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   18. The number of observations (i.e., country-months) decreases as we move away from the date of opening due to nonavailability of data.
   19. Greater integration of markets suggested by the lower long-run average returns in this article is consistent with the recent evidence on market integration. Buckberg (1995) finds evidence of integration of emerging markets with the world markets during the 1985–91 period. Bekaert and Harvey (1995), however, suggest that greater integration is not always evident for emerging markets. Korajczyk (1996) applies a new measure of deviations from the law of one price to estimate integration and obtains different results. He finds evidence consistent with the notion that adjusted mispricing tends to decrease through time, which to him suggests greater integration between emerging markets and the developed markets. Bekaert, Harvey, and Lumsdaine (1998) search for a common break in financial series for the emerging countries. In this way, they are able to identify the dates when the equity markets become financially integrated with world capital markets.

TABLE 3 — Tests of Changes in Stock Returns, Inflation, and Exchange Rates around Market Openings

Description of Comparison	n	Nonparametric Test			Parametric Test	
		% Positive	z-Statistic	Sign Test of No Difference	Mean Change (%)	t-Statistic of Mean
Panel A: changes in monthly excess dollar returns:*						
Post 1st year versus pre 2d year	170	61.8	3.00	.00	+6.23	4.02
Post 2d year versus pre 2d year	170	52.9	.68	.49	+1.70	1.16
Post 3d year versus pre 3d year	163	46.6	−.79	.43	−3.03	−2.07
Post 4th year versus pre 4th year	144	42.4	−1.74	.08	−.49	−.34
Post 5th year versus pre 5th year	128	44.5	−1.16	.25	−1.47	−.82
Panel B: changes in inflation rates:†						
Post 1st year versus pre 2d year	179	40.8	−2.38	.02	−.75	−3.97
Post 2d year versus pre 2d year	179	40.8	−2.38	.02	−.76	−4.04
Post 3d year versus pre 3d year	168	38.1	−3.01	.00	−.65	−4.09
Post 4th year versus pre 4th year	159	59.7	2.37	.02	.14	1.02
Post 5th year versus pre 5th year	143	50.3	.01	1.00	.22	.91
Panel C: changes in nominal exchange rates:†						
Post 1st year versus pre 2d year	180	66.7	4.41	.00	1.01	8.35
Post 2d year versus pre 2d year	180	71.1	5.59	.00	1.10	8.64
Post 3d year versus pre 3d year	180	70.0	5.29	.00	1.04	6.78
Post 4th year versus pre 4th year	174	62.6	3.25	.00	.60	4.66
Post 5th year versus pre 5th year	158	55.7	1.35	.18	.09	.55
Panel D: changes in real exchange rates:†						
Post 1st year versus pre 2d year	169	62.1	3.06	.00	1.62	7.04
Post 2d year versus pre 2d year	169	66.9	4.32	.00	1.72	7.52
Post 3d year versus pre 3d year	168	64.9	3.79	.00	1.34	5.59
Post 4th year versus pre 4th year	159	56.0	1.43	.15	.66	3.23
Post 5th year versus pre 5th year	143	51.0	.16	.88	.05	.19

NOTE.—Preopening rates (excess dollar returns, inflation rates, and exchange rates) are compared with postopening rates in the following manner. First year after opening (relative months +1 to +12) is compared with the second year prior to opening (relative months −13 to −24). Since there is anticipation of market opening, the year immediately preceding the market opening is excluded. The second year after opening is compared with the second year before opening. The third year after opening is compared with the third year before opening, et cetera. Three tests are used to test for the difference between the two periods. The first nonparametric test is the z-statistic based on the number of increases and decreases. The second nonparametric test is the sign test for which the p-values are given. The last test is a parametric one that reports the difference in means. The significance is evaluated by a t-test that assumes independence.

* The following countries are not included: Jordan and Malaysia (no data before opening), Nigeria (closed as of 1998), and Indonesia and Portugal (less than 6 months of data before opening).

† The following countries are not included: Malaysia (no data before opening), Nigeria (closed as of 1998), Taiwan (no data in the International Financial Statistics of the International Monetary Fund 1997), and high inflation countries, Argentina and Brazil, both of which experienced inflation exceeding 10% per month.

provides superior forecasts of volatility (see Brailsford and Faff 1996). This method is used extensively in the literature.[20]

The first step in estimating conditional volatility is to specify a return-generating model.[21] Monthly stock index returns have been shown to include both seasonal and autoregressive components (see Bekaert and Harvey 1997). Although the conditional mean model can be specified in several ways, we choose the following model that allows for autocorrelation up to 12 lags because it has the best fit and superior autocorrelation properties. The other models we considered allowed for first-order autocorrelation only.[22] Schwert (1989) also uses this specification of the return-generating model:

$$\tilde{R}_t = \sum_{j=1}^{12} \alpha_j D_{jt} + \sum_{i=1}^{12} \beta_i R_{t-i} + \tilde{\epsilon}_t, \qquad (2)$$

where R_t is the stock return during month t, D_{jt} are the 12 monthly dummies, and R_{t-i} are lagged returns.

We use ARCH and GARCH to fit the volatilities for each country. Different models ranging from ARCH(1) to ARCH(12) and GARCH(1,1) to GARCH(8,4) are fit for each country to estimate their volatilities. The best fit varies from ARCH(1) to ARCH(8) and GARCH(1,1) to GARCH(4,3) based on the log-likelihood estimates. The stock return volatility estimates by country are plotted in figure 2 for 10 years (± 60 months) around market opening, and the aggregate volatility estimates for all markets are reported in the first two rows of table 4. In addition to the five countries excluded from the stock return computations, the Philippines is excluded because it has only four observations during the preperiod.

The first row of table 4 shows a marginally significant decrease in volatility after the market opens to foreign participation. Since the market opening itself as well as events leading to the policy change may affect volatility, we make another comparison after excluding ± 1 year around market opening. As shown in the second row of the table, excluding the 24 months around opening reveals a significant decrease in volatility from an average of 10.8% during the preperiod to 9.5% in the postopening period.

Panel A of table 5 reports the results of one parametric test and two nonparametric tests, which are similar to those reported in table 3. The parametric test assumes that stock return volatilities are normally distributed. Since this assumption may not be accurate, we also use the

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20. See Bollerslev, Chou, and Kroner (1992) for an extensive overview of applications of conditional volatility models. Hargis (1994) and Aggarwal, Inclan, and Leal (1995) use the ARCH model for emerging markets.

21. In this article, we follow Frennberg and Hansson (1995).

22. For details pertaining to the selection of this model, please contact us.
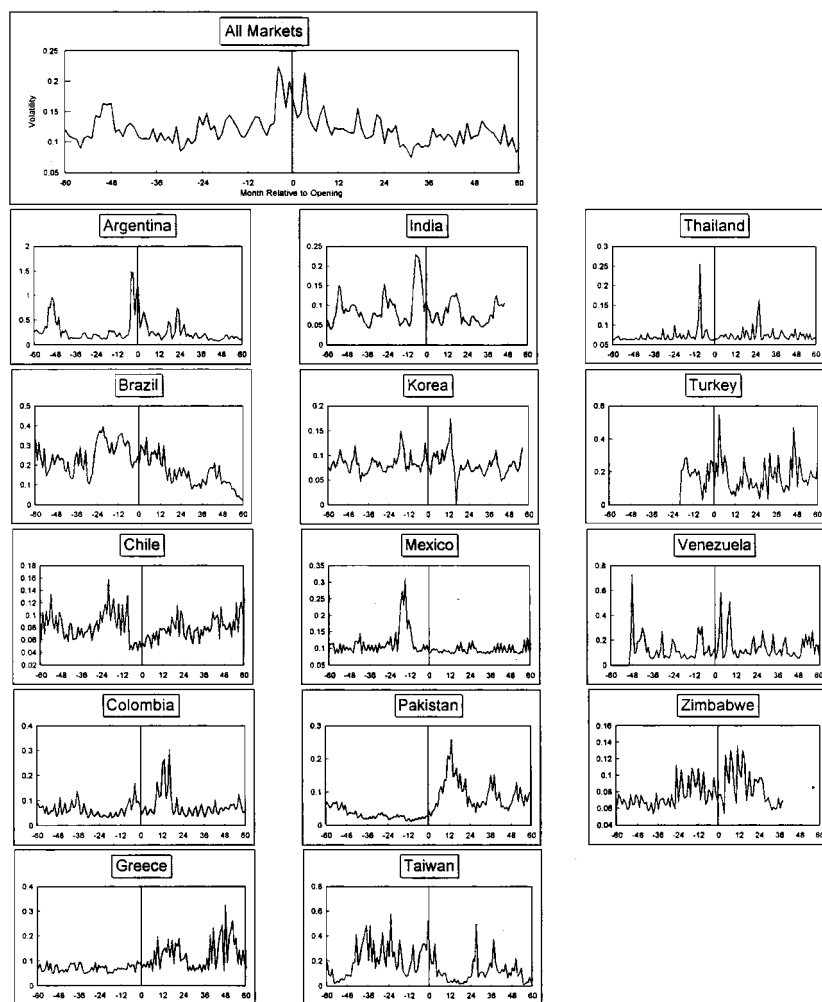
Fig. 2.—Changes in stock return volatility around market openings

ordinary sign test and a binomial test to evaluate changes in volatility.[23] Similar nonparametric tests are used by Ohlson and Penman (1985) and Skinner (1989) to test for changes in volatility. As stock return volatility may have a seasonal component, we compare the volatility of postopening months with the volatilities during the corresponding months in the preperiod. This is done for all countries in the sample.

