Stopping hot money

Reinhart, Carmen and Edison, Hali
University of Maryland, College Park, Department of Economics

December 2001

Stopping Hot Money

Hali Edison
Board of Governors of the Federal Reserve
Carmen M. Reinhart [1]
University of Maryland and NBER

First draft: November 29, 1999
A revised version of this paper was published in:
Journal of Development Economics, Vol. 66 No. 2, December 2001, 533-553.

While high interest rates and foreign exchange sales are the most common way of dealing with a speculative attack in the foreign exchange market, several countries resorted to capital controls during recent periods of currency market turbulence. The purpose of this study is to use daily financial data to examine four of these capital controls episodes--Brazil, 1999, Malaysia 1998, Spain 1992, and Thailand 1997. We aim to assess the extent to which the capital controls were effective in delivering the outcomes that motivated their inception in the first place. We conclude that in two of the three cases (Brazil and Thailand), the controls did not deliver much of what was intended--although, one does not observe the counterfactual. By contrast, in the case of Malaysia the controls did align closely with the priors of what controls are intended to achieve: greater interest rate and exchange rate stability and more policy autonomy.

1 This paper was prepared for the National Bureau of Economic Research and Universidad del CEMA 12th Annual Inter-American Seminar on Economics Economic Integration: *Financial and* Real, December 2-4, 1999, Buenos Aires, Argentina The authors wish to thank Vincent Reinhart for very helpful comments and suggestions and Rafael Romeu for excellent research assistance.

I. Introduction

During the course of the 1990s, many emerging market economies experienced both the highs and the lows of the international capital flow cycle. Early in the decade, many developing countries regained access to international capital markets after many years of debt servicing difficulties that gave them little recourse to new international lending. As capital began to find its way back to countries in Asia and Latin America, the debate on how to manage a surge in capital inflows emerged as one of the most pressing policy topics of the day. [1] Capital controls, when they were discussed at all, were examined in the context of liberalizing restrictions on capital outflows or in terms of the relative merits of whether certain types of capital inflows--usually short-term offshore borrowing--should be taxed or in any way restricted. Indeed, much of the subsequent empirical work on capital controls was devoted to assessing whether these measures were effective in achieving their stated objectives. For instance, Edwards (1998) examined whether Chile's reserve requirement policy bought its central bank some greater control over short-term interest rates; Montiel and Reinhart (1999), looked at a panel of 15 emerging markets (EMs) to determine whether these curbs or taxes on inflows were successful in influencing the volume and composition of capital flows; and Cardoso and Goldfajn (1998) examined some of these issues for the case of Brazil.

In the event, the EM capital flow surge proved to be as fragile and volatile in the 1990s as it had been previously.[2] The first prick of the capital flow bubble came with the Mexican crisis in December 1994, which affected other Latin American countries--most notably Argentina.[3] In

---

[1] See Calvo, Leiderman, and Reinhart (1993) and Reinhart and Reinhart (1998).

[2] See Eichengreen (1994).

[3] See Edwards (1998) on this issue.

mid-1997, much of emerging Asia was engulfed in a financial crisis of unprecedented severity for that region.[4] The Russian crisis and the near-bankruptcy of Long Term Capital Management (LTCM) in the fall of 1998 further dried up the remaining capital flows to EMs. [5] In early 1999, Brazil followed suit with a currency crisis of its own--raising (yet again) concerns about the prospects for Argentina. Nor does this discussion provide an exhaustive chronology of recent episodes of currency market turbulence. Colombia, which was one of the few Latin American countries to avoid default in the early 1980s, fell into a severe financial crisis late in the summer of 1998 while Ecuador's default on Brady and Eurobond obligations subsequently received much attention from the financial press.

Given this string of disruptive events in international capital markets, it is not surprising that the academic and policy discussion of and debate over capital controls began to shift markedly in emphasis. The types of controls that were contemplated or used during several of the recent crises were very different from the measures introduced during the inflow phase of the capital flow cycle. Presumably this difference has a good theoretical grounding. As explained by Bartolini and Drazen (1996), capital controls can convey information to the market about policymakers' preferences. No doubt policymakers would want to send different signals--which are gotten from the controls--to slow the inflow of capital in good times relative to outflows in bad times. The policies that were implemented to discourage capital inflows had two important distinguishing features. First, the measures were typically introduced in a "tranquil" period during which there were capital inflows. Second, those types of controls were largely seen by market

[4] See Kaminsky and Reinhart (1998).

[5] See Bank of International Settlements (1999) for a detailed analysis of the events of the fall of 1998.

participants as being of a benign or "prudential" nature. Those measures very different from the prototype capital control episode we examine in this paper, which were more akin to those discussed in Paul Krugman's policy advice appearing in the financial press in early 1998.[6] In these writings, the emphasis was on the possible usefulness of capital controls as a means to buy time during crisis periods. The policies, born out of necessity rather than precaution, are not typically heralded as market-friendly. Malaysia's controls in the fall of 1998 represented the most extreme example of "adverse signaling". Such signals were reenforced by Dr. Mahathir's anti-foreigners rhetoric at the time the controls were launched, which raised widespread concerns that even more drastic measures, including expropriation, would follow.[7]

While high interest rates and foreign exchange sales are still the most common way of dealing with a speculative attack in the foreign exchange market, several countries resorted to introducing capital controls during recent periods of currency market turbulence. The purpose of this study is to examine four of these crisis/capital controls episodes, three of them--Brazil, 1999, Malaysia 1998, and Thailand 1997--in greater detail and Spain1992, serving as a comparison. We aim to assess the extent to which the capital controls were effective and successful in delivering some of the outcomes that motivated their inception in the first place.

The frequency of the data is daily. Except for Spain, which covers the 1991-1993 period, the sample is 1995 through July 23, 1999. In addition to the four control episodes, there are two "control group countries" the Philippines and South Korea, which had crises but did not introduce controls. Our variables of interest are: Interest rates--both the overnight policy rate and various

---

[6] See Krugman (1998).

[7] Indeed, institutional investors' anxiety that a new wind was blowing regarding official attitudes were heightened by the short-lived restrictions in Japan on short selling.

market rates and changes in interest rates, equity market returns, exchange rate changes, domestic-foreign interest rate differentials, bid-ask spreads on foreign exchange, onshore-offshore interest rate spreads, and readings on the slope of the term structure of interest rates.

As to the empirical methodology, we employ an eclectic variety of tests: Tests for the equality of moments and changes in persistence between capital control and no control periods; principal component analysis--to assess contemporaneous comovement; block exogeneity tests in a VAR framework to assess temporal international causality; GARCH tests for the effects of controls on volatility--to assess changes in cross border volatility links, as in Edwards (1998) and; Wald tests for structural breaks over a rolling window--to determine whether the timing of structural breaks coincides with policy changes on capital controls.

There are, of course, several limitations and concerns with this kind of analysis. First, results are episode specific because there are too few episodes to be confident in generating "stylized facts." Second, given that these kinds of controls are introduced during periods of turbulence, it is particularly difficult to parse what owes to the controls from what is due to the financial crisis per se. For instance, a generalized withdrawal from risk-taking (as what followed the Russia/LTCM episode in the fall of 1998) could have similar implications and outcomes as the introduction of capital controls. It is for that reason we examine some crises episodes for countries that did not resort to controls as part of a control group.

With these caveats in mind, our key empirical findings are summarized below.

As to the behavior of the variables of interest in the control versus no-control period, we find: Interest rates were less variable and usually more persistent following the introduction of controls--but, except in Malaysia, domestic interest rates were **not** lower during the control period. Stock returns tended to be more variable following the introduction of capital controls--

especially so in the case of Thailand--consistent with the view that more of the burden of adjustment falls on prices when the change in quantities is restricted. There is no evidence, except for the case of Malaysia, that the controls were associated with more stable exchange rates. Indeed, exchange rate variability **increased** significantly in all the other episodes.

As to the **side-effects** of capital controls, we find that foreign exchange bid-ask spreads were uniformly wider and more variable during the control periods. Of course, this was also the case for the Philippines during its 1997 crisis--despite no new capital controls. Also, onshore-offshore interest rate spreads widened and become more volatile following the introduction of controls.

As to the central **issue of insulating the economy from external shocks and gaining greater policy autonomy**, our results suggest that there is little evidence that capital controls were effective in decoupling domestic interest rates from foreign interest rates--either contemporaneously or temporally. The closest episode that meets this expectation is Malaysia. There is also little evidence that these measures were effective in decoupling domestic exchange rate changes from exchange rates abroad--either contemporaneously or temporally. Again, Malaysia's experience comes the closest to meeting this expectation. The evidence suggests that equity markets continue to be internationally linked, despite the introduction of controls. Lastly, financial crises appear to be a key determinant of the timing structural changes--more so than capital controls.

