

## FINANCIAL DEREGULATION AND VOLATILITY IN EMERGING EQUITY MARKETS

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The opening of stock markets in Asian, Latin American and other developing countries over the past decade has been widely praised, as there are many potential benefits of financial integration with the rest of the world. However, the turmoil in emerging markets since the Mexican, Asian, and Russian crises have led policy makers and investors to wonder whether greater financial openness may actually increase the volatility of stock returns. The variance of share returns has important implications for determining portfolio allocation as well as the cost of capital, and if variability rises it may counteract some of the benefits of openness. Theory on the effects of market opening on volatility has been ambiguous, and empirical work has yielded conflicting results. This paper examines the issue by testing for a larger variety of reforms than have been studied before. Moreover, the data set employed spans important episodes such as the Asian, Russian and Brazilian devaluations which have occurred since previous empirical studies were written. Results indicate that reform has a statistically significant impact in almost three fifths of the emerging markets surveyed, but more often than not, the effect is actually to raise, rather than lower the volatility of stock returns.

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### 1. INTRODUCTION

The past decade has been a period of widespread deregulation and opening in emerging financial markets in Asia, Latin America, and elsewhere. This trend toward greater openness has been hailed by many academics and commentators, yet at the same time, as liberalization has proceeded, there has been notable turmoil in the form of

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episodes such as the Mexican, Asian, Russian and Brazilian devaluations and financial crises. This paper will focus on the effect liberalization has on the volatility of returns in emerging stock markets.

The recent opening in emerging financial markets has generated a large literature, with many commentators predicting that such liberalization will increase the inflow of foreign capital, leading to greater financial development and economic growth. In principle, some models maintain that a market opening should decrease the variability of asset prices. The more able investors are to adjust the quantity of their portfolios in response to shocks, the less impact there should be on prices, and hence the volatility of returns should fall (see Reinhart (1998)). However, the tumultuous events in developing countries over the last few years have led some practitioners and policymakers to question whether opening may in fact substantially raise the volatility of asset prices. Moreover, several papers examining the behavior of recently liberalized stock exchanges (Borenstein and Gelos (2000), Froot, O'Connell and Seasholes (1999), and Kaminsky, Lyons and Schmukler (1999)) have found strong evidence of herding, momentum trading, and trend chasing, all of which can substantially increase, rather than decrease, the volatility of share prices.

There have been previous studies which have examined the effect of liberalization on stock volatility (Bekaert and Harvey (1997), DeSantis and Imrohorglu (1997), Inclan, Aggarwal, and Leal (1997), Kim and Singal (2000), and Levine and Servos (1998)). All of these papers have made important contributions to the understanding of deregulations' effects on volatility. They have presented conflicting findings. Depending on the method and sample employed, some find that liberalization raises the variance of returns, others find no significant effect, and some find that volatility has decreased as a result of deregulation.

This paper will expand this research in two important directions. First, more types of liberalization will be examined than have been previously. As will be explained, the removal of official restrictions on foreign participation may not capture true liberalization. The regulations may have previously been evaded. Moreover, the effect of market opening depends importantly on the state of global financial conditions. The second extension of previous research is the inclusion of data that spans the Asian, Russian and Brazilian devaluations. These events may well have a palpable impact on the estimated response of volatility to liberalization. Previous papers have examined post-liberalization periods which for many countries begin around 1990 and end near 1996. In retrospect, this period looks deceptively tranquil, save for the Mexican crisis of 1994-1995. Failing to include the late 1990s in the sample may give a misleading picture of reforms' effect on the variance of returns. Results here will indicate that opening has increased volatility for some, and decreased it for others, depending on individual country circumstances.

This paper proceeds as follows. The previous literature on liberalization and stock return volatility is reviewed. The data and methodology are discussed in the next section. Results, indicating both a positive and negative effect on volatility depending on country experience are then presented. Section five concludes.