23. One alternative is to use variance ratios. If returns are normally distributed, the ratio of the variances will have an *F* distribution. However, empirical evidence seems to indicate that variance ratios of returns do not follow an *F* distribution (see Skinner 1989).

TABLE 4   **Changes in Volatility of Stock Returns, Inflation, and Exchange Rates around Market Openings**

Country	Conditional Volatility prior to Market Opening		Conditional Volatility after Market Opening		Change in Volatility	
	Mean (%)	Standard Deviation (%)	Mean (%)	Standard Deviation (%)	Change (%)	z-Statistic
Volatility of stock returns— all markets*	12.48	2.71	11.63	2.27	−.85	−1.88
Volatility of stock returns— all markets, excluding 24 months*	10.82	2.44	9.45	2.59	−1.37	−4.53
Volatility of inflation in low inflation markets†	1.05	.24	.93	.21	−.12	−2.93
Volatility of changes in nominal exchange rates in low inflation markets†	.32	.12	.25	.10	−.06	−3.16
Volatility of changes in real exchange rates in low inflation markets†	.34	.11	.30	.12	−.04	−1.99

Note.—Volatility estimates are presented for a period of ±60 months around the month of market opening. Market opening dates are given in the appendix. The estimates are obtained by averaging across all the countries. Row 2 of the table reports the volatility after excluding 24 months centered on the month of market opening. It is better to exclude this period for comparison as changes may take place because of the uncertainty created by market opening.

* The following countries are not included: Jordan and Malaysia (no data before opening), Nigeria (closed as of 1998), and Indonesia, Philippines, and Portugal (insufficient data before opening for volatility estimation).

† The following countries are not included: Malaysia (no data before opening), Nigeria (closed as of 1998), and Taiwan (no data in the International Financial Statistics of the International Monetary Fund 1997). Low inflation markets exclude Argentina and Brazil, both of which experienced inflation exceeding 10% per month.

The results presented in table 5 show that changes in volatility during the first 2 years after opening are not significantly different from the volatility levels before opening. The parametric test, however, suggests that there is a significant decrease in stock return volatility in the fourth and fifth years after opening.

Two recent papers, Bekaert and Harvey (1997) and de Santis and Imrohoroglu (1997), have also examined changes in stock return volatility around liberalization. While de Santis and Imrohoroglu (1997) do not find any evidence of a systematic effect of market liberalization on stock return volatility similar to what we present in panel A of our table 5, Bekaert and Harvey (1997), find an overall decrease in volatility for the countries in their sample that is similar to what we show in our table 4. Since there is considerable variation in changes in stock return volatility across countries as shown in figure 2, the differences in results may be attributable to differences in sample countries and differences in the method of aggregation among the studies. Figure 2 illustrates that many countries have short periods of high volatility. For example,

TABLE 5   Tests of Changes in Conditional Volatility of Stock Returns, Inflation, and Exchange Rates around Market Openings

Description of Comparison	n	Nonparametric Test		Sign Test of No Difference	Parametric Test	
		% Positive	z-Statistic		Mean Change	t-Statistic of Mean
Panel A: changes in conditional volatility of stock returns:*						
Post 1st year versus pre 2d year	163	50.9	.15	.88	.78	.85
Post 2d year versus pre 2d year	163	49.7	−.02	1.00	−.48	−.50
Post 3d year versus pre 3d year	156	44.9	−1.19	.23	−.81	−1.37
Post 4th year versus pre 4th year	144	49.3	−.08	.93	−2.10	−2.24
Post 5th year versus pre 5th year	117	47.9	−.36	.71	−3.78	−2.66
Panel B: changes in conditional volatility of inflation rates:†						
Post 1st year versus pre 2d year	168	32.7	−4.41	.00	−.33	−4.20
Post 2d year versus pre 2d year	168	35.7	−3.62	.00	−.37	−4.36
Post 3d year versus pre 3d year	168	33.3	−4.24	.00	−.23	−4.44
Post 4th year versus pre 4th year	159	40.7	−2.28	.02	−.10	−3.09
Post 5th year versus pre 5th year	143	40.4	−2.24	.03	.05	.41
Panel C: changes in conditional volatility of nominal exchange rates:†						
Post 1st year versus pre 2d year	180	40.6	−2.45	.01	−.02	−.36
Post 2d year versus pre 2d year	180	37.2	−3.36	.00	−.09	−2.10
Post 3d year versus pre 3d year	180	36.1	−3.65	.00	−.17	−3.08
Post 4th year versus pre 4th year	165	47.3	−.62	.53	−.03	−1.32
Post 5th year versus pre 5th year	146	52.7	.57	.56	−.01	−.28
Panel D: changes in conditional volatility of real exchange rates:†						
Post 1st year versus pre 2d year	168	39.9	−2.54	.01	−.00	−.07
Post 2d year versus pre 2d year	168	27.4	−5.78	.00	−.08	−2.04
Post 3d year versus pre 3d year	168	38.7	−2.85	.00	−.14	−2.89
Post 4th year versus pre 4th year	159	47.5	−.56	.58	−.04	−1.81
Post 5th year versus pre 5th year	143	54.1	.91	.36	.02	.32

Note.—Preopening volatility of excess dollar returns, inflation rates, and exchange rates is compared with postopening volatility in the following manner. First year after opening (relative months +1 to +12) is compared with the second year prior to opening (relative months −13 to −24). Since there is anticipation of market opening, the year immediately preceding the market opening is excluded. The second year after opening is compared with the second year before opening. The third year after opening is compared with the third year before opening, et cetera. Three tests are used to test for the difference between the two periods. The first nonparametric test is the z-statistic based on the number of increases and decreases. The second nonparametric test is the sign test for which the *p*-values are given. The last test is a parametric one that reports the difference in means. The significance is evaluated by a *t*-test that assumes independence.
  * The following countries are not included: Jordan and Malaysia (no data before opening), Nigeria (closed as of 1998), and Indonesia, Philippines, and Portugal (insufficient data before opening for volatility estimation).
  † The following countries are not included: Malaysia (no data before opening), Nigeria (closed as of 1998), Taiwan (no data in the International Financial Statistics of the International Monetary Fund 1997), and high inflation countries, Argentina and Brazil, both of which experienced inflation exceeding 10% per month.

Argentina and India experienced high volatility around market opening. Mexico had a short period of high volatility prior to market opening, while Colombia had a period of high volatility after market opening. In contrast, some countries have long periods of high volatility: Greece and Pakistan both experienced extended periods of high volatility after market opening. From these results, the only unambiguous conclusion we can draw is that, contrary to popular belief, foreign investors do not add to stock market volatility.

C. Stock Market Efficiency

The third and last aspect of the stock markets examined relates to changes in stock market efficiency around market openings. To investigate these changes, we examine whether the stock returns become more random when markets open.[24] Although randomness of stock returns need not imply efficiency, it can generally be claimed that randomness is related to market efficiency.[25] Thus, while we test the random walk hypothesis, our conclusions relating to market efficiency are based on the randomness of stock returns.