The remainder of the paper is organized as follows. Section II discusses some of the pertinent theoretical predictions as to what can be expected if the controls are effective. Section III describes the measures and their chronology and presents the descriptive statistics for a variety of financial variables during the various episodes, while the section that follows describes the

empirical tests performed and their outcomes and implications. The final section discusses possible extensions and policy implications of the analysis.

II. Theoretical Predictions of the Effects of Controls

In this section, we first review some of the reasons most often voiced by policy makers for resorting to capital controls during periods of turbulence. Knowing what the stated expectations from the policy change are in the first place is essential to assess whether the policy was "effective" or "successful." Since many of these expectations are grounded on an implicit model, we then proceed to summarize the implications of capital controls for some of the variables of interest.

1. Reasons for resorting to capital controls during crises periods

The first line of defense by central banks dealing with speculative attacks on their currencies is usually to sell off their holdings of foreign exchange. However, central bank holdings of foreign exchange are often inadequate to support the currency and, even if the initial stock is high by international standards, recurring runs on the currency can quickly deplete the initial war chest. Not surprisingly, policy makers will often cite the need to stem the drain on foreign exchange reserves as a motivation for introducing capital controls during periods of extreme market stress.

Also central banks can (and often do) react to speculative pressures by raising interest rates, occasionally to prohibitively high levels. However, given the consequences of high interest rates on economic activity and debt servicing costs, this policy alternative is not particularly appealing either--especially if the pressures persist over an extended period and the domestic financial

system is weak. Hence, capital controls are seen as a course of action which would enable the monetary authorities to maintain lower (and more stable) interest rates than would be the case under free capital mobility--especially if credibility has been lost. More generally, controls can (if they are effective) fulfill the authorities' desire to regain autonomy in monetary policy--without floating the exchange rate.

Since volatile international bond and equity portfolio flows are frequently viewed as a destabilizing force in asset markets and, more generally, in the financial system, another reason which is often cited for introducing controls is the desire to reduce the volatility in asset prices.

2. Theoretical priors

The Mundellian trinity suggests that fixed (or quasi fixed) exchange rates, independent monetary policy, and perfect capital mobility cannot be achieved simultaneously. Capital controls are a way of allowing the authorities to retain simultaneous control over the interest rate and the exchange rate. Capital controls may be particularly appealing when the authorities are reluctant to allow the exchange rate to float freely, which is the case in most EMs.[8] Fear of floating may arise for a variety of reasons, including the dollarization of liabilities--but for the purposes at hand, however, those reasons are not central to our analysis. The important point for our analysis is that controls introduce a systematic wedge between domestic and foreign interest rates. As uncovered interest rate parity breaks down, the domestic policy interest rate (from the vantage point of a small open economy) need not follow international interest rates.[9] In principle, variation in that

[8] See Calvo and Reinhart (1999).

[9] Of course, imperfect asset substitutability and a time varying risk premia are sufficient to explain a breakdown of uncovered interest parity--even in the absence of capital controls.

wedge can be introduced by the authorities to influence the exchange rate systematically. One example of this is the theoretical model of Reinhart and Reinhart (1998), who trace out the effects of one of the simplest forms of capital controls--a reserve requirement. Depending on the degree of competition among financial intermediaries, Reinhart and Reinhart show that the wedge between foreign and domestic interest rates induced by the reserve requirement influences the response of the exchange rate and the real economy to shocks.

The potential consequences of capital controls become even more persuasive in models that provide an important role for asset stocks in affecting an economy. The general mechanism at work is that, if the flow of capital is restricted in any way, then the burden of adjustment in asset markets falls more on prices. Calvo and Rodriguez (1978) forst showed how sluggishness in the flow of international assets can generate overshooting of the exchange rate. Reinhart (1998) broadened that model by incorporating equity prices and introducing three different kinds of restrictions on capital flows. The implication in Reinhart's framework is that equity price volatility should increase with the imposition of controls. The generic features of such models are laid out in Figure 1. A shock to the desired portfolio allocation generally triggers adjustments to both asset quantities and prices. Capital controls shift more of that adjustment toward prices and, to the extent that they introduce interest rate wedges, may also alter the relationship between asset prices and the policy rate.

Table 1 provides a summary of the predictions of theory for selected financial variables. Capital controls also have well defined predictions for central bank foreign exchange reserve losses and capital outflows. Such data, however, is only available at lower frequencies and we confine our emphasis here to financial indicators which are observable on a daily basis.

We should expect following the introduction of capital account restrictions:

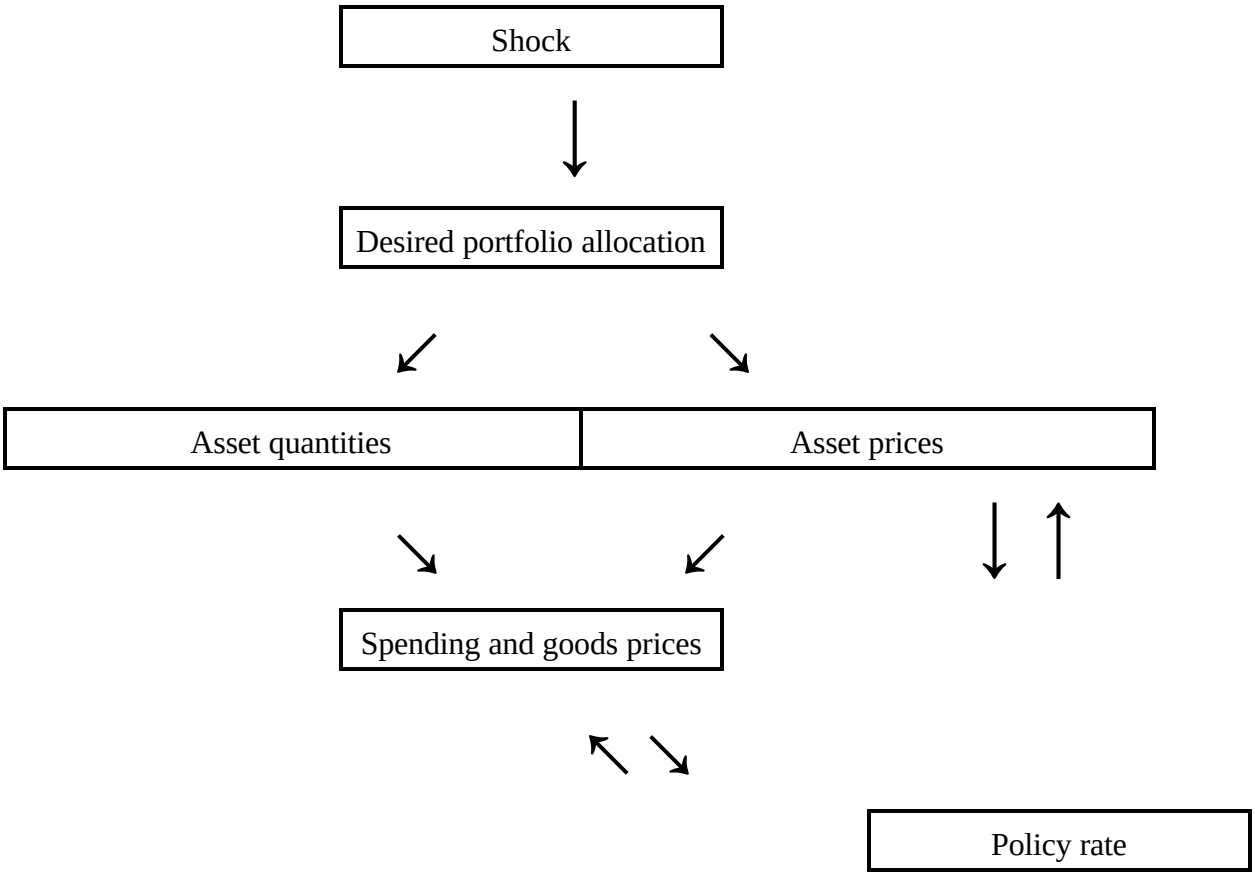
Less contemporaneous movement with international variables--particularly in interest rates and exchange rates; a weaker causal (temporal) influence from foreign variables to domestic ones; a decline in volatility spillovers; and evidence of structural breaks around the introduction of controls.

The implications of a decline in market liquidity--whether owing to a capital control or a generalized withdrawal from risk taking-- are also straightforward. Bid-ask spreads in the market(s) where liquidity has diminished should widen and become more volatile.

A general caveat is in order, however. As the flow chart shown in Figure 1 highlights, if asset prices are affected by the controls (as expected) **and** the policy interest rate responds to asset prices, in turn, then controls may not be the insulating mechanism that they were intended to be. [10]

[10] A recent example of evidence of monetary authorities' concern with asset prices was provided by the Hong Kong Monetary Authorities large-scale intervention in the equity market in the turbulent fall of 1998.