## 2. PREVIOUS LITERATURE ON LIBERALIZATION AND VOLATILITY

The effect of liberalization on stock market volatility has concerned both academics and practitioners, and the turbulence of emerging markets in the last several years has only accentuated the importance of the issue for policymakers. The previous literature has been often enlightening but also yielded conflicting results on the expected impact of market opening.

Theoretically, Reinhart (1998) models the effect of capital controls on domestic stock markets, and concludes that such restrictions should raise the volatility of prices. The rationale is that when investors are constrained in adjusting the quantity of asset holdings in response to a shock, more of the response falls on price, raising the latter's variability. Conversely, it would thus be expected that the removal of controls on foreign investment in local equity should lower volatility in prices. This theory has intuitive appeal in light of most standard asset pricing models.

However, other papers give reason to question the hope that fewer restrictions lead to more tranquil price changes. Kaminsky, Lyons and Schmukler (2000) demonstrate that, during the Asian and Russian difficulties, nations whose markets were most liquid (and thus, in important respects more open by criteria such as volume traded as a fraction of output, lack of capital controls, the share of the country in mutual fund portfolios and the trading of local stocks in developed equity markets) tended to suffer the greater sell-offs by mutual funds than those nations with less liquid, and thus more closed, exchanges, all else constant. For instance, China, a nation with clear fundamental difficulties, suffered little stock market volatility during the Asian and Russian episodes, while Taiwan and Hong Kong, each with better fundamentals than the mainland, suffered from sharp selling as managers of open-ended mutual funds sought cash for redemptions.

There are other findings which qualify the case for liberalization leading to less variability. Froot, O'Connell and Seasholes (1999) find that, unlike in developed bourses, the purchases and sales of institutional investors have predictive power for future price movements in emerging financial markets. This finding may imply that institutional investors have better information than local agents, or that such institutions have the power to move prices and affect volatility in a way they cannot in developed-country exchanges. The authors also find evidence of positive feedback trading, or trend following, in which past returns influence current flows. Borenstein and Gelos (2000) find strong evidence of herding behavior by mutual fund managers in emerging markets. These funds tend to follow momentum strategies, buying past winners and selling past losers, potentially further adding to volatility. And indeed the turmoil observed in many developing countries has led to calls for greater restrictions on capital mobility, rather than greater opening (see Krugman (1999)).

Given the conflicting predictions of such papers, it is not surprising that attempts to empirically measure the impact of stock market opening have yielded different results. The differing methodologies employed in such papers have also contributed to the

divergent findings. Aggarwal, Inclan and Leal (1997) examine emerging equity market volatility through changes in conditional volatility (GARCH models) but do not test for the effect of liberalization. Bekaert and Harvey (1997) find that liberalization generally, although not always, leads to lower conditional volatility for a sample of developing countries. Levine and Zervos (1998), on the other hand, find that the rolling standard deviation (corrected for autocorrelation) of most stock returns tends to rise following a market opening. Kim and Singal (2000) find, when employing ARCH and GARCH models, that aggregate conditional variance for all emerging markets in their sample decreases marginally after opening. Later, a parametric test of volatility suggests no difference before and after liberalization, while a non-parametric test indicates a decrease in variance. DeSantis and Imrohroglu (1997) employ a GARCH model, and split the sample at the end of 1989, which is taken as a proxy for market opening for five countries. In three of the five nations, volatility is greater before 1990 than after.

The divergent results on volatility doubtless derive in part from differing methods and samples, as well as different dates used as the reform period. And indeed, even if there is a uniform method employed, country experience of similar reforms can be different depending on the institutional arrangements of the domestic financial sector and the state of global financial conditions at the time of liberalization. This paper will accordingly model volatility for seventeen countries as a GARCH process, and rather than imposing one uniform date on all countries, or even looking at one type of reform for all nations, will look at five different types of market openings.