The random walk hypothesis is tested using the variance ratio test proposed by Lo and MacKinlay (1988).[26] This method has been used by Claessens, Dasgupta, and Glen (1995) and Coppejans and Domowitz (1996) to evaluate stock market efficiency in emerging markets. We begin with the recursive relation

$$X_t = \mu + X_{t-l} + \varepsilon_t, \tag{3}$$

where $X_t \equiv \ln P_t$ and P_t is the stock price at time t. The variable μ denotes drift, and ε_t is the random disturbance. The expectation of ε_t is assumed to be zero. Variance ratio tests exploit the property of random walks that the variance is a linear function of period: $1/q$th of the variance of $X_t - X_{t-q}$ should be equal to the variance of $X_t - X_{t-1}$. Lo and MacKinlay (1988) develop two tests, a z-statistic under the assumption of homoskedasticity and a $z*$ statistic that allows for time-varying volatilities. The heteroskedasticity-corrected z-statistic is defined below:

$$z*(q) = \sqrt{nq}\,\overline{M}_r(q)/\sqrt{\hat{\overline{\theta}}} \quad \overset{a}{\sim} N(0,1), \tag{4}$$

24. Previous research has shown that stock prices do not follow a random walk in the emerging stock markets. See Harvey (1993) and Claessens, Dasgupta, and Glen (1995).
25. Stock return generating models could be consistent with both market efficiency and returns consisting of a nonrandom component.
26. Also see Lo and MacKinlay (1989), Liu and He (1991), and Ajayi and Karemera (1996). Jones and Kaul (1994) suggest that variance ratio tests do not suffer from known biases when used for testing for autocorrelation in portfolio returns.

where q is the number of overlapping base observations used for computing the variance, nq is the total number of base observations, and

$$\overline{M}_r(q) \equiv \frac{\overline{\sigma}_c^2(q)}{\overline{\sigma}_a^2} - 1;$$

$$\overline{\sigma}_a^2 = \frac{1}{nq - 1} \sum_{k=1}^{nq} (X_k - X_{k-1} - \hat{\mu})^2;$$

$$\overline{\sigma}_c^2 = \frac{1}{m} \sum_{k=q}^{nq} (X_k - X_{k-q} - q\hat{\mu})^2;$$

$$m = q(nq - q + 1)\left(1 - \frac{q}{nq}\right);$$

$$\hat{\theta}(q) \equiv \sum_{j=1}^{q-1} \left(\frac{2(q - j)}{q}\right)^2 \hat{\delta}(j);$$

and

$$\hat{\delta}(j) = \frac{\displaystyle\sum_{k=j+1}^{nq} (X_k - X_{k-1} - \hat{\mu})^2 (X_{k-j} - X_{k-j-1} - \hat{\mu})^2}{\left(\displaystyle\sum_{k=1}^{nq} (X_k - X_{k-1} - \hat{\mu})^2\right)^2}.$$

In addition to the monthly data described in Section I, weekly stock market indices are also available from December 1988 for 16 countries, from September 1990 for Indonesia, from March 1991 for Pakistan, and from July 1993 for Zimbabwe and Nigeria. There are trade-offs in choosing between weekly and monthly data. Monthly data are preferred because they cover longer periods (back to January 1976 in many cases) and because there would be smaller biases due to nonsynchronous trading. Weekly data are preferred because of the greater number of observations. Possibly, the bias due to nonsynchronous trading is limited even with weekly data as the IFC index is based on relatively large stocks. For each country, the ''Data Used'' column in table 6 indicates whether weekly or monthly data are used. The criteria for selection are the availability of data for both premarket opening and postmarket opening periods and increasing the minimum number of observations for both premarket and postmarket opening. Specific reasons for selecting the data type used for a specific country are given in the notes to the table.

TABLE 6   Tests of Random Walk around Market Openings

Country	Data Used	Preopening			Postopening			Difference	
		n	2-base	8-base	n	2-base	8-base	2-base	8-base
Argentina	Monthly (3)	160	1.16 [1.24]	1.40 [1.32]	80	.83 [−.84]	.93 [−.19]	−.33 [−1.37]	−.47 [−.99]
Brazil	Weekly (3)	120	1.34 [2.69]	1.66 [2.06]	272	.98	.96 [−.85]	−.36	−.70 [−2.16]
Chile	Monthly (3)	160	1.17 [2.11]	1.81 [3.25]	80	1.29 [2.41]	1.73 [2.14]	.12 [.83]	−.08 [−.19]
Colombia	Weekly (2)	104	1.49 [3.45]	2.77 [4.91]	288	1.21 [2.41]	2.11 [4.07]	−.28 [−1.68]	−.66 [−1.46]
Greece	Monthly (1)	120	1.08 [.75]	1.03 [.11]	120	1.15 [1.72]	1.29 [.89]	.07 [.51]	.26 [.61]
India	Weekly (3)	192	1.11 [1.14]	1.71 [2.51]	200	1.12 [1.36]	1.23 [1.01]	.01 [.08]	−.48 [−1.32]
Korea	Weekly (3)	152	.95 [−.51]	1.06 [.26]	240	1.07 [.80]	1.22 [.96]	.12 [.91]	.16 [.49]
Mexico	Monthly (3)	160	1.39 [2.55]	2.09 [2.79]	80	1.15 [1.06]	1.19 [.55]	−.24 [−1.15]	−.90 [−1.73]
Pakistan	Monthly (1)	72	1.00 [−.04]	.67 [−.91]	64	1.26 [1.57]	1.67 [1.62]	.26 [1.57]	1.00 [1.82]
Philippines	Monthly (1)	8	1.42 [3.68]	1.71 [2.51]	120	1.21 [2.11]	1.36 [1.23]	−.21 [−1.39]	−.35 [−.86]
Taiwan	Weekly (2)	96	1.02 [.15]	1.71 [1.75]	296	1.03 [.55]	1.37 [1.81]	.01 [.07]	−.34 [−.75]
Turkey	Weekly (2)	24	1.27 [1.37]	.87 [−.23]	368	1.04 [.61]	1.01 [.03]	−.23 [−1.11]	.14 [.21]
Venezuela	Weekly (2)	48	1.40 [2.43]	2.48 [3.20]	344	1.22 [3.08]	1.73 [3.91]	−.18 [−1.00]	−.75 [−1.50]
Zimbabwe	Monthly (1)	208	1.11 [1.29]	2.25 [5.32]	32	1.34 [1.60]	1.77 [1.35]	.23 [1.00]	−.48 [−.78]
Overall	...	...	...	...	...	...	...	[−1.48]	[−2.30]

NOTE.—The method used for the variance ratio test results reported here is described in the text. The tests are conducted using 2-base and 8-base observations. Reasons for selecting the periodicity of data include (1) no weekly data were available prior to opening, (2) equal or larger number of observations for both prior and post–market opening periods are available with weekly data, and (3) the periodicity of data used maximizes the minimum number of observations available for the prior market opening period and the post–market opening period. The numbers in parentheses in column 2 correspond to these three reasons. In the Argentinian row, e.g., (3) refers to the third reason given above. The heteroskedasticity-robust z-statistic is in brackets.

The tests are conducted using local currency returns. In this instance, it is not necessary to use U.S. dollar returns since raw returns across different countries are neither compared nor aggregated. The results for 14 countries prior to market opening and after market opening are presented in table 6.[27] Variance ratios are reported using 2-base and 8-base observations. The variance ratios should be equal to one for stock prices to follow a random walk.[28]

The preopening data in table 6 show that the returns were predictable in the 2-base test or the 8-base test or both for Brazil, Chile, Colombia, India, Mexico, the Philippines, Venezuela, and Zimbabwe. Several other studies have documented predictability of returns in emerging markets. Claessens, Dasgupta, and Glen (1995) find significant autocorrelations for many emerging markets. Based on variance ratios, they reject the null hypothesis of independently and identically distributed (i.i.d.) returns for seven countries. Harvey (1995) documents higher predictability for emerging market returns than for stock returns in developed markets.

The change in predictability of returns around market openings is given in the last two columns of table 6. There is a statistically significant reduction in predictability of returns for Brazil, Colombia, and Mexico. There is an increase in predictability only for Pakistan. For the remaining countries, the change is insignificantly different from zero. For the sample as a whole, however, stock markets tend to become more efficient in impounding information over longer periods: the heteroskedasticity corrected z-statistic for the overall sample is significantly negative for 8-base observations. For 2-base observations, the z-statistic is negative but not significantly different from zero. The results for the complete sample indicate that the stock returns become less predictable after market opening up to 8 periods in advance.

The improvement in market efficiency is consistent with increasing integration with the world markets as documented by Harvey (1995) and Korajczyk (1996). If markets are predictable and foreign investors are sophisticated, then foreign investors are likely to profit from the predictability of returns. As the foreign investors take advantage of market inefficiencies, those market inefficiencies will decrease and the prices will react more quickly to new information.

Another explanation for the observed decrease in predictability could be more frequent trading. If country indices include stocks that are infrequently traded, then index returns may give an impression of auto-

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27. Indonesia, Jordan, Malaysia, Nigeria, Portugal, and Thailand are excluded due to insufficient data.

28. For instance, using 2-base observations for Argentina, the variance ratio prior to market opening is 1.16. However, the heteroskedasticity-robust z-statistic of 1.24 suggests that it is not statistically different from one. After market opening, the variance ratio decreases to 0.83, which is also insignificantly different from one.