Figure 1. Flowchart of a Generic Model



III. The Control Episodes

In this section, we describe the timing and nature of the selected capital control episodes as well as some of the more relevant events surrounding the introduction and lifting of these measures. We then confront the theoretical predictions with the data from four recent episodes.

1. The policy measures and chronology of events

The capital control episodes that we analyze are: Thailand (May 14, 1997-January 30, 1998), Malaysia (September 1, 1998 to present), and Brazil, (March 1, 1999 to present). All

three are recent examples of EM countries resorting to capital controls during periods of market stress. We also examine, in less detail Spain (September 21- November 23, 1992), which was one of the European countries to introduce controls during the Exchange Rate Mechanism (ERM) crisis of 1992-1993. The chronology of the episodes and further details of the measures are summarized in Table 2.

In the case of Brazil, it is worth pointing out that the division between the "control" and "no-control" period is somewhat blurred by the variety of measures Brazil introduced since the mid-1990s measures that were along the lines of a Tobin tax on bond and equity purchases. As the tax is paid upon the purchase of the asset, it disproportionally falls on investors which have a very short holding period. Those measures were intended to curb what were perceived to be very volatile portfolio capital inflows. By contrast, the measures announced on February 11 were designed to force investment funds to hold more domestic government bonds--which lowered the amount of other countries' debt these fund could hold--thus restricting capital outflows.

As to the two control group countries, the Philippines and South Korea, the crisis episode is set to span from the devaluation of the Thai baht on July 2, 1997 to end-July 1998, as these countries were little affected by the Russian devaluation and the LTCM episode in the fall of 1998.

2. Methodology issues and limitations of the analysis

There are, of course, several limitations and concerns with the kind of analysis we undertake. First, results are episode specific--not "stylized facts." There are too few episodes for that label. Second, given that these kinds of controls are introduced during periods of turbulence, it is particularly difficult to separate what owes to the controls and what is due to the financial crisis per se. For instance, a generalized withdrawal from risk-taking (as what followed the

Russia/LTCM episode in the fall of 1998) can have similar implications and outcomes as the introduction of capital controls. Namely, international flows dry up, spreads widen volatility in asset markets increases, and so on. Hence, the importance of having some crises episodes for countries that did not resort to controls as part of a control group. Third, our empirical methodology assumes linearities in relationships, which may break down during period of extreme market stress--an issue that is highlighted in multiple-equilibria crises models.

3. Interest rates, stock returns and exchange rates during control and crises periods

In the preceding section, we provided a sketch of what theory predicts as regards the behavior of selected key financial variables following the introduction of measures that curtail international capital movements. In this section, we confront those predictions with the data from four recent episodes. We examine the behavior of daily interest rates and changes in interest rates, stock returns, exchange rate changes, bid-ask spreads on foreign exchange, domestic-foreign interest rate differentials, and onshore-offshore interest rate differentials (where relevant).

For each of these time series we provide descriptive statistics (mean and standard errors) and test for the equality of first and second moments between the capital control and free capital mobility periods. A correlogram for the individual subperiods is also used to assess whether the persistence of shocks changes as a result of the change in policy. We also analyze this battery of statistics and tests for two countries that had currency crises but did not impose controls. We compare the crisis and tranquil periods with the aim of assessing the extent to which observed changes in the key variables may be attributed to the crisis rather that the capital controls. Tables 3-8 report the results for each of the six countries.

In the case of ***Brazil***, the observed changes in the financial variables (to the extent that

there are any) align loosely with the theoretical predictions. While interest variability declines following the introduction of controls, the reduction in interest rates is not significant; stock market price volatility increases--but, again, the increase is not significant. Exchange rate volatility increases markedly in the control period, as the "quasi-fixed" exchange rate regime was abandoned shortly before the introduction of controls. Reflecting reduced market liquidity, bid-ask spreads on foreign exchange widen and become more volatile after March 1, 1999.

By contrast, ***Malaysia's*** controls seem to be associated with the kind of changes one would expect a priori if the controls were effective. The policy interest rate declines, and its level becomes more stable and persistent. Similarly, the exchange rate also becomes more stable (the ringgit was pegged to the US dollar on September 2, 1998). However, as the burden of adjustment in asset markets falls more on prices than on quantities, equity prices become more volatile. Indeed, as shown in Table 2, six days after the controls are introduced the stock market suffered its largest one-day decline (a staggering 22 percent). As in the case of Brazil, reduced market liquidity leads to wider and more volatile bid-ask spreads in the foreign exchange market.

The pre- and post-control comparisons for ***Spain*** and ***Thailand*** look more like those for Brazil rather than Malaysia's. Interest rate variability declines--but interest rates actually increase in both cases. However, domestic-foreign interest rate spreads actually decline and become more stable for Spain. Yet, exchange rate variability increases (rather than declines), as Spain ultimately devalued the peseta against other ERM currencies on October 12, 1992 and Thailand floated the baht on July 2, 1997. As predicted by theory, equity prices are significantly more volatile during the control period, and bid-ask spreads widen and become more volatile in both countries. Thai onshore-offshore interest rate spreads widen significantly and become more variable as controls squeeze liquidity in the offshore market.

However, it will be difficult to trace to what extent some of these effects are owing exclusively to the introduction of capital controls. While it is the case that for, ***the Philippines*** and ***South Korea,*** interest rate variability does not decline during the crisis period (indeed, they actually increase in Korea), equity price volatility is higher in both cases as the crisis unfolds. It is also the case that, for the Philippines, market liquidity appears to deteriorate during the crisis as bid-ask spreads on foreign exchange widen and become more variable.[11]

A summary of the main results is provided in Table 9. As to the behavior of the variables of interest in the control versus no-control period, we find that: Interest rates were less variable and usually more persistent following the introduction of controls--but, except in Malaysia, interest rates were **not** lower during the control period. Stock returns tended to be more variable following the introduction of capital controls--especially so in the case of Thailand--consistent with the view that more of the burden of adjustment falls on prices when the change in quantities is restricted. There is no evidence, except for the case of Malaysia, that the controls were associated with more stable exchange rates. Indeed, exchange rate variability **increased** significantly in all the other episodes.

IV. Are Control Periods Different?

In this section, we employ an eclectic variety of tests to examine whether the periods when capital controls are in place are different. Specifically, we turn our attention to the issue of external shocks, cross-border interdependence, and volatility spillovers. We employ principal component analysis--to assess contemporaneous comovement; block exogeneity tests in a VAR

[11] These are unchanged for South Korea.

framework--to assess temporal international causality; GARCH tests for the effects of controls on volatility spillovers--to assess changes in cross border volatility links, as in Edwards (1998) and; Wald tests for structural breaks over a rolling window--to determine whether the timing of structural breaks coincides with policy changes on capital controls.

1. Principal component analysis

To assess whether the degree of comovement across countries in several financial variables is influenced by the introduction of capital controls, we applied principal component analysis to the financial time series data over the control period and contrasted those results to the subsample with no controls. A priori, one should expect a lower degree of comovement for the country that has imposed controls during the period in which these are in place.

We focus on three daily time series, the domestic policy interest rate (described for each country in Tables 3-9) the return on equity, and the change in the exchange rate (in percent) for the five EM countries in our sample, Brazil, Malaysia, the Philippines, South Korea, and Thailand. From these series, we constructed a smaller set of series, the principal components, that explain as much of the variance of the original series as possible. The higher the degree of co-movement in the original series, the fewer the number of principal components needed to explain a large portion of the variance of the original series. In case where the original series are identical (perfectly collinear), the first principal component would explain 100 percent of the variation in the original series. Alternatively, if the series are orthogonal to one another, it would take as many principal components as there are series to explain all the variance in the original series. In that case, no advantage would be gained by looking at common factors, as none exist.

The procedure begins by standardizing the variables so that each series has a zero mean

and a unit standard deviation. This standardization ensures that all series receive uniform treatment and the construction of the principal component indices is not influenced disproportionately by the series exhibiting the largest variation. The correlation matrix of the standardized series, Ó, is decomposed into its Eigen-vectors (P) and the diagonal matrix of Eigen-values (Ë).

$$Ó = P'ËP \quad (1)$$

The Eigen-vectors are the loading factors, or weights, attached to each of the original series. For a particular time-series, the higher the degree of comovement with other series the higher (in absolute value) its loading factor. If a particular time series is uncorrelated with the remaining series included in the analysis, then its loading factor in the first principal component should be close to zero. A priori, this is what we should expect to see for the time series for the country with capital controls during the period in which these are in place.

In Table 9, we present the results for the various sample periods for interest rates. As with the descriptive statistics presented in Tables 3-8, we also include the results for the two control group countries, the Philippines and South Korea. In none of the capital control episodes do the loading factors approach zero. In the case of Brazilian interest rates the loading factor increases (in absolute terms), as Brazil and South Korea co-move inversely with the remaining three countries. Malaysia's interest rates, after its introduction of controls on September 1, 1998 continues to exhibit a high degree of comovement with neighboring Thailand and the Philippines. While Thailand's loading factor drops from 0.929 to 0.739 with the introduction of controls, it still shows considerable comovement with Malaysia, the Philippines, and Brazil during that period.