### 3. DATA AND METHODOLOGY

The data comes from the International Financial Statistics (IFS) Emerging Markets Data Base (EMDB). Monthly data on stock index prices for seventeen countries begins, for some, in December of 1975 and runs through April of 2001. As noted, this sample spans the turbulent period of the Asian and Russian crises, as well as the Brazilian devaluation of January 1999, which the previously cited papers did not include. The inclusion of the more volatile periods can have a palpable impact on the estimated conditional variances. The nations are Argentina, Brazil, Chile, Columbia, India, Jordan, Korea, Malaysia, Mexico, Nigeria, Pakistan, Philippines, Taiwan, Thailand, Turkey, Venezuela, and Zimbabwe. The variable modeled will be returns, here the difference in the log of dollar index prices. The dates for liberalization are displayed in table one.

**Table 1.** Liberalization Dates in Emerging Markets

	Official	ADR	Fund	U.S. Flows
Argentina	Nov. 1989	Aug. 1991	Nov. 1991	April 1994
Brazil	May 1991	Jan. 1992	Oct. 1987	June 1988

**Table 1.** (Continued)

	Official	ADR	Fund	U.S. Flows
Chile	Jan. 1992	March 1990	Sept. 1989	Jan. 1988
Columbia	Feb. 1991	Dec. 1992	May 1992	Aug. 1993
India	Nov. 1992	Feb. 1992	June 1986	April 1993
Jordan	Dec. 1995	-	-	-
Korea	Jan. 1992	Nov. 1990	Aug. 1984	March 1993
Malaysia	Dec. 1988	Aug. 1992	Dec. 1987	April 1992
Mexico	Nov. 1989	Jan. 1989	June 1981	May 1990
Nigeria	Aug. 1998	-	-	-
Pakistan	Feb. 1991	-	Sept. 1997	April 1993
Philippines	June 1991	March 1993	May 1987	Jan. 1990
Portugal	July 1986	June 1990	Aug. 1987	Aug. 1994
Taiwan	Jan. 1991	Dec. 1991	May 1986	Aug. 1992
Thailand	Sept. 1987	Jan. 1991	July 1985	July 1988
Turkey	Aug. 1989	Sept. 1997	Dec. 1989	Dec. 1989
Venezuela	Jan. 1990	Aug. 1991	-	Feb. 1992
Zimbabwe	June 1993	-	-	-

Source: Bekaert and Harvey (2000).

Some previous papers have measured the unconditional variance, while others have estimated the variance conditional on its own past. The latter are generally measured in ARCH (Autoregressive Conditional Heteroscedasticity) or GARCH (Generalized ARCH) models. These models have now become standard in measuring volatility in developed countries and in emerging markets, as investors are interested in the variance over a holding period, rather than the unconditional variance. Moreover, an increase in the conditional variance is also an increase in the unconditional variance. Therefore GARCH models will be employed here.

The models, at their most general, are as follows:

$$r_t = \mathbf{a} + \mathbf{b}r_{t-1} + \mathbf{e}_t, \quad (1)$$

$$\mathbf{s}_t^2 = \mathbf{w} + \sum_{i=1}^q \mathbf{q}_i \mathbf{e}_{t-i}^2 + \mathbf{g} \mathbf{e}_{t-1}^2 d_{t-1} + \sum_{j=1}^p \mathbf{d}_j \mathbf{s}_{t-j}^2. \quad (2)$$

Here,  $r_t$  denotes the monthly return, and  $\mathbf{e}_t$  is a random error. In this specification, the variance is subject to persistent shocks, and hence the conditional, rather than the unconditional variance is modeled. In Equation (2), the conditional variance follows an asymmetric GARCH ( $p, q$ ) process. That is, the variance follows an ARMA process,

with the  $s_t^2$  terms representing the AR portion and the  $e_t^2$  terms the moving average. The middle term,  $ge_{t-1}^2 d_{t-1}$  represents the asymmetric portion of the conditional variance. Here, the dummy variable,  $d_{t-1}$  is equal to one if  $e_t < 0$ , and zero otherwise. Thus, negative shocks raise volatility by more than positive innovations. This specification is based on a finding by Black (1976). It has been argued that negative shocks raise the leverage of firms, thus leading to higher variability. The structural economic reasons for this empirical regularity are still debated, but this effect has very often been found in equity markets, and thus it seems important to allow for it. Models that include this asymmetric effect are termed Threshold GARCH, or T-GARCH models.