TABLE 7   **Frequency of Trading**

	Preopening		Postopening		
Country	n	Days Traded	n	Days Traded	Difference
Argentina	43	17.69	60	18.64	.95
		(1.62)		(1.82)	[2.79]
Brazil	58	18.30	60	17.36	−.94
		(2.17)		(1.52)	[−2.72]
Chile	42	17.72	60	17.42	−.30
		(1.35)		(1.72)	[−.99]
Colombia	60	11.11	60	14.69	3.58
		(1.44)		(1.98)	[11.33]
Greece	4	13.40	60	17.14	3.74
		(1.29)		(2.17)	[5.32]
India	55	16.91	60	19.06	2.15
		(2.80)		(2.35)	[4.44]
Korea	60	24.19	44	24.58	.39
		(1.60)		(1.31)	[1.36]
Mexico	37	17.18	55	12.85	−4.33
		(2.86)		(2.03)	[−7.96]
Pakistan	60	14.61	60	12.76	−1.85
		(2.33)		(1.60)	[−5.07]
Philippines	16	9.77	60	16.67	6.90
		(1.86)		(2.45)	[12.27]
Taiwan	60	23.75	60	23.85	.10
		(2.73)		(2.24)	[.22]
Turkey	19	20.01	60	20.51	.50
		(1.42)		(1.77)	[1.26]
Venezuela	42	11.84	60	15.88	4.04
		(2.48)		(1.66)	[9.21]
Zimbabwe	60	7.69	37	12.71	5.02
		(1.48)		(2.05)	[12.96]

NOTE.—''Days Traded'' refers to the average number of days traded per month across all securities in the index for each country during the pre- and postperiod; n refers to the number of months covered by the data. The standard deviation is given in the ''Days Traded'' columns in parentheses. The z-statistics are given in the ''Difference'' column in brackets.

correlation. Once stocks start trading more often, the nontrading bias in the autocorrelations will be eliminated, thereby enhancing the measured efficiency of the market even though there has been no change in the informational efficiency of the market. To examine this possibility, we study the change in the frequency of trading. The Emerging Markets DataBase has information on the number of days that a stock trades each month.[29] The frequencies of trading data are presented in table 7. The average number of days traded per month increases significantly after market opening for seven countries, decreases for three countries, and is not significantly different for the remaining four countries.

29. While we would have liked to have repeated this experiment with weekly data, frequency of trading data are not available in the weekly files of the Emerging Markets DataBase.

To compare how changes in trading frequency relate to efficiency improvements, we note the following: of the seven countries for which trading frequency increased, one country (Colombia) experienced an improvement in market efficiency; of the three countries for which trading frequency decreased, there are two countries for which market efficiency improved and one for which market efficiency deteriorated (Pakistan); of the four countries for which no significant change in trading frequency took place, there is no significant change in market efficiency. These data do not seem to indicate that the observed improvement in market efficiency is due to an increase in trading frequency. This result is also consistent with Mech (1993), who finds that the autocorrelation in NASDAQ stock portfolios cannot be explained by nontrading.

In sum, the results for both returns and volatilities around market openings reveal that market openings are good for domestic investors: the stock prices rise while the volatility does not increase. The subsequent drop in stock returns suggests that expected returns decrease and hence the domestic firms get access to lower cost capital. Furthermore, the test of the random walk hypothesis suggests that stock returns are less predictable over longer horizons. To the extent that less predictability in stock prices reflects greater stock market efficiency, open markets should result in a more efficient allocation of capital.

IV. Effect on Inflation and Exchange Rates

Policy makers of emerging economies are concerned that the inflow of capital after market opening may result in greater inflation and a stronger currency. They fear that if there are not enough investment opportunities to absorb the new inflow of foreign capital, excess capital may fuel inflation. Similarly, a strong currency may make exports more expensive and less competitive, thereby hurting the export sector of the economy. In addition, it is possible that large changes in portfolio capital flow (inflow and outflow) increase volatility of inflation and exchange rates. In this section, we analyze the effect of market opening on these macroeconomic variables.

A. *Inflation*

Monthly data relating to inflation have been obtained from the International Financial Statistics, which are published by the International Monetary Fund. For measuring inflation, the consumer price indices are used; these are available for all countries in the sample except Taiwan.[30] In addition to excluding Taiwan from our analyses of inflation

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30. The consumer price index for each country is taken from line 64 of the International Financial Statistics on CD-ROM (International Monetary Fund 1997).

volatility, we also exclude Malaysia because of insufficient data prior to market opening and Nigeria because of insufficient data after market opening. Rates of inflation, as measured by changes in the consumer price index (CPI), are computed for 17 countries ±60 months around market opening. These are plotted in figure 3. Statistical tests for individual countries show that inflation seems to have increased significantly after market opening for Pakistan, Thailand, and Turkey and to have decreased significantly for Argentina, Chile, Korea, Mexico, the Philippines, and Portugal.[31]

To provide an overall picture of the effect of liberalization on inflation, inflation rates are aggregated across different countries. Since Argentina and Brazil have had very high rates of inflation, inflation rates of these countries will swamp the inflation rates of other countries. To overcome this problem, two different methods are used. First, we aggregate across countries but exclude those two countries with high inflation rates. These countries are called ''low inflation markets.'' The third row in table 2 shows a significant decrease in inflation for the low inflation markets: inflation falls from 1.67% per month before market opening to 1.39% per month after market opening.

Second, we aggregate using standardized excess inflation rates. Specifically, we compute the excess inflation rate above the level of inflation rates for up to 5 years prior to market opening and standardize it by the sample standard deviation. Estimates of the mean inflation rate and the sample standard deviation are obtained for a period of 60 months immediately preceding the market opening. If 60 months of preopening data are not available, then all of the preopening data are used. The excess inflation (EI) is estimated as given by equation (5):

$$\text{EI}_{jt} = \frac{(\pi_{jt} - \overline{\pi})}{\hat{S}_j}, \tag{5}$$

where $\overline{\pi}$ is the average preopening inflation rate, and $\hat{S}_j$ is the standard deviation. The standardized excess inflation rates for each country are averaged across for each relative month. The standardized excess inflation rates are plotted for all countries (''All Markets–EI'') and only for the low inflation countries (''Low Inflation Markets–EI''). All three aggregate plots in figure 3 imply that there is a decrease in the level of inflation rates after market opening.

Panel B of table 3 reports the month-by-month aggregate changes in inflation rates using only the low inflation markets. There is a significant decrease in inflation for all 3 years after market opening irre-

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31. The statistical tests reported in table 2 for a portfolio of countries are also conducted for individual countries. The results are too voluminous to report here, but they are available from us upon request.
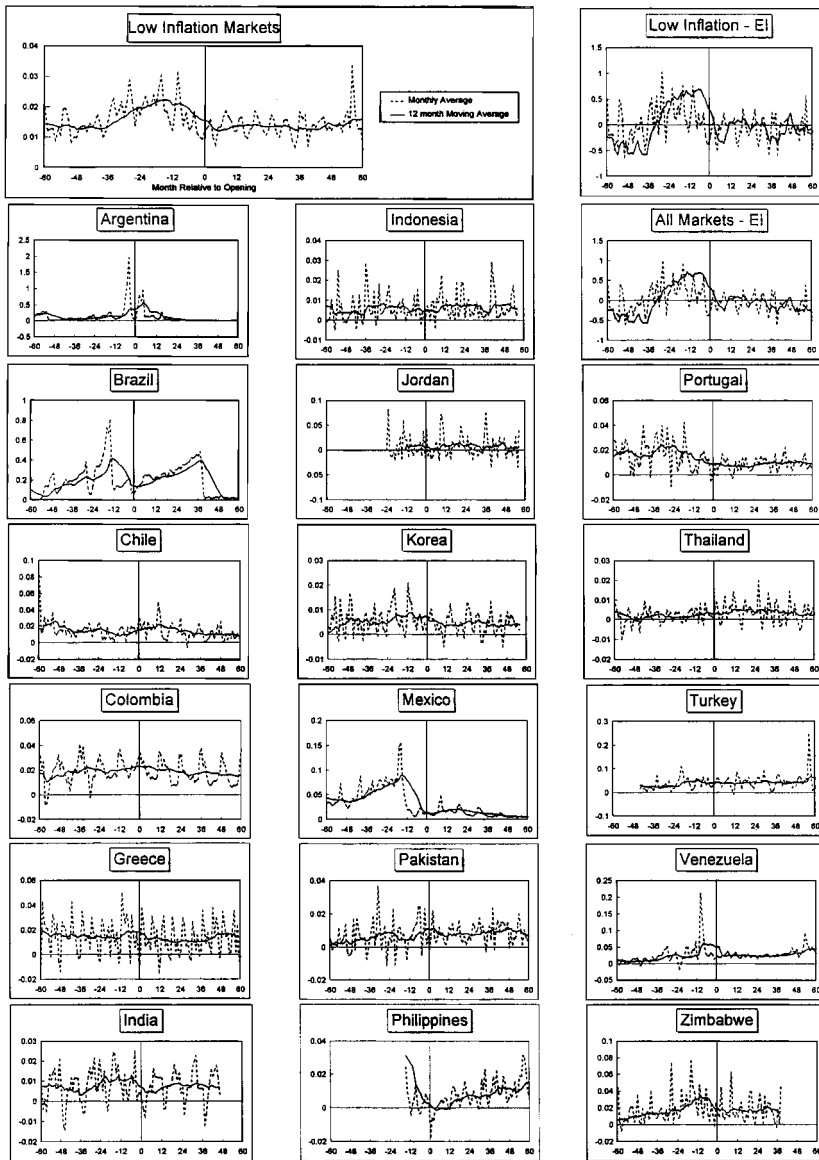
FIG. 3.—Rates of inflation around market openings

spective of whether parametric or nonparametric tests are used. Certainly, the evidence is consistent with the conclusion that inflation does not increase as a consequence of market openings.