Table 10 summarizes the comparable results for stock returns. The extent of contemporaneous co-movement of equity returns drops markedly for both Brazil (from pre-control level of 0.328 to 0.171) and Malaysia (from 0.739 to 0.346) following the introduction of controls and moderately so for Thailand.[12] The clearest cut results, however, come from performing this exercise using daily exchange rate changes, as shown in Table 14. In both the case of Brazil after capital controls are introduced on March 1, 1999 and following Malaysia's imposition of controls on September 1, 1998, their respective loading factors drop to almost zero while the controls are in place suggesting that, at least contemporaneously, their exchange rate changes are independent from exchange rate shocks elsewhere.

However, this analysis only provides a partial picture of what can be a fuller dynamic cross-border interdependence. While principal component analysis reveals the extent to which there is contemporaneous comovement across the countries in our study in interest rates, stock returns and changes in the exchange rate across the various subsamples, interdependence may have a temporal dimension as well. That is, a shock in one country may not have an immediate effect on a second country but the effects of the shock may be spread out over the course of several days. Given that our data is daily, such temporal relationships may be of greater importance than for lower frequency data, where the synchronicity of financial market hours across different regions and other institutional aspects of trading are less important. We turn to this issue next.

2. Causality and interdependence: Some tests

[12] Thailand continues to show a high degree of comovement in the May 14, 1997-January 30, 1998 period with Malaysia, the Philippines, and South Korea.

To examine whether there is greater or less temporal interdependence or unidirectional causal links among five of the countries following the introduction of capital controls, we proceed much as we in the previous exercises. For Thailand, though, we now divide the sample into three subperiods, the period preceding the controls which runs from January 1, 1995 to May 13, 1997, the control period, which spans May 14, 1997 to January 30 and the post-control period which ends on July 29, 1999. Similarly, for the Philippines and South Korea, we break up the sample into the pre- and post-financial crisis and the crisis period, which as noted earlier spans July 2, 1997 through July 31, 1998. The focus is on cross-country links in interest rates, stock returns, and changes in the exchange rate. A priori, if the controls are insulating the country from external shocks and facilitating independent monetary policy, one should see a weakening in any pre-existing causal links.

We employ a simple vector autoregression (VAR) framework that treats all variables as potentially endogenous and include ten lags of each of the variables in the system. Omitting time subscripts, a representative equation for domestic interest rates in Brazil (denoted by the subscript *b*) in this five-equation system is given by,

$$r_b = \acute{a}_b + A_1(L)r_b + A_2(L)r_m + A_3(L)r_p + A_4(L)r_{sk} + A_5(L)r_t + \mathring{a}_b. \quad (2)$$

The subscripts *m, p, sk,* and *t* refer to Malaysia, the Philippines, South Korea, and Thailand, respectively. The lag operators are the *A*'s and å's denote the random shocks. Because the variance of the underlying fundamentals tends to increase during periods of turbulence, it is necessary to correct for heteroskedastic disturbances when estimating the parameters the

system.[13] Hubert/White robust standard errors were computed. The comparable system was estimated for daily stock returns and changes in the exchange rate (in percent). For each block of regressors, we conducted F- and log-likelihood ratio tests that tested the null hypothesis of no causal relationship.

Table 12 reports the results for interest rates; the detailed test statistics and their associated probability values are presented in Appendix Tables 1-2. The columns "cause" the rows; an N denotes that the null hypothesis of no causality was not rejected while a Y indicates rejection of the null hypothesis at a 10 percent level of significance or higher. For example, the top row, which summarizes the results for Brazil for the January 1, 1995-February 28, 1999 period shows four N entries, indicating that interest rates in the four remaining countries in the system had no systematic influence on Brazilian interest rates prior to the introduction of controls. The last column of Table 12 tallies the number of significant entries. Tables 13 and 14 summarize in comparable manner the results for the daily stock returns and exchange rate changes.

Table 12 presents no evidence to indicate that in the cases of Brazil, Malaysia, and Thailand capital controls weakened the international interdependence of interest rates--indeed, quite the contrary. Prior to March 1, 1999, interest rates in Brazil were not influenced by interest rate changes in the other four countries. In the more recent control period, however, interest rates are significantly influenced by Korean and Thai rates. In the case of the Thai controls, a similar tendency toward greater interdependence during the period during which the controls were in place is also evident. For Malaysia, there is also no evidence of a decline in interdependence but rather a shift in which country's rates are significant. At a more general level, there is a feature of the results for the causality tests worth noting. For the earlier part of the sample, which

[13] See Rigobón (1998).

includes the pre-Asian crisis period, most of the regressors (other than lags of the dependent variable) are not statistically significant at standard confidence levels. The more recent period (i.e., post crisis) is quite different in that regard with a greater degree of interdependence among the countries--particularly for the countries that did not introduce controls. Philippine and South Korean interest rates are significantly influenced by interest rates in the remaining countries in the sample.

Turning to stock returns, Table 13, presents several parallels to the results for interest rates. In the case of Brazil, stock market interdependence is greater during the more recent control period (South Korean and Thai stock returns are both statistically significant), while for Thailand, the introduction of controls did not alter pre-existing causal relationships. The more marked change is in Malaysia, where the number of countries whose equity market shocks have a significant on the Malay market drops from three to one, as shown in the last column of Table 13. This is a contrast to South Korea, where international interdependence in equity returns seems to be on the rise during the more recent post-crisis period.

As regard daily exchange rate changes, Brazil's exchange rate is influenced more prominently by foreign exchange rate shocks during the capital control period. This result is not surprising in light of the fact that the *real* was predetermined and confined to a narrow band during most of the pre-control sample and allowed to fluctuate more freely during the control period. The same observation applies to Thailand, which has continued with a managed float up until the present time. As with equity returns, the importance of external exchange rate shocks diminishes for Malaysia during the capital control period.

Taken together, these results suggest that capital controls had little effect in reducing international interdependence among currencies, equity markets, and interest rates for both Brazil

and Thailand. By contrast, Malaysia's equity market and exchange rate are more autonomously determined, following the introduction of controls. The results also suggest that interdependence among four of the five EM economies (the exception is Malaysia) has increased in the wake of the Asian financial crisis in the more recent period. Given that trade and financial linkages have not changed markedly during this recent period, one interpretation for this greater interdependence is that in the aftermath of the crisis financial market participants are more likely to lump these economies into one group than they did previously.

3. Volatility and capital controls

While principal component analysis sheds light on contemporaneous international links and the VARs added a temporal dimension to the analysis of international interdependence, both of these approaches have focused on first moments. Yet, the descriptive statistics discussed in Section III clearly suggested that there were important differences across regimes in second moments (i.e., variances) in a high share of the financial variables analyzed. Furthermore, our theoretical priors suggested that there should be such differences. In this subsection, we focus on how capital controls and crises affect the volatility of interest rates and stock returns.

A related issue was recently examined in Edwards (1998). Using weekly interest rate data for Argentina, Chile, and Mexico, Edwards (1998) analyzed the consequences of the Mexican crisis for interest rate volatility in Argentina and Chile. The "Mexican spillover" dummies were statistically significant for Argentina, irrespective of the specification used, and uniformly insignificant for Chile. One possible interpretation of these results, he concluded, is that Chile's capital controls were effective in insulating Chile from the turmoil abroad.

In what follows, we will work with a variety of generalized autoregressive conditional

heteroskedasticity (GARCH) models to examine whether was an observed change in volatility during the capital controls episodes.[14] As before, we will contrast these results to the crises episodes in the Philippines and South Korea where no controls are imposed during the crisis. We consider the following models:

$$r_t = \sum_{t=t-i}^{t-k} \hat{a}_i r_{t-i} + \sum_{j=1}^{4} \tilde{a}_j r^*_{jt} + \mathrm{å}_t$$

$$\mathrm{ó}^2_{rt} = \mathrm{ù} + dummy_c + \acute{a}\mathrm{å}^2_{t-1} + \ddot{a}\mathrm{ó}^2_{t-1} \qquad (3)$$

and

$$\ddot{A}r_t = \sum_{t=t-i}^{t-k} \hat{a}_i \ddot{A}r_{t-i} + \sum_{j=1}^{4} \tilde{a}_j \ddot{A}r^*_{jt} + \mathrm{å}_t$$

$$\mathrm{ó}^2_{\ddot{A}rt} = \mathrm{ù} + dummy_c + \acute{a}\mathrm{å}^2_{t-1} + \ddot{a}\mathrm{ó}^2_{t-1}. \qquad (4)$$

where the domestic nominal interest rate is denoted by r_t, in equation (3), the foreign interest rates for the other four countries in the study are denoted by the r^*_{jt}, and the random shock is denoted by å. In the variance equation, ù is the mean of the variance; the lag of the mean squared residual from the mean equation (i.e., $\mathrm{å}^2_{t-1}$) is the ARCH term and last period's forecast variance (i.e., $\mathrm{ó}^2_{t-1}$) is the GARCH term. The term $dummy_c$ is a dummy variable that takes on the value of one during the control period for Brazil, Malaysia, and Thailand and zero otherwise. For the Philippines and South Korea it takes on a value of one during the crisis period and zero otherwise.