There exist a number of criteria for choosing the correct number of lags and specification in GARCH models, (AIC, SIC, maximum likelihood, etc.). Since consistency of the estimates is of overriding importance, a conservative strategy of choosing a model based on no remaining correlation in the squared residuals was used. Thus, for each nation, the specification of ARCH, GARCH, asymmetry and lag length chosen depended on testing for the absence of remaining ARCH effects using a LaGrange Multiplier test once a given model had been estimated. That is, once a GARCH model has been estimated, the remaining squared residuals should exhibit no autocorrelation. If there were remaining ARCH effects, the model is adjusted by adding parameters until the effects were no longer significant. There are therefore different models for the nations. Some specifications had no GARCH terms, some had no asymmetry parameter, and there were a variety of lag lengths chosen. Table two contains the particular GARCH specification chosen for each country index, as well as the results of the LM tests for autocorrelation in the squared residuals of the models. As shown, for no model can the null hypothesis of no autocorrelation be rejected at anything close to a standard significance level. Given the well-known findings regarding the non-normality of return residuals in both developed and emerging equity markets, robust Bollerslev-Wooldridge standard errors were employed for all countries.

**Table 2.** GARCH Models and LM Tests

Country	Model	P-Value on ARCH LM Test
Argentina	GARCH(1,1)	0.748
Brazil	T-GARCH(1,1)	0.889
Chile	GARCH(1,1)	0.362
Columbia	T-GARCH(2,1)	0.660
India	T-GARCH(2,1)	0.775
Jordan	T-GARCH(1,1)	0.390
Korea	T-GARCH(1,1)	0.798
Malaysia	GARCH(1,1)	0.892
Mexico	GARCH(1,1)	0.687

**Table 2.** (Continued)

Country	Model	P-Value on ARCH LM Test
Nigeria	GARCH(1,1)	0.990
Pakistan	T-GARCH(2,1)	0.395
Philippines	GARCH(1,2)	0.885
Portugal	GARCH(1,1)	0.773
Taiwan	GARCH(1,1)	0.964
Thailand	ARCH(2)	0.775
Venezuela	T-GARCH(1,1)	0.931
Zimbabwe	ARCH(4)	0.886

Given the baseline models, the next step is to test for the significance of measures of reform. Previous papers have used one date for all countries, or have used one type of reform, such as official market opening for all the emerging markets under study. Because of the ambiguities associated with certain reforms, the models here will be used to test for the effectiveness of five different types of market opening. The first, and most straightforward, is the removal of official restrictions on foreign investment in domestic capital markets. The dates for each country are taken from Bekaert and Harvey (2000), as are the dates for three of the other four reforms. While this measure is used frequently in other studies, and is intuitively the most clear example of a market opening, it is not without problems of interpretation. For example, such restrictions may be evaded, at least partially. Some studies of capital controls in emerging markets over the 1990s find that such regulations are only partially effective. These restrictions may influence the volume, but not the composition of total inflows in some nations, or only affect foreign investment in the short term, but not in the longer run, in other countries (see Cardoso and Goldfajn (1998), and Montiel and Reinhart (1999)). Thus their removal may not represent much of a change in investment opportunities for foreigners seeking to buy domestic stocks.