B. *Exchange Rates*

To measure relevant changes in exchange rates, we use the U.S. dollar as the reference currency.[32] An alternative is to use the currencies of the country's trading partners and competitors as the reference currency (referred to as effective exchange rates).[33] We do not use effective exchange rates for two reasons.[34] First, effective exchange rates are available only for eight countries in our sample (including Nigeria and Malaysia, which, as will be explained below, had to be dropped from this analysis for other reasons). Reliance on the effective exchange rates would reduce our sample size from 17 to six. Second, much of international trade is denominated in the U.S. dollar even when trading is not done with the United States.

Exchange rates are expressed as U.S. dollar per unit of local currency. An increase in the exchange rate implies an appreciation of the local currency, while a decrease in the exchange rate means a depreciation of the local currency. Changes in nominal exchange rates are computed for the 17 countries for which data are available. Taiwan is excluded because no exchange rate data are available, Malaysia because no data are available prior to opening, and Nigeria because no data are available after market opening.

The changes in nominal exchange rates around market openings are reported in the fourth row of table 2 and are plotted in figure 4. Many emerging economies had fixed exchange rates prior to market opening and still continue to have either fixed rate or managed floating rates. While the market eventually forces the countries to adjust exchange rates, the government-mandated changes tend to be infrequent but large. The large changes are smoothed by using the 12-month moving averages, which are shown in figure 4.

Individual country results (not reported) show that the currencies of Korea, Pakistan, and Turkey fell more rapidly after market opening than in the preopening period.[35] For all other countries, either the change is not significantly different from zero or the rate of depreciation is significantly lower in the postperiod than in the period preceding market opening. A striking feature of the data is that the changes in exchange rates show a persistent depreciation of the currency (i.e., the

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32. Line ''AH..X'' from the International Financial Statistics on CD-ROM (International Monetary Fund 1997).
33. Lines ''rec'' and ''nec'' from the International Financial Statistics on CD-ROM (International Monetary Fund 1997).
34. Qualitatively similar results are obtained when effective exchange rates are used.
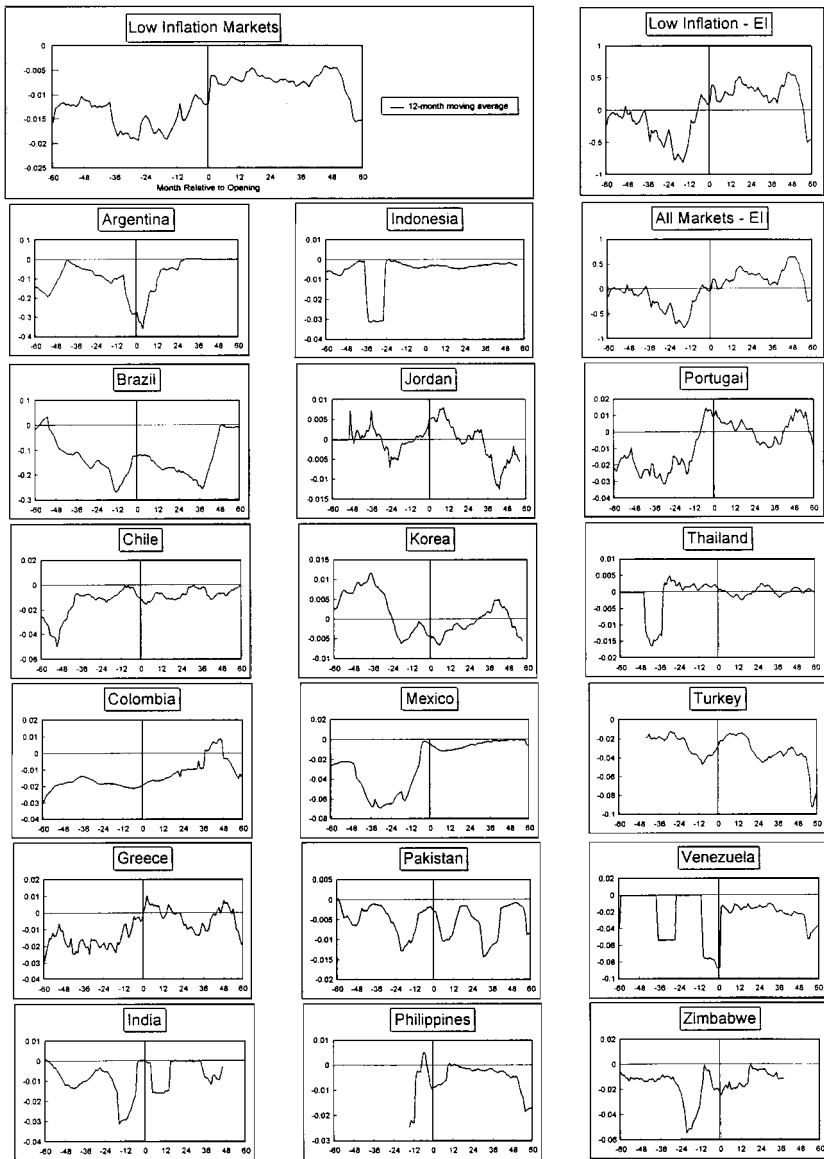35. See n. 31 above.

FIG. 4.—Nominal exchange rates around market openings

changes are negative) both before and after market opening. Currencies continue to fall in value but at a lower rate. The appreciation of the nominal exchange is not significant for any country during either the pre- or postopening period.

Aggregated over all markets (excluding Argentina and Brazil, which are high inflation countries) and reported in table 2, the rate of currency depreciation is significantly lower in the postperiod as compared to the preperiod, a decline in the rate of depreciation from −1.44% per month to −0.75% per month. This implies that while the currencies of emerging economies continued to depreciate, they did not depreciate nearly as much as they did in the preperiod.

The month-by-month test statistics for aggregate changes in exchange rates for low inflation markets are presented in panel C of table 3. The table confirms that there is a significant decrease in the rate of currency depreciation irrespective of whether the parametric or nonparametric tests are used.

Since the nominal exchange rates are unadjusted for relative inflation rates in the United States and the emerging economies, we also analyze changes in real exchange rates. The real exchange rate is calculated using the 1985 CPI for the United States and the emerging market. The results, given in the last row in table 2 and in panel D of table 3, are similar to those for the nominal exchange rates.

Overall, changes in exchange rates are negative prior to market opening, which implies a significant decrease in the currency value of emerging economies. This rate of currency depreciation falls significantly after market opening. The results do not present any evidence to suggest that there has been an appreciation in the currency values of emerging economies subsequent to market opening.