[14] In all cases a GARCH (1, 1) model was estimated.

The number of autoregressive lags, *k*, is reported for the cases *k*=0, 5, and 10. We also estimate the model in first differences ($Ä r_{t,}$ shown in equation 4) and for the case where the *r*s and r^*s refer to equity returns. As discussed earlier, periods of turbulence that are part of our sample of daily observations render the assumption of identically and independently distributed conditionally normal disturbances in the basic GARCH model inadequate. Given the presence of heteroskedastic disturbances in our sample, we use the methods described in Bollersev and Woolridge (1992) to compute the Quasi-Maximum Likelihood covariances and standard errors.

The results for interest rates, changes in interest rates, and stock returns, are reported in Tables 16-21. As to the specification for nominal interest rates, while both ARCH and GARCH terms are statistically significant in Brazil, Malaysia, and Thailand (Table 16), the capital control dummy variable is only significant for Malaysia--although this result is not robust across alternative lag specifications. In the case of Malaysia, the controls dummy variable has the anticipated negative sign, while in the case of Brazil and Thailand the sign is positive, although not statistically significant. For the two countries that did not introduce capital controls (Table 17), the crisis dummy variable is not statistically significant.

Turning next to the results for the first differences of interest rates (shown in Tables 18 and 19), we find the same pattern. Among the three capital control and two crises without capital controls episodes, the dummy variable is only significant for Malaysia for most of the lag profiles used.

Finally, for daily equity price returns, the control dummy is significant and positive for Thailand, indicating the control period was associated with above-average volatility in the equity market (Table 20). However, it is difficult to attribute the increased volatility exclusively to the controls. As Table 21 highlights, the crisis period in the Philippines (despite the absence of new

capital account restrictions) was also associated with higher equity market volatility.

All in all, while the GARCH results do not point to across-the-board differences in volatility across capital account regimes, the three cases where the control dummies are significant (interest rates and interest rate changes in Malaysia and equity returns in Thailand) have the expected sign.

4. The timing of structural breaks

The last of the tests that we perform involves an iterative search for breakpoints in interest rate behavior over a rolling sample window. As before, the interest rate is modeled as a function of its own lagged terms, contemporaneous interest rates in the other countries in the sample, and a heteroskedastic disturbance,

$$r_t = \sum_{t=t-i}^{t-k} \hat{a}_i r_{t-i} + \sum_{j=1}^{4} \tilde{a}_j r^*_{jt} + \mathring{a}_t. \qquad (5)$$

The sample is broken into two subperiods, and we use a Wald test to test for the restriction of the equality of coefficients in the two subperiods. The first of these tests breaks the sample into January 1, 1995 through April 7, 1996 and a second 70-day sample period beginning on April 8, 1996. The exercise is repeated recursively by moving the window by two days. Hence, the number of observations in the early part of the subsample increases by two observations with each iteration while the number of observations in latter part of sample remains constant at 70 days over the rolling window. The Likelihood Ratio test identifies when the structural breaks occur. The dates identified for the five countries as candidates of structural

breaks are reported [15]

None of these dates coincide exactly with the introduction of controls in Brazil and Malaysia. For these two countries, evidence of structural breaks in the behavior of interest rates come earlier. In the case of Brazil, the first break occurs on October 6, 1997, which is at the height of the Asian crisis as Korea gets dragged down by the turmoil. Two other breaks occur in 1998, which are more difficult to associate with key international events. In the case of Malaysia, the breakpoints run from June 24, 1997 through January 28, 1998 encompassing the height of the Asian crisis. In both the case of Malaysia where controls are introduced in the fall of 1998 and Brazil where the controls are in early 1999, the Wald tests would be biased toward identifying earlier breaks, as once the crises observations are incorporated in the earlier sample, it becomes harder to reject the hypothesis of stability. [16] For the case of Thailand (as is the case for the Philippines and South Korea), the dates structural breaks are closely aligned with the height of the Asian financial crisis, indicating in all cases that the effects of the crisis on interest rate behavior may be at the heart of the breakdown in past relationships.

5. Summary of findings

While the emphasis of the previous section was on examining possible changes in the key financial variables, much of this section has been devoted to examining cross-border financial links and interdependence across policy regimes. As to the central issue of insulating the economy

---

[15] Plots for the rolling probability values for each country for the entire sample are available from the authors.

[16] Indeed, a better way of analyzing these two episodes may be to also allow the early subperiod to be a rolling 70 day window as well, rather than an ever-increasing sample beginning in 1995.

from external shocks and gaining greater policy autonomy, our results suggest that: there is little evidence that capital controls were effective in decoupling domestic interest rates from foreign interest rates--either contemporaneously or temporally. The closest to meeting this expectation is Malaysia. There is also little evidence that these measures were effective in decoupling domestic exchange rate changes from those changes abroad--either contemporaneously or temporally. Again, the closest to meeting this expectation is Malaysia. The evidence suggests that equity markets continue to be internationally linked, despite the introduction of controls. Finally, financial crises appear to be a key determinant of the timing structural changes--more so than capital controls.

V. Final Remarks

We have examined some recent experiences with capital controls during periods of market stress. In two of the three cases (Brazil and Thailand), the controls did not appear to deliver much of what was intended. Although, of course, one does not observe the counterfactual. By contrast, in the case of Malaysia, the controls did align more closely with the priors of what controls are intended to achieve--namely, greater interest rate and exchange rate stability and more policy autonomy.

Generalized policy lessons are not possible from such a scanty set of experiences. Yet it would appear that a fruitful area for future research would be to investigate the effectiveness of controls for a more comprehensive set of episodes as it relates to the development and international integration of the financial sector. One could speculate that Brazil's relatively sophisticated financial markets, which are second in liquidity to Hong Kong among EMs, and Thailand's offshore banking center provided leakage and arbitrage opportunities that were absent

in Malaysia. If, indeed, it were to be the case that financial sector development plays a prominent role in explaining when capital account restrictions have a bite, then the policy implications for different "tiers" of EMs would be somewhat clearer.

References

Bank of International Settlements, 1999. (Basle, Switzerland: Bank for International Settlements).

Bartolini, Leonardo, and Alan Drazen,

Bollersev, Tim, and Jeffrey M. Woolridge, (1992). "Quasi-Maximum Likelihood Estimation and Inference in Dynamic Models with Time Varying Covariances," *Econometric Reviews* 11, 143-172.

Calvo, Guillermo A., Leonardo Leiderman, and Carmen M. Reinhart, 1993. "Capital Inflows to Latin America: The Role of External Factors," *IMF Staff Papers* 40, (March).

Calvo, Guillermo A., and Carmen M. Reinhart, 1999. "Fear of Floating," mimeograph. (College Park: University of Maryland).

Calvo, Guillermo A., and Carlos A. Rodriguez, 1979. "A Model of Exchange Rate Determination Under Currency Substitution and Rational Expectations," *Journal of Political Economy* 85, (June): 617-625.

Cardoso, Eliana, and Ilan Goldfajn, 1998. *IMF Staff Papers* , (March).

Dooley, Michael, "A Survey of the Academic Literature on Controls over International Capital Transactions," *IMF Staff Papers*

Dornbusch, Rudiger

Edwards, Sebastian, 1998. "Interest Rate Volatility, Contagion and Convergence: An Empirical Investigation of the Cases of Argentina, Chile, and Mexico

Eichengreen, Barry,. "Trends and Cycles in Foreign Lending," in Siebert

Kaminsky, Graciela L. and Carmen M. Reinhart, 1998. "Financial Crises in Asia and Latin America: Then and Now," *American Economic Review (May).*

Mathieson, Donald, and Liliana Rojas-Suarez, IMF Occasional Paper, (Washington DC: International Monetary Fund).

Montiel, Peter, and Carmen M. Reinhart, 1999. "Do Capital Controls and Macroeconomic Policies Influence the Volume and Composition of Capital Flows? Evidence from the 1990s," *Journal of International Money and Finance* (August).

Reinhart, Vincent R., 1998. "How the Machinery of International Finance Runs with Sand in its Wheels," forthcoming in *Review of International Economics.*

Reinhart, Carmen M., and Vincent R. Reinhart, 1998 “Some Lessons for policy Makers On the Mixed Blessing of Dealing with Capital Inflows,” in M. Kahler, **Financial Crises**, (Cornell University Press).

Rigobón, Roberto.