A related reason that removal of official restrictions may not capture the true change in market opening is that the level of capital inflows into an emerging market depends very importantly on the world financial environment, possibly more than it depends on the official policy stance of the emerging market toward foreign stock purchases. Just as a nation may employ an ineffective regime of controls on stock purchases by foreigners, it may remove official restrictions and experience little subsequent increase in equity inflows. For example, a number of authors (Calvo, Leiderman and Reinhart (1993), Fernandez-Arias (1996), Taylor and Sarno (1997)) have found that much, perhaps most, of the capital which flowed into emerging markets in the early 1990s was motivated not so much by improved investment conditions or high returns in those nations but by the poor returns then available in developed countries. This surge in inflows after 1989 took place just after many developing countries had been effectively rationed out of world

capital markets in the aftermath of the 1980s debt crisis. Papers such as those mentioned above found that low interest rates and stock returns in the United States, Japan and Europe encouraged investors to seek higher returns in emerging markets. Capital flowed to many nations in very different stages of economic growth and reform. And conversely, in other periods, almost no financial inflows from the developed world are available, as was the case for Latin America from the 1930s until the 1970s. Thus one type of market opening is the change in the external environment that arises when funds are “pushed” into the local stock market, rather than being “pulled” by domestic reforms and conditions.

Accordingly, two dates are employed to capture the changes that the world financial markets brought to developing countries. The first is the structural break in the flow of U.S. funds into the local stock market. The date for this break for each country is taken from Bekaert and Harvey (2000). The United States is the only country for which flow of funds data into emerging stock markets is available on such a basis. Of course, this is an imperfect measure, as there are other nations, and the U.S. flows are subject to measurement error. Thus, a second date is employed for all countries to capture the change in the world financial condition-December 1989. This date is marked by previous authors such as Fernandez-Arias as the point at which investors in the developed world began sending funds on a large scale to emerging markets. DeSantis and Imrohroglu also employ the date as the break point at which they split their sample for five nations and examine changes in variance. Thus this date will be used for all seventeen countries.

Finally two other measures of market opening were employed. The first is the date on which country funds were originally introduced for a given nation. Country funds are closed-end mutual funds which invest in a given nation’s stock market. They provide a vehicle (initially perhaps the only vehicle) for investors in the U.S., Europe or Japan to purchase shares in a certain emerging market. Diwan, Errunza and Senbet (1993) show theoretically that the introduction of country funds increases capital mobilization and augments market efficiency for stock exchanges. The second is the introduction of American Depository Receipts, or ADRs. These are rights to foreign stocks which trade in the United States. As explained in Bekaert and Harvey (2000), these instruments may help overcome both official restrictions and information asymmetries for investors. Their effects are theoretically similar to those of country funds. The date of introduction, for both country funds and ADRs will again be taken from Bekaert and Harvey (2000).

To measure the impact of each reform, it would be optimal to have a continuous measure of foreign investor participation. The fraction of foreign investor trading volume, for instance, would be a good independent variable to include as a determinant of volatility. However, such data is not available, and thus studies of liberalization all rely on some sort of dummy variable or structural break at the time of deregulation to gauge the impact of market opening. Accordingly, dummy variables for each country will be added to the models which take on a value of 1 after reform and zero before. Thus the following model:



$$r_t = \mathbf{a} + \mathbf{b}r_{t-1} + \mathbf{e}_t, \quad (3)$$

$$s_t^2 = \mathbf{w} + \sum_{i=1}^q \mathbf{q}_i \mathbf{e}_{t-i}^2 + \mathbf{g} \mathbf{e}_{t-1}^2 d_{t-1} + \mathbf{d} D + \sum_{j=1}^p \mathbf{d}_j s_{t-j}^2 \quad (4)$$

was estimated for all countries, identical to the original T-GARCH models, except for the addition of the  $\mathbf{d}D$  term, where  $D$  is the policy dummy. This is the same method used by Edison and Reinhart (1999) to measure the impact of capital restrictions during the Asian crisis on a set of financial and economic variables. Edwards (1998) also employed the method to test for contagion over crisis periods in Latin American markets. As with these authors, the dummy variable will be used to test for a structural change in the conditional volatility process itself, using a  $t$ -test.

#### 4. RESULTS

The results of testing for the effects of different reform measures are displayed in tables three through six.