C. Volatility of Inflation Rates and Changes in Exchange Rates

The volatility of inflation rates, nominal exchange rates, and real exchange rates is estimated as described in Section III*B*. In all of the volatility calculations, equation (2) is estimated using ARCH or GARCH to model conditional volatilities in individual countries. The volatility estimates are presented individually for all countries with sufficient data in graphical form (data in tabular form are presented for a portfolio of countries). Aggregation across low inflation markets is attained by simple averages.[36]

Country-by-country volatility of inflation estimates are plotted in figure 5. Individual country test results (not reported here) reveal that no country experienced a significant increase in the volatility of inflation. The volatility decreased significantly in nine out of 17 countries:

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36. There is no significant difference between standardized and simple average results for these countries.
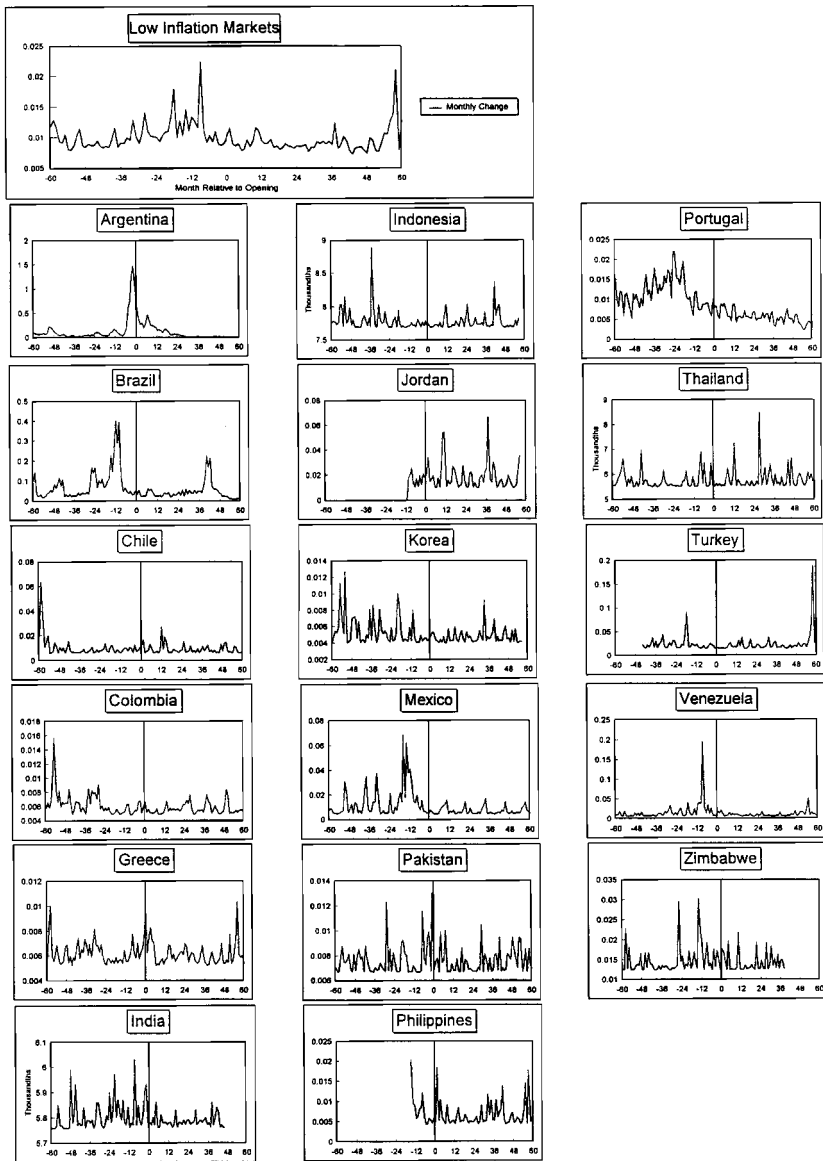
FIG. 5.—Volatility of inflation around market openings

Argentina, Brazil, Colombia, India, Korea, Mexico, the Philippines, Portugal, and Venezuela.

Aggregate results are presented as the third row of table 4 and in panel B of table 5 for 15 countries, excluding Argentina and Brazil. All of the results show a significant decrease in the volatility of inflation. Furthermore, the decrease in the volatility of inflation is not transitory—it decreases for the first, second, third, and fourth years after market opening.

Volatility of exchange rates is also important because it adds risk to cross-border transactions. Exchange-rate volatility is estimated for both nominal exchange rates and real exchange rates. Estimates for volatility of nominal exchange rates are presented in figure 6 and in the fourth row of table 4. The individual country test results (not reported) show that the volatility increased significantly in Colombia and Turkey and marginally in Pakistan, while it decreased significantly in seven countries. The aggregate test in table 4 shows that there was a significant decrease in volatility of nominal exchange rates after market opening. Month-by-month comparisons for the low inflation markets are presented in panel C of table 5. The nonparametric tests suggest that there was a significant decrease in volatility for 3 years after market opening when compared with the corresponding preopening periods. Results of the parametric test are also consistent with those of the nonparametric tests, except that the decreases in volatility are significant only for the second and third years after opening. However, none of the tests imply an increase in the volatility of nominal exchange rates. Volatility estimates of real exchange rates, reported as the last data row in table 4 and in panel D of table 5, are similar to those for nominal exchange rates.

Volatility of inflation, nominal exchange rates, and real exchange rates all show a decrease after market opening. There is certainly no hint of a substantial increase in volatility, though exceptions occur for a few individual countries. Overall, there is a distinctive pattern of a decrease in volatility after the opening of markets to foreign participation. The decrease in volatility suggests that capital inflows brought on by stock market openings are not disruptive to the economy.

V.   Summary and Concluding Remarks

Our exploratory inquiry reveals that the opening of stock markets significantly increases stock prices without a concurrent increase in stock return volatility. The increase in stock prices is indicative of an increase in demand for domestic securities and the increased access of domestic firms to foreign capital at a lower cost. Once the stock prices adjust to new information, stock returns fall, reflecting lower expected returns.

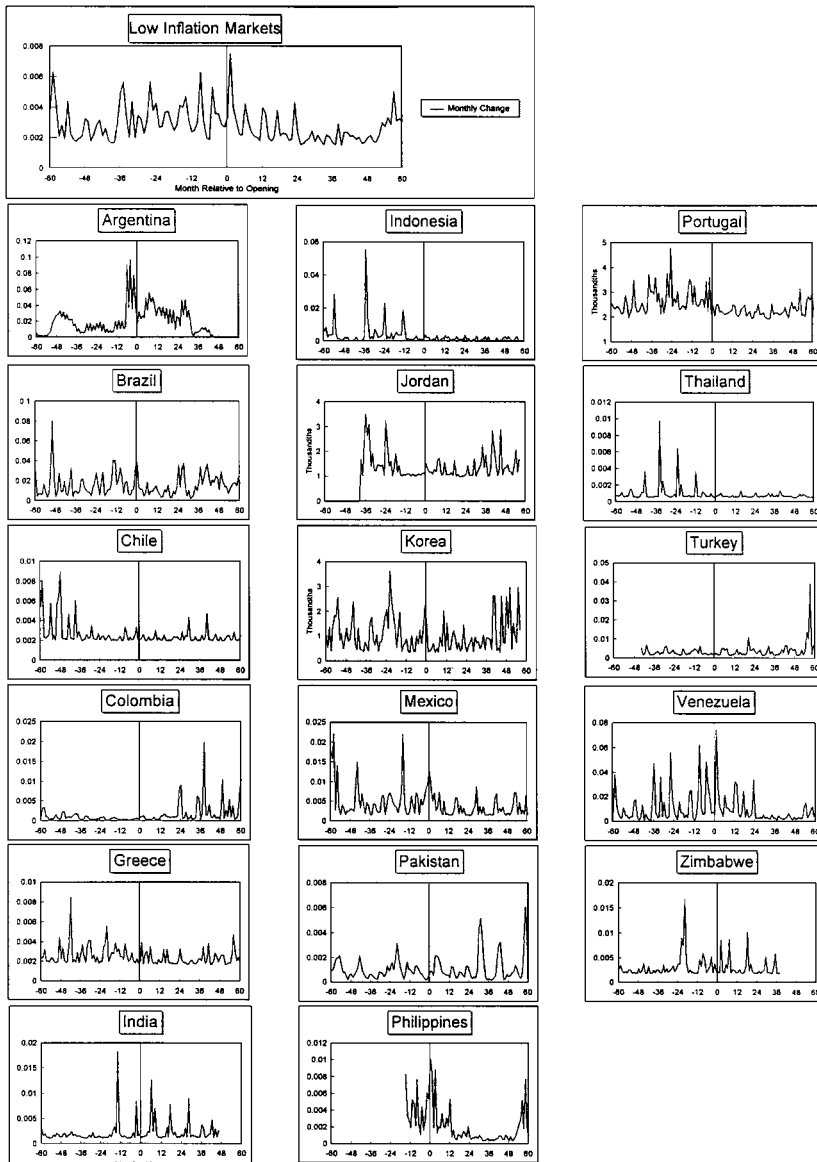When we test the random walk hypothesis, we find that the stock

FIG. 6.—Volatility of nominal exchange rates around market openings

prices are less autocorrelated subsequent to market opening. The increased randomness of returns probably suggests an improvement in market efficiency. A more efficient market means better allocation of capital and an increase in the productivity of capital.

Policy makers are often concerned that these efficiency gains are offset by macroeconomic instability stemming from upward pressure on inflation and exchange rates. The results reveal no such upward pressure on inflation. Indeed, the results suggest that inflation rates, on average, fall after stock market liberalization.

The results regarding exchange rates are also comforting. We observe no evidence of an appreciation of the local currency that may adversely affect competition abroad. The evidence indicates that emerging market currencies had been depreciating relative to the U.S. dollar prior to market openings and that they continued to decline after the openings. But, the rate of depreciation declined significantly around the openings. This decrease in the rate of exchange rate depreciation seems to reflect increased investor confidence in the economy that is undergoing capital market liberalization.