Table 1. Selected Theoretical Predictions of the Effects of Capital Controls

Variable	**Expected outcome with the introduction of capital controls during a crisis**
Interest rate	
Level	Lower
Variance	Lower
Persistence	Higher
Changes in interest rates	
Level	Lower
Variance	Lower
Persistence	Higher
Stock returns	
Level	?
Variance	Higher
Persistence	?
Exchange rate changes	
Level	?
Variance	Lower
Persistence	Higher
Side effects of capital controls	
Bid-ask spreads	
Level	Wider
Variance	Higher
Persistence	?
Onshore-offshore interest rate spreads	
Level	Wider
Variance	Higher
Persistence	?

Table 2. A Chronology of Key Events

Episode and country	Date	Key events
Spain, ERM Crisis, 1992	July 16	Bank of Spain (BOS) increases official discount rate by 60 basis points.
	September 17	Peseta devalued by 5 percent against other ERM currencies.
	September 21	BOS suspends regular money market operations.
	September 23	BOS introduces foreign exchange controls.
	October 5	BOS increases intervention borrowing rate by 100 basis points.
	October 12	BOS announces the lifting of some exchange controls.
	November 22	BOS resumes money market operations.
	November 23	Peseta devalued by 6 percent against other ERM currencies. Remaining foreign exchange controls rescinded.
Thailand, Asian crisis, 1997-1998	May 14	Bank of Thailand (BOT) introduces restrictions on capital account transactions.
	May 28	BOT limits outright forward transactions.
	June 2	BOT introduces additional measures to limit capital flows.
	June 10	Baht proceeds from sales of stocks required to be converted at the onshore exchange rate. Additional controls are introduced.
	June 18	The onshore-offshore interest rate differential hits a peak at 639 percent.
	July 2	BOT introduces a two-tier exchange rate. Thai baht is devalued.
	September 23	Additional controls on invisible and current account transactions are introduced.
	January 7, 1998	Proceeds on exports and invisible transactions and current account transfers must be surrendered after 7 days (instead of 15 days).
	January 30, 1998	BOT ends two-tier exchange rate.
	February 3, 1998	The stock market suffers its largest one-day decline (9.5 percent).
Korea, Asian crisis, 1997-1998	November 17	The Bank of Korea abandons the defense of the won.
	November 24	The stock market suffers its largest one-day decline (down 11 percent).
	December 22	Won plummets 12 percent against the dollar--its largest daily decline.
Philippines Asian crisis, 1997-1998	June 10	The peso plummets 12 percent against the dollar. Its largest daily decline.
	August 27	The equity market posts its largest (9.3 percent) daily decline.

Table 2. A Chronology of Key Events (continued)

Episode and country	Date	Key events
Malaysia, Asian crisis, 1997-1998	July 14, 1997 January 5, 1998 September 1, 1998 September 2, 1998 September 7, 1998 February 4, 1999	Interest rates peak. Ringgit suffers its largest daily decline (7.5 percent) against the dollar. Exchange controls introduced. Exchange rate is fixed. The stocks market suffers its largest one-day decline (down 22 percent). Exchange controls modified. New rule introduced to replace one-year holding period rule for portfolio capital.
Brazil, 1999 crisis	January 14 February 11 March 1	The stocks market suffers its largest one-day decline (down 15.8 percent). The real plummets by 12 percent against the dollar. Controls are announced. Controls become effective. **Government ordered local investment funds to increase their holdings of government bonds. The central bank raised to 80 percent from 60 percent the minimum amount of sovereign debt that must be held in the country foreign investment fund. This lowered the share that could be held in other countries' debt.

Table 3. Brazil, January 1, 1995 to July 23, 1999: Descriptive Statistics for Daily Data

Variable	Mean No controls	Mean Control period	Equality in means t-test Probability	Standard deviation No controls	Standard deviation Control period	Equality in variance test 1/	Auto correlation No controls	Auto correlation Control period
Bid-ask spread 1/	-0.001	-0.005	*0.000**	0.004	0.005	*0.001**	0.303	0.625
Interest Rate	32.921	30.525	0.150	13.582	6.818	*0.000**	0.940	0.849
Change in interest rate	-0.049	-0.414	0.242	2.420	1.849	0.192	-0.052	-0.038
Stock returns	0.105	0.195	0.826	2.372	3.257	0.764	0.040	-0.022
Domestic/ foreign interest rate spread: One-month	27.918	26.080	0.264	13.444	6.738	*0.000**	0.916	0.848
Exchange rate changes	0.080	-0.205	*0.006**	0.766	1.549	*0.000**	0.047	0.213

1/ Siegel-Tukey test is reported. Other test results are available from the authors upon request.

Table 4 Malaysia, January 1, 1995 to July 23, 1999: Descriptive Statistics for Daily Data

Variable	Mean No controls	Mean Control period	Equality in means t-test Probability	Standard deviation No controls	Standard deviation Control period	Equality in variance test 1/	Auto correlation No controls	Auto correlation Control period
Bid-ask spread 1/	-0.006	-0.008	*0.012**	0.015	0.006	*0.000**	0.153	0.275
Interest Rate	8.328	5.720	*0.000**	1.549	1.452	*0.000**	0.935	0.956
Change in interest rate	0.121	-0.545	*0.004**	0.386	0.140	0.157	0.212	0.219
Stock returns	-0.194	0.652	*0.000**	2.089	3.385	*0.000**	-0.080	0.133
Domestic/ foreign interest rate spread: 3-month	3.192	1.473	*0.000**	1.490	1.469	*0.002**	0.912	0.934
Domestic/ foreign interest rate spread: 6-month	3.163	1.491	*0.000**	1.586	1.463	*0.000**	0.914	0.940
Domestic/ foreign interest rate spread: 12-month	3.045	1.541	*0.000**	1.699	1.493	*0.000**	0.925	0.942
Exchange rate changes	0.064	-0.011	0.405	1.241	0.166	*0.000**	-0.011	0.049

1/ Siegel-Tukey test is reported. Other test results are available from the authors upon request.

Table 5. Spain, January 1, 1991 to December 31, 1993: Descriptive Statistics for Daily Data

Variable	Mean No controls	Mean Control period	Equality in means t-test Probability	Standard deviation No controls	Standard deviation Control period	Equality in variance test 1/	Auto correlation No controls	Auto correlation Control period
Interest Rate	12.351	13.069	*0.000**	1.379	0.218	0.009	0.988	0.832
Change in interest rate	-0.009	0.012	0.075	0.088	0.093	0.188	-0.011	-0.016
Stock returns	0.062	0.065	0.981	0.978	1.488	*0.000**	0.247	0.057
Domestic/ foreign interest rate spread: overnight	8.981	10.655	*0.000**	3.681	0.651	*0.000**	0.195	0.545
Domestic/ foreign interest rate spread: 3-month	8.496	11.071	*0.000**	1.698	0.637	*0.000**	0.914	0.857
Domestic/ foreign interest rate spread: 10-year	4.149	6.139	*0.000**	0.907	0.589	*0.000**	0.895	0.871
Exchange rate changes	0.033	0.447	*0.001**	0.771	1.546	*0.000**	0.040	-0.071

1/ Siegel-Tukey test is reported. Other test results are available from the authors upon request.

Table 6. Thailand, January 1, 1995 to July 23, 1999: Descriptive Statistics for Daily Data

Variable	Mean No controls	Mean Control period	Equality in means t-test Probability	Standard deviation No controls	Standard deviation Control period	Equality in variance test 1/	Auto correlation No controls	Auto correlation Control period
Bid-ask spread 1/	-0.074	-0.313	*0.000**	0.111	0.978	*0.033**	0.318	0.474
Interest Rate	12.461	20.920	*0.000**	5.779	3.829	*0.000**	0.930	0.912
Change in interest rate	-0.0318	0.073	0.067	0.600	0.818	*0.000**	-0.061	0.202
Stock returns	-0.114	0.019	0.510	2.153	2.923	*0.000**	0.115	0.258
Domestic/ foreign interest rate spread: 1-month	7.704	15.941	*0.000**	5.609	3.804	0.075		
Exchange rate changes	-0.047	0.361	0.000*	0.828	2.623	0.000*	0.047	-0.123
Onshore-offshore interest rate spreads								
Overnight	1.336	16.730	*0.000**	4.878	85.488	*0.000**	0.332	0.872
Weekly	3.978	17.004	*0.000**	7.900	58.323	*0.000**	0.725	0.882
One-month	4.381	11.633	*0.000**	6.420	22.955	*0.000**	0.806	0.869
Three-month	4.067	6.988	*0.000**	4.923	6.937	*0.021**	0.845	0.867
Six-month	3.655	5.097	*0.035**	7.973	6.136	*0.000**	0.158	0.850
12-month	2.807	3.916	*0.000**	2.978	3.752	*0.000**	0.882	0.813

1/ Siegel-Tukey test is reported. Other test results are available from the authors upon request.