**Table 3.** Estimates of GARCH and Market Opening Effects: Columbia, India, Nigeria

<b>Columbia</b>	Coefficient	T-Stat	P-Value
ARCH(1)	0.163	1.794	0.072
ARCH(2)	0.168	1.472	0.140
TARCH(1)	-0.335641	-4.08	0.00
GARCH(1)	0.439	2.57	0.01
Avg. Return	1.205		
Official	25.75	2.20	0.0278
<b>India</b>	Coefficient	T-Stat	P-Value
ARCH(1)	0.1953	2.01	0.043
ARCH(2)	-0.18	-1.87	0.0612
TARCH(1)	-0.0705	-1.532	0.1253
GARCH(1)	1.013	44.62	0.00
Avg. Return	0.907		
Dec. 1989	20.65	2.25	0.0239
Fund	20.611	2.76	0.0058
<b>Nigeria</b>	Coefficient	T-Stat	P-Value
ARCH(1)	-0.0254	-3.65	0.0003
GARCH(1)	0.532	1.697	0.0896
Avg. Return	0.974		
Official	-41.5	-1.75	0.0788

**Table 4.** Estimates of GARCH and Market Opening Effects:  
Pakistan and the Philippines

<b>Pakistan</b>	Coefficient	T-Stat	P-Value
ARCH(1)	0.4106	1.73	0.0836
ARCH(2)	-0.1654	-1.03	0.302
TARCH(1)	-0.1536	-0.7282	0.4664
GARCH(1)	0.869	14.42	0.000
Avg. Return	0.4322		
Dec. 1989	63.948	3.22	0.0013
Official	34.298	1.888	0.0590
Fund	75.507	3.962	0.0001
US Break	87.22	2.478	0.0132
<b>Philippines</b>	Coefficient	T-Stat	P-Value
ARCH(1)	0.0019	0.794	0.426
TARCH	-0.00392	-1.36	0.1737
GARCH(1)	1.97	556.7	0.0000
GARCH(2)	-0.998	-301.4	0.000
Avg. Return	1.644		
Fund	-0.499	-2.166	0.03

**Table 5.** Estimates of GARCH and Market Opening Effects:  
Portugal, Taiwan and Thailand

<b>Portugal</b>	Coefficient	T-Stat	P-Value
ARCH(1)	0.7361	3.17	0.0015
GARCH(1)	0.169	1.655	0.0978
Avg. Return	2.249		
Dec. 1989	-77.78	-2.19	0.0282
US Break	-17.34	-1.683	0.0922
<b>Taiwan</b>	Coefficient	T-Stat	P-Value
ARCH(1)	0.096078	1.207	0.2272
GARCH(1)	0.7969	6.402	0.000
Avg. Return	1.824		
Official	-13.289	-4.24	0.000
ADR	-11.439	-2.32	0.0198
<b>Thailand</b>	Coefficient	T-Stat	P-Value
ARCH(1)	0.205	1.65	0.0988
ARCH(2)	0.3352	3.064	0.0022
Avg. Return	0.001281		
Dec. 1989	0.007266	2.79	0.0051

**Table 6.** Estimates of GARCH and Market Opening Effects:  
Venezuela and Zimbabwe

<b>Venezuela</b>	Coefficient	T-Stat	P-Value
ARCH(1)	1.383	3.541	0.004
GARCH(1)	-0.0475	-2.914	0.0036
TARCH	-1.173	-2.974	0.0029
Avg. Return	1.614		
Official	93.058	3.042	0.0023
US Break	75.12	1.94	0.0522
<b>Zimbabwe</b>	Coefficient	T-Stat	P-Value
ARCH(1)	0.1066	1.8278	0.0676
ARCH(2)	-0.01995	0.9903	0.322
ARCH(3)	0.2412	0.5815	0.5609
ARCH(4)	0.4416	3.323	0.0009
Avg. Return	-0.0011		
Official	0.0036	1.896	0.0579

For ten of the seventeen countries at least one measure of reform is statistically significant, and figures one through ten display the conditional standard deviation for these countries. Interestingly, however, for six of the ten countries in which reform has a significant impact, the effect is to *raise* the conditional volatility of returns, while for the other four reform lowers return variability. The difference in impact is not surprising given the different findings of previous researchers-some found reform had no discernible effect, others found it increased, and yet others that it decreased volatility. The impact of a given reform in no doubt depends on other aspects of the financial institutional structure in the given economy in which it is undertaken.