The volatility of inflation also fell significantly after market openings as did the volatility of exchange rate changes. These reductions mean less inflation-related risk and less risk associated with international trade and international borrowing and lending.

What is the lesson that a country can draw from the experience of emerging markets, especially a country contemplating greater capital controls versus increased accessibility to foreign investors? As each country has its unique features that are different from our ''average'' country, it is difficult to argue that the country will only benefit from internationalization and that the risks associated with internationalization are irrelevant. However, by examining a sample of emerging economies instead of a single country, this study is better equipped to isolate the impact of market opening from country-specific factors. Thus, we conclude that the benefits are likely to outweigh the perceived risks associated with foreign portfolio flows.

Finally, some caveats are in order. The implications of this study are somewhat limited to the extent that it has not tried to control for other confounding factors. For example, countries often open stock markets as part of a broader liberalization package. Thus, the observed effects could be due to liberalization of economic policies and controls.[37] Further, most governments will attempt to control the potential ill effects of market openings by various policy measures. Thus, all we can safely say is that a majority of the emerging economies have

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37. Henry (1998) finds an effect on stock returns that is similar to ours even after controlling for concurrent economic reforms.

successfully controlled the potential dangerous side effects of liberalization while reaping its benefits.

The evidence herein also has implications for the recent financial turmoil in emerging markets and the threatened reversion to capital controls. Based on the evidence provided in this article, we must agree with the advocates of the free flow of capital that, rather than imposing controls flows, capital markets should be made more open and transparent. Capital control enthusiasts should take note of the fact that liberalization took place more than 5 years (and as much as 10 years) before the Asian crisis began. It would certainly seem unlikely that the act of market liberalization was responsible for the crisis. Economic mismanagement and value destruction in the corporate sector are more likely causes.[38]

Perhaps it is time to recognize that we have now reached a stage of global economic development where capital users (sovereign countries) compete for capital in a competitive market environment. In such an environment, the only way to insure against a sudden outflow of capital and the ensuing financial crisis is to maintain the confidence of suppliers of capital, which in turn requires that the capital be used productively, investors treated fairly, and information flow freely.

Appendix

The Process of Liberalization in Sample Countries

Argentina

Start of monthly stock date.   January 1976.
Market opening date.   November 1989.
Details.   The liberalization began with the New Foreign Investment Regime in November 1989 (Park and Van Agtmael 1993, p. 326). Under this reform, all legal limits on the type and nature of foreign investments were abolished, and a free exchange regime was introduced. Capital, dividends, and capital gains could be repatriated freely. International Finance Corporation (1990) also lists Argentina as a free market for foreign investment on December 31, 1989. Bekaert (1995) reports that all limits on foreign capital were abolished by December 1989.

The market was fully opened in October 1991 (International Finance Corporation 1996*b*). The Deregulation Decree issued on October 31, 1991, eliminated most restrictions on foreign investment, including taxes on capital gains (Park and Van Agtmael 1993, p. 335). Buckberg (1995) lists October 1991 as the month of full opening.

Foreign portfolio investment by residents was unrestricted until October 1983 when it was suspended (Cowitt 1985, p. 66). Apparently residents could begin buying foreign securities from March 1990 when the currency was made fully convertible (Cowitt, Edwards, and Boyce 1996, pp. 218–19). Bentley (1986) also

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38. See Kim (1998) for further discussion on this line of inquiry.

reports that foreign portfolio investment by residents is restricted and requires prior approval of the government.

Brazil

Start of monthly stock data.   January 1976.
Market opening data.   May 1991.
Details.   From March 1987 to May 1991, foreign portfolio investment took place under CVM Resolution 1289, Annex II, which limited foreign portfolio investment to investment through special funds with onerous conditions. Since May 1991, foreign institutions were allowed to own up to 49% of voting stock and 100% of nonvoting stock under Resolution 1832, Annex IV. Some limitations apply—Petrobras common stock and banks' voting stock cannot be purchased. Bekaert (1995) reports that foreign investment trusts were approved in March 1987 and that foreign ownership levels were increased in May 1991. Buckberg (1995) reports that country funds were admitted in September 1987 but that the full opening took place in May 1991. International Finance Corporation (1996*b*) reports that foreign investors can invest 100% of nonvoting preferred stock and 49% of voting common stock as of May 1991. Park and Van Agtmael (1993, p. 302) have a slightly different date. They report that from March 1987 to July 1991, foreign investors could invest only through specialized funds. Price (1994, p. 96) reiterated the May 1991 opening date. Foreign portfolio investment by residents is restricted. See Bentley 1986; Cowitt 1991, p. 247; Cowitt, Edwards, and Boyce 1996, p. 244.

Chile

Start of monthly stock data.   January 1976.
Market opening date.   October 1989.
Details.   Foreign investors are restricted under Law 18657 and DL 600. Law 18657 of 1987 requires capital to be retained for 5 years before it can be repatriated, while DL 600 of 1974 imposed a 1-year restriction only. Among other conditions, such restrictions were onerous. See Park and Van Agtmael (1993, pp. 317–18) and Price (1994, pp. 105, 106, and 119). Approvals under DL 600 have increased over time. Buckberg (1995) reports that the first country fund was admitted in October 1989. We use this date for initial opening of the market. The International Finance Corporation (1996*b*) considers the market as 100% open from January 1995.

Foreign portfolio investment by residents was allowed from April 1990 (Cowitt, Edwards, and Boyce 1996, p. 256). Prior to that time, residents could not own foreign securities (Cowitt 1991, p. 260).

Colombia

Start of monthly stock data.   January 1985.
Market opening date.   February 1991.
Details.   The International Finance Corporation (1996*b*, p. 53) considers the Columbian market fully open from February 1991. Resolution 52, which was

adopted in December 1991, allowed foreign investors to buy up to 100% of the shares of locally listed companies, thereby eliminating the previous cap of 10%. It also abolished the requirement that investment funds remain in the country for at least a year. See Price (1994, p. 129). Buckberg (1995) reports full opening as occurring by October 1991. Foreign portfolio investment by residents is not allowed (Cowitt, Edwards, and Boyce 1996, p. 263).

Greece

Start of monthly stock data.   January 1976.
Market opening date.   August 1986.
Details.   Until August 1986, only blocked accounts of nonresidents could be used for purchase of local securities (Cowitt 1989, pp. 611–14). After August 1986, European Community nationals were free to invest in Greek securities. International Finance Corporation (1988, p. 47) also reports that European Community investors could invest with no restrictions as of the end of 1987.

As of 1989, Greek nationals could not send remittances abroad (de Caires and Simmonds 1989; Cowitt 1991, p. 609). On May 14, 1994, the government lifted all restrictions on capital movements, even for Greek nationals. Now they can freely convert national currency into other currencies and borrow in other currencies. As a result of European Community directives, the foreign exchange restrictions were lifted in the summer of 1991 for investments in European Community countries.

India

Start of monthly stock data.   January 1976.
Market opening date.   November 1992.
Details.   The International Finance Corporation (1996*b,* p. 53) considers the market fully open from November 1992 when the Ministry of Finance established regulations permitting the Securities and Exchange Board of India to register Foreign Investment Institutions (FIIs) for investment in primary and secondary markets. There is an overall limit of 24% foreign investment per company and a per-FII limit of 5% per company. Foreign portfolio investment by residents is not allowed (Cowitt, Edwards, and Boyce 1996, p. 432).

Indonesia

Start of monthly stock data.   January 1990.
Market opening date.   September 1989.
Foreign portfolio investment.   Residents were allowed to own foreign securities before the start of stock data.
Details.   Until December 1987, the market was closed to foreign investment. In December 1987, the government introduced measures to allow foreigners to purchase shares in eight non-joint-venture companies. The International Finance Corporation (1996*b,* p. 53) considers the market open from September 16, 1989, when the Ministry of Finance allowed foreigners to purchase up to 49% of all companies' listed shares excluding bank shares. The Bank Act of 1992, enacted

October 30, 1992, allowed foreigners to invest up to 49% of listed shares of private national banks. See Park and Van Agtmael (1993, p. 166). Buckberg (1995) reports that there were minor restrictions on entry and exit in March 1989. Foreign portfolio investment by residents has been freely allowed since 1984 (or earlier), which is before the start of available data (Cowitt 1985, p. 357, 1989, p. 442, 1991, p. 446; Cowitt, Edwards, and Boyce 1996, p. 439).

Jordan

Start of monthly stock data.   January 1979.
Market opening date.   January 1978.
Details.   The Amman Stock Exchange opened in January 1978. Foreign investors have been allowed to own 49% of equity from the time that the market opened. See Economist Intelligence Unit (1978, p. 29). Foreign portfolio investment by residents is not allowed (Cowitt, Edwards, and Boyce 1996, p. 813).