Table 7. Philippines, January 1, 1995 to July 23, 1999: Descriptive Statistics for Daily Data

Variable	Mean tranquil period	Mean crisis period	Equality in means t-test Probability	Standard deviation tranquil period	Standard deviation crisis period	Equality in variance test 1/	Auto correlation tranquil period	Auto correlation crisis period
Bid-ask spread 1/	-0.049	-0.123	*0.000**	0.107	0.269	*0.020**	0.447	0.247
Interest Rate	11.974	13.581	*0.000**	1.201	1.232	0.657	0.962	0.97
Change in interest rate	-0.029	-0.003	0.468	0.554	0.278	0.214	0.005	0.274
Stock returns	0.083	-0.197	0.044	1.643	2.311	*0.000**	0.199	0.214
Domestic/ foreign interest rate spread: overnight	7.093	8.601	*0.000**	1.153	1.175	*0.000**	0.925	0.879
Exchange rate changes	-0.010	0.172	*0.015**	0.404	1.769	*0.000**	0.059	-0.044

1/ Siegel-Tukey test is reported. Other test results are available from the authors upon request.

Table 8. South Korea, January 1, 1995 to July 23, 1999: Descriptive Statistics for Daily Data

Variable	Mean tranquil period	Mean crisis period	Equality in means t-test Probability	Standard deviation tranquil period	Standard deviation crisis period	Equality in variance test 1/	Auto correlation tranquil period	Auto correlation crisis period
Bid-ask spread 1/	-0.335	-0.460	0.135	1.118	1.288	0.102	0.350	0.195
Interest Rate	13.450	11.657	*0.000**	6.077	6.339	*0.000**	0.977	0.987
Change in interest rate	0.012	-0.746	0.100	0.860	0.343	*0.009**	-0.033	-0.257
Stock returns	0.141	-0.323	*0.013**	2.041	3.249	*0.000**	0.094	0.142
Domestic/ foreign interest rate spread: Overnight	4.557	6.697	*0.000**	7.803	6.355	*0.006**	0.955	0.949
Exchange rate changes	0.016	0.213	0.059	0.475	2.442	*0.000**	0.112	0.149

1/ Siegel-Tukey test is reported. Other test results are available from the authors upon request.

Table 9. Summary of Key Differences in Descriptive Statistics

	Control period versus no-control period				Crisis period versus tranquil	
Variable	**Brazil**	**Malaysia**	**Spain**	**Thailand**	**Philippines**	**South Korea**
Bid-ask spread	wider, more variable, more persistent	wider, less variable, more persistent	wider	wider, more variable, more persistent	wider, more variable, less persistent	no change
Interest Rate	less variable	lower, less variable, more persistent	higher, less variable, less persistent	higher, less variable	higher	lower, more variable
Change in interest rate	no change	larger, less variable	no change	more variable, more persistent	no change	less variable, more persistent
Stock returns	no change	higher, more variable, more persistent	more variable, less persistent	more variable	more variable	lower, more variable
Domestic/ foreign interest rate spread	less variable	lower, less variable	higher, less variable	higher, less variable	higher, more variable	lower, less variable
Exchange rate changes	larger, more volatile and persistent	smaller, less volatile	larger, more variable	larger, more variable	larger, more variable, less persistent	larger, more variable
Onshore-offshore interest rate spread	n.a.	n.a.	n.a.	wider, more variable, and more persistent	n.a.	n.a.

Table 10. Daily Interest Rates: Principal Component Analysis

		Factor loadings in first principal component for:				
Episode and time period	**R^2**	**Brazil**	**Malaysia**	**Philippines**	**South Korea**	**Thailand**
Full sample	0.395	0.322	0.823	0.762	-0.456	0.867
Crises and capital control episodes						
Brazil						
Pre controls: January 1, 1995-February 28, 1999	0.359	0.312	0.833	0.801	-0.402	0.843
Controls: March 1, 1999-present	0.625	0.-654	0.712	0.912	-0.565	0.901
Malaysia						
Pre controls: January 1, 1995-August 31, 1998	0.414	0.482	0.788	0.778	-0.571	0.827
Controls: September 1, 1998-present	0.700	-0.774	0.841	0.936	-0.696	0.928
Thailand						
No controls: Remainder of sample	0.437	0.079	0.931	0.624	-0.686	0.929
Controls: May 14, 1997-January 30, 1998	0.533	0.773	0.624	0.828	-0.902	0.739
Crises episodes without capital controls						
Philippines and South Korea						
Tranquil period: Remainder of sample	0.345	-0.848	0.527	0.081	0.646	0.727
Crisis: July 2, 1997-July 31, 1998	0.387	0.497	0.620	0.669	-0.774	0.777

Table 11. Daily Stock Returns: Principal Component Analysis

		Factor loadings in first principal component for:				
Episode and time period	**R^2**	**Brazil**	**Malaysia**	**Philippines**	**South Korea**	**Thailand**
Full sample	0.374	0.326	0.649	0.679	0.605	0.722
Crises and capital control episodes						
Brazil						
Pre controls: January 1, 1995-February 28, 1999	0.378	0.328	0.655	0.680	0.600	0.727
Controls: March 1, 1999-present	0.311	0.171	0.382	0.697	0.739	0.591
Malaysia						
Pre controls: January 1, 1995-August 31, 1998	0.394	0.378	0.739	0.690	0.559	0.704
Controls: September 1, 1998-present	0.334	0.302	0.346	0.671	0.687	0.733
Thailand						
No controls: Remainder of sample	0.363	0.302	0.591	0.677	0.598	0.746
Controls: May 14, 1997-January 30, 1998	0.403	0.377	0.742	0.709	0.570	0.705
Crises episodes without capital controls						
Philippines and South Korea						
Tranquil period: Remainder of sample	0.330	0.270	0.518	0.667	0.611	0.699
Crisis: July 2, 1997-July 31, 1998	0.431	0.407	0.750	0.696	0.606	0.758

Table 13. Daily Exchange Rate Changes: Principal Component Analysis

		Factor loadings in first principal component for:				
Episode and time period	**R^2**	**Brazil**	**Malaysia**	**Philippines**	**South Korea**	**Thailand**
Full sample	0.345	0.020	0.734	0.680	0.386	0.758
Crises and capital control episodes						
Brazil						
Pre controls: January 1, 1995-February 28, 1999	0.346	0.013	0.734	0.670	0.387	0.760
Controls: March 1, 1999-present	0.266	0.594	-0.000	0.472	-0.451	0.743
Malaysia						
Pre controls: January 1, 1995-August 31, 1998	0.347	0.018	0.743	0.683	0.380	0.757
Controls: September 1, 1998-present	0.282	0.188	0.039	0.747	0.488	0.759
Thailand						
No controls: Remainder of sample	0.380	0.044	0.814	0.711	0.207	0.828
Controls: May 14, 1997-January 30, 1998	0.328	0.109	0.694	0.671	0.406	0.728
Crises episodes without capital controls						
Philippines and South Korea						
Tranquil period: Remainder of sample	0.272	0.261	0.560	0.737	0.378	0.543
Crisis: July 2, 1997-July 31, 1998	0.351	0.087	0.747	0.677	0.366	0.777

Table 13. Daily Interest Rates: Causality Tests
Hubert/White Robust Standard Errors

	Brazil	**Malaysia**	**Philippines**	**South Korea**	**Thailand**	**Number significant**
Crises and capital control episodes						
Brazil						
Pre controls: January 1, 1995-February 28, 1999		N	N	N	N	0
Controls: March 1, 1999-present		N	N	Y	Y	2
Malaysia						
Pre controls: January 1, 1995-August 31, 1998	N		N	N	Y	1
Controls: September 1, 1998-present	Y		N	N	N	1
Thailand						
Pre controls: January 1, 1995-May 13, 1997	N	Y	N	N		1
Controls: May 14, 1997-January 30, 1998	N	N	Y	Y		2
Post controls: January 31, 1998-present	N	N	N	Y		1
Crises episodes without capital controls						
Philippines						
Pre crisis: January 1, 1995-July 1, 1997	N	N		N	Y	1
Crisis: July 2, 1997-July 31, 1998	N	N		N	N	0
Post crisis: August 1, 1998-present	Y	Y		Y	Y	4
South Korea						
Pre crisis: January 1, 1995-July 1, 1997	N	N	N		N	0
Crisis: July 2, 1997-July 31, 1998	N	Y	N		N	1
Post crisis: August 1, 1998-present	Y	Y	Y		Y	4

Table 14. Daily Stock Returns: Causality Tests
Hubert/White Robust Standard Errors