As noted in the previous section, an increase in the conditional variance is also an increase in the unconditional variance. The six countries for which reform measures raise volatility are Columbia, India, Pakistan, Thailand, Venezuela and Zimbabwe. As noted in table three, in four of the six (all but Columbia and Zimbabwe) external measures-December of 1989, or the structural break in U.S. flows-were significant. Additionally, for four of the six (Columbia, Pakistan, and Venezuela and Zimbabwe) official reform also succeeded in raising the variance of returns. Also, for two nations (India and Pakistan) the introduction of country funds had a positive impact. The only reform measure that did not raise the variance for any nation was the introduction of ADRs.

The four nations for which reform lowered the conditional variance are Nigeria, the Philippines, Portugal, and Taiwan. No real pattern emerges here. In two (Nigeria and Taiwan) official reform lowers variance. For Portugal, both the structural break in U.S. equity flows and December of 1989 lower volatility. In the Philippines, the introduction

of country funds lowers variability. Finally, in Taiwan, in addition to official reform, the introduction of ADRs lowers the variance.

The effect of liberalization thus differs across countries, and, as noted, likely depends on the particular institutional arrangements in financial markets in the particular nation. Overall, while no large patterns stand out, there are several results of note. First, for no Latin American nation does the variance of returns fall in response to any liberalization. For Asia, both Pakistan and India, which had been relatively closed both in their capital and trade accounts, show increased volatility as a result of liberalization. In East Asia, Thailand's volatility rose, while Taiwan's fell.

For the specific liberalization measures, the end of official restrictions lowers the variance in two instances, and raises it in four others. The introduction of ADRs increases volatility in one case, and lowers it one other. Country funds, on the other hand, raise the variance three times, and lower volatility only once. The break in U.S. equity flows has a positive effect on the variance in two cases, and a negative impact in one. The December 1989 date raises variance in three cases, and lowers it only once. The latter two measures of the impact of a changing external environment thus raise volatility in five cases, and lower variability in only two, indicating that lower world returns appear to raise local stock return variances. Overall, the results do not provide support to claims that increased openness will lower volatility in emerging stock markets.

## 5. CONCLUSION

The theoretical priors regarding the effect of liberalization on stock return variance are ambiguous. Some models imply that allowing flows, or quantities to absorb shocks leaves prices more stable. On the other hand, models of herding and other market imperfections lead to fear of increased volatility once bourses are open to foreign participation.

Results here demonstrate that the results of reform are often country-specific. Outside of the fact that no Latin American nation saw its volatility decrease, and that both Pakistan and India, which had been relatively closed both in terms of the current and capital accounts until recently, saw only increases in variability, no striking patterns emerge from the results. Policymakers thus may generally not expect that increased openness leads to greater tranquility on average.

It is important to note that despite reform raising return variability more often than decreasing it, one should not conclude that reform is harmful to economic or overall financial development. Even if policymakers can reasonably expect an increase in return variance subsequent to liberalization, there are many other effects which are highly beneficial and may outweigh any welfare cost associated with higher volatility. Bekaert and Harvey (2000) and Henry (2000) both document the clear effect that market opening has in raising prices, and hence lowering returns. These lower returns represent a lower

cost of capital to emerging markets, and allow for greater capital accumulation and hence economic growth. Market opening also allows investors worldwide greater opportunity for diversification. Results indicate, however, that reform cannot dependably lower the variance of share prices.

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