Korea

Start of monthly stock data.   January 1976.
Market opening date.   January 1992.
Details.   Although the government intended to open the stock market to foreign investment in 1988, the opening was delayed due to a rapid increase in the money supply in the Korean economy. Eventually the market was opened on January 1, 1992. Foreign investors could own up to 10% of listed companies. The limit has been increased subsequently to 12% (January 1995), 15% (July 1, 1995), and 18% (April 1, 1996). See International Finance Corporation (1996b, p. 53).

Foreign portfolio investment by residents is restricted. See Bentley (1986) and Cowitt, Edwards, and Boyce (1996, p. 454).

Malaysia

Start of monthly stock data.   January 1985.
Market opening date.   Prior to availability of data.
Details.   The Malaysian market opened before December 1975. With the exception of bank and finance company stocks, most stocks are generally 100% available to foreign investors. Malaysian exchange control regulations are liberal. Foreign portfolio investment by residents has been freely allowed since 1984 (or earlier). See Cowitt (1985, p. 495) and Bentley (1986).

Mexico

Start of monthly stock data.   January 1976.
Market opening date.   May 1989.
Foreign portfolio investment.   Residents were allowed to own foreign securities before the start of stock data.
Details.   The 1989 revision of the 1973 Law to Promote Mexican Investment and Regulate Foreign Investment has relaxed restrictions on foreign ownership.

Foreign investment is now permitted up to 100% in 73% of Mexico's 754 economic sectors. The market is considered open from May 1989. See Bekaert (1995), Buckberg (1995), and International Financial Corporation (1996b, p. 53). Foreign portfolio investment by residents was freely allowed prior to January 1976. See *Pick's Currency Yearbook* (1976–77, p. 403), Cowitt (1985, p. 513), and Bentley (1986).

Nigeria

Start of data.   January 1985.
Market opening date.   Still considered closed.
Details.   Nigeria was closed to foreign investors until mid-1995. Decree 16 (July 1995) allowed foreign investors to invest. However, the secondary market is virtually nonexistent. The International Finance Corporation (1996b, p. 53) still considers it closed. Foreign portfolio investment by residents is not allowed (Bentley 1986, and Cowitt, Edwards, and Boyce 1996, p. 142).

Pakistan

Start of monthly stock data.   January 1985.
Market opening date.   February 1991.
Details.   A new Foreign Investment Law passed in February 1991 allows foreigners to own 100% equity in any industrial or business venture in Pakistan (Cowitt, Edwards, and Boyce 1996b, p. 502). The International Finance Corporation (1996b, p. 53) considers the Pakistani market 100% open from February 1991. Buckberg (1995) notes June 1991 as the full opening date, while Bekaert (1995) reaffirms the February 1991 date.

Foreign portfolio investment by residents is restricted and subject to government approval. See Bentley (1986) and Cowitt, Edwards, and Boyce (1996, p. 501).

Philippines

Start of monthly stock data.   January 1985.
Market opening date.   March 1986.
Details.   At the end of 1984, up to 40% of local firms could be owned by foreign nationals (Cowitt 1985, p. 614). Two classes of shares exist—one for locals only (class A) and the other for foreigners and locals (class B). However, there was not much interest in the equity markets until the ouster of Ferdinand Marcos from office in March 1986. As of the end of 1987, there were few restrictions on repatriation of capital and income (International Financial Corporation 1988, p. 47). According to Buckberg (1995), the first country fund was admitted in October 1989. Bekaert (1995) lists November 1991 as the liberalization date.

Foreign portfolio investment by residents was not allowed as of the end of 1989 (Cowitt 1991, p. 511). However, by the end of 1993, residents could freely own foreign securities. See Cowitt, Edwards, and Boyce (1996, p. 510).

Portugal

Start of monthly stock data.　February 1986.

Market opening date.　July 1986.

Details.　The Foreign Investment Code of July 1986 places only the arms sector off limits to foreign capital. Foreign nationals can own all other Portuguese companies, and there are no longer restrictions on repatriation of capital or income. See Cowitt (1989, p. 663). Buckberg (1995) reports January 1986 as the month of full opening.

Foreign portfolio investment by residents was restricted and subject to government approval until the end of 1989. See Cowitt (1991, p. 663). These controls were relaxed during 1992 and 1993. Residents can now freely invest overseas. See Cowitt, Edwards, and Boyce (1996, p. 707).

Taiwan

Start of monthly stock data.　January 1985.

Market opening date.　January 1991.

Foreign portfolio investment.　Residents were allowed to own foreign securities beginning July 1987.

Details.　The stock market was closed until January 1, 1991 (except for closed-end funds). At that time, foreigners were allowed to invest up to 10% subject to an overall limit. The initial ceiling was $2.5 billion, which was raised to $5 billion on August 1, 1993, and to $7.5 billion on March 5, 1994. On July 8, 1995, the ceiling was eliminated and the limit was raised to 12%. The limit was raised further to 15% on September 1995 and to 20% on March 2, 1996. See International Finance Corporation (1996*b,* p. 53).

Taiwan nationals have been allowed to remit up to $3 million per year (inward or outward) since July 15, 1987. See Park and Van Agtmael (1993).

Thailand

Start of monthly stock date.　January 1976.

Market opening date.　August 1988.

Details.　According to the International Finance Corporation (1988), some restrictions existed on both entry and exit of foreign capital at the end of 1987. Beginning in 1988, several foreign country funds were allowed to invest in Thailand. In 1988, a ''Foreign Board'' was established as a parallel stock exchange for trading shares that could be held by foreigners to invest in Thailand (Park and Van Agtmael 1993, p. 128).

Foreign portfolio investment by residents is restricted and subject to government approval. See Cowitt, Edwards, and Boyce (1996b, p. 535) and de Caires and Simmonds (1989).

Turkey

Start of monthly stock data.　January 1987.

Market opening date.　August 1989.

Details. The market is considered 100% open from August 1989. (See International Finance Corporation 1996b, p. 53). Until then, purchases of securities by nonresidents required prior approval (Cowitt 1991, p. 687). Buckberg (1995) reports December 1989 as the liberalization date. As of 1989, investment in foreign securities have required governmental approval. See de Caires and Simmonds (1989) and Cowitt (1991, p. 687).

Venezuela

Start of monthly stock data. January 1985.
Market opening date. January 1990.
Foreign portfolio investment. Residents were allowed to invest abroad before 1984, that is, before the Venezuelan market was opened.
Details. The Venezuelan stock market was considered 100% open from January 1, 1990, under Decree 727, except for bank stocks. Since January 1994, bank stocks have also been fully open. In June 1994, the government fixed the exchange rate and effectively prohibited the repatriation of capital and income. Although Resolution 41 of November 1994 was intended to alleviate that constraint, it did not do so in practice. In June 1995, the government approved the trading of Brady bonds at the bolsa (stock exchange), creating de facto currency convertibility. See International Finance Corporation (1996b, p. 53). According to Bekaert (1995), too, the date of liberalization is January 1990, the date when all restrictions were lifted. Buckberg (1995) reports that minor restrictions on entry and exit existed in December 1988.

Foreign portfolio investment by residents has been freely allowed since 1976 (or earlier) (*Picks Currency Yearbook* 1976–77, p. 633; Cowitt 1985, p. 807, 1987, p. 891, 1989, p. 384, 1991, p. 389; Bentley 1986; Cowitt, Edwards, and Boyce 1996, p. 633), which is before the start of available data.

Zimbabwe

Start of monthly stock data. January 1976.
Market opening date. July 1993.
Details. The stock market was effectively closed to foreign investment by virtue of severe exchange controls until June 1993. The regulations permitted foreigners to purchase up to 25% of listed shares. This limit was raised to 35% on January 1, 1996. See International Finance Corporation (1996b, p. 53).

Foreign portfolio investment by residents is not permitted. See Cowitt, Edwards, and Boyce (1996, p. 535).

The Data Sources

The dates and other information in this appendix are based on information obtained from the following sources: *Picks Currency Yearbook* (1976–77); *World Currency Yearbooks* (Cowitt 1985, 1987, 1989, 1991; Cowitt, Edwards, and Boyce 1996); Bentley (1986); Economist Publications (1988); International Finance Corporation, *Emerging Stock Markets Factbook* (1988, 1990, 1993, 1994, 1995, 1996a); de Caires and Simmonds (1989); O'Conner and Smith (1991); Park

and Van Agtmael (1993); Price (1994); International Finance Corporation, *The IFC Indexes—Methodology, Definitions, and Practices* (1996*b*); Economist Intelligence Unit, Country Reports, various issues; International Finance Corporation, *Monthly Review of Emerging Stock Markets,* various issues. Complete details are in the reference list.

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