	Brazil	**Malaysia**	**Philippines**	**South Korea**	**Thailand**	**Number significant**
Crises and capital control episodes						
Brazil						
Pre controls: January 1, 1995-February 28, 1999		Y	N	N	N	1
Controls: March 1, 1999-present		N	N	Y	Y	2
Malaysia						
Pre controls: January 1, 1995-August 31, 1998	Y		Y	Y	N	3
Controls: September 1, 1998-present	Y		N	N	N	1
Thailand						
Pre controls: January 1, 1995-May 13, 1997	N	N	N	Y		1
Controls: May 14, 1997-January 30, 1998	N	N	N	Y		1
Post controls: January 31, 1998-present	N	N	N	N		0
Crises episodes without capital controls						
Philippines						
Pre crisis: January 1, 1995-July 1, 1997	Y	Y		N	N	2
Crisis: July 2, 1997-July 31, 1998	Y	N		N	N	1
Post crisis: August 1, 1998-present	Y	Y		N	N	2
South Korea						
Pre crisis: January 1, 1995-July 1, 1997	N	Y	N		N	1
Crisis: July 2, 1997-July 31, 1998	Y	Y	N		N	2
Post crisis: August 1, 1998-present	Y	N	Y		Y	3

Table 15. Daily Exchange Rate Changes: Causality Tests
Hubert/White Robust Standard Errors
(In percent)

	Brazil	**Malaysia**	**Philippines**	**South Korea**	**Thailand**	**Number significant**
Crises and capital control episodes						
Brazil						
Pre controls: January 1, 1995-February 28, 1999		N	N	N	N	0
Controls: March 1, 1999-present		Y	Y	Y	Y	4
Malaysia						
Pre controls: January 1, 1995-August 31, 1998	N		Y	Y	N	2
Controls: September 1, 1998-present	N		N	Y	N	1
Thailand						
Pre controls: January 1, 1995-May 13, 1997	N	N	Y	N		1
Controls: May 14, 1997-January 30, 1998	Y	Y	N	N		2
Post controls: January 31, 1998-present	N	Y	Y	Y		3
Crises episodes without capital controls						
Philippines						
Pre crisis: January 1, 1995-July 1, 1997	N	Y		N	Y	2
Crisis: July 2, 1997-July 31, 1998	N	Y		Y	Y	3
Post crisis: August 1, 1998-present	Y	N		Y	Y	3
South Korea						
Pre crisis: January 1, 1995-July 1, 1997	N	N	N		N	0
Crisis: July 2, 1997-July 31, 1998	Y	N	Y		N	2
Post crisis: August 1, 1998-present	N	N	N		N	0

Table 16. Daily Interest Rates Variance Equation: Volatility Spillovers With and Without Capital Controls
Bollersev-Woolridge robust standard errors and covariance, GARCH (1,1)

Brazil			
Number of autoregressive lags included	**ARCH (1)**	**GARCH (1)**	**Controls dummy**
0	0.109 (0.273)	*0.852* *(0.000)**	-0.044 (0.598)
5	*0.335* *(0.003)**	*0.668* *(0.000)**	0.104 (0.577)
10	*0.374* *(0.002)**	*0.708* *(0.000)**	0.111 (0.597)
Malaysia			
0	*0.503* *(0.045)**	*0.559* *(0.000)**	-0.004 (0.129)
5	*1.464* *(0.000)**	*0.117* *(0.060)**	-0.005 (0.131)
10	*1.442* *(0.003)**	*0.136* *(0.037)**	*-0.008* *(0.021)**
Thailand			
0	*0.331* *(0.081)**	*0.603* *(0.000)**	0.073 (0.133)
5	*0.342* *(0.062)**	*0.582* *(0.000)**	0.074 (0.109)
10	*0.355* *(0.055)**	*0.576* *(0.000)**	0.072 (0.111)

Table 17. Daily Interest Rates Variance Equation: Volatility Spillovers In Crisis and tranquil Periods Bollersev-Woolridge robust standard errors and covariance, GARCH (1,1)

Number of autoregressive lags included	ARCH (1)	GARCH (1)	Crisis dummy
Philippines			
0	0.099 (0.363)	*0.697* *(0.011)**	-0.011 (0.506)
5	*2.635* *(0.002)**	*0.109* *(0.036)**	*-0.045* *(0.243)*
10	*4.295* *(0.001)**	0.003 (0.489)	*-0.046* *(0.236)*
South Korea			
0	*0.347* *(0.018)**	*0.046* *(0.000)**	0.007 (0.860)
5	*0.278* *(0.012)**	*0.816* *(0.000)**	0.001 (0.813)
10	*0.275* *(0.014)**	*0.816* *(0.000)**	0.001 (0.775)

Table 18. Daily Interest Rate Changes Variance Equation:
Volatility Spillovers With and Without Capital Controls
Bollersev-Woolridge robust standard errors and covariance, GARCH (1,1)

Brazil			
Number of autoregressive lags included	**ARCH (1)**	**GARCH (1)**	**Controls dummy**
0	0.110 (0.272)	*0.851* *(0.000)**	-0.044 (0.595)
5	*0.337* *(0.003)**	*0.734* *(0.000)**	0.102 (0.598)
10	*0.343* *(0.048)**	*0.766* *(0.000)**	0.104 (0.599)
Malaysia			
0	*0.465* *(0.041)**	*0.583* *(0.000)**	-0.004 (0.119)
5	*0.543* *(0.050)**	*0.495* *(0.000)**	-0.005 (0.100)*
10	*1.492* *(0.001)**	*0.083* *(0.079)**	-0.009 (0.025)*
Thailand			
0	0.316 (0.090)*	0.601 (0.000)*	0.078 (0.136)
5	0.338 (0.067)*	0.571 (0.000)*	0.078 (0.112)
10	0.345 (0.058)*	0.577 (0.000)*	0.072 (0.111)

Table 19. Daily Interest Rates Changes Variance Equation: Volatility Spillovers In Crisis and Tranquil Periods

Bollersev-Woolridge robust standard errors and covariance, GARCH (1,1)

Number of autoregressive lags included	ARCH (1)	GARCH (1)	Crisis dummy
Philippines			
0	0.108 (0.400)	*0.664* *(0.078)**	-0.013 (0.529)
5	0.100 (0.419)	*0.666* *(0.064)**	-0.012 (0.524)
10	0.157 (0.292)	0.490 (0.073)	-0.002 (0.389)
South Korea			
0	*0.350* *(0.030)**	*0.804* *(0.000)**	-0.001 (0.944)
5	*0.323* *(0.029)**	*0.815* *(0.000)**	-0.001 (0.847)
10	*0.327* *(0.026)**	*0.808* *(0.000)**	-0.001 (0.988)

Table 20. Daily Stock Returns Variance Equation:
Volatility Spillovers With and Without Capital Controls
Bollersev-Woolridge robust standard errors and covariance, GARCH (1,1)

Brazil			
Number of autoregressive lags included	**ARCH (1)**	**GARCH (1)**	**Controls dummy**
0	*0.246 (0.001)**	*0.728 (0.000)**	0.001 (0.904)
5	*0.239 (0.001)**	*0.735 (0.000)**	0.001 (0.870)
10	*0.241 (0.000)**	*0.736 (0.000)**	0.001 (0.952)
Malaysia			
0	*0.131 (0.000)**	*0.882 (0.000)**	0.001 (0.708)
5	*0.129 (0.000)**	*0.884 (0.000)**	0.001 (0.738)
10	*0.146 (0.000)**	*0.869 (0.000)**	0.001 (0.652)
Thailand			
0	0.140 (0.000)*	0.818 (0.000)*	0.002 (0.082)*
5	0.148 (0.067)*	0.805 (0.000)*	0.002 (0.072)*
10	0.137 (0.000)*	0.828 (0.000)*	0.002 (0.079)*

Table 21. Daily Stock Returns Variance Equation: Volatility Spillovers In Crisis and Tranquil Periods
Bollersev-Woolridge robust standard errors and covariance, GARCH (1,1)

Number of autoregressive lags included	ARCH (1)	GARCH (1)	Crisis dummy
Philippines			
0	*0.184 (0.000)**	*0.781 (0.000)**	*0.001 (0.071)**
5	*0.198 (0.000)**	*0.766 (0.000)**	*0.001 (0.082)**
10	*0.216 (0.000)**	*0.742 (0.000)**	*0.001 (0.056)**
South Korea			
0	*0.086 (0.000)**	*0.910 (0.000)**	0.001 (0.156)
5	*0.059 (0.001)**	*0.940 (0.000)**	0.001 (0.187)
10	*0.061 (0.001)**	*0.938 (0.000)**	0.001 (0.199)

Table 22. Rolling Wald Tests for Structural Breaks in International Interest Rate Links

Country	**Break Dates**
Brazil	October 6, 1997 April 2, 1998 June 9, 1998
Malaysia	June 24, 1997 through January 28, 1998
Philippines	May 21, 1997 through December 19, 1997
South Korea	April 28, 1997 through May 29, 1997
Thailand	August 30, 1996 April 7, 1997 through September 24, 1997

Table 23. Summary of Key Findings

	Control period versus no-control period			**Crisis versus tranquil period**	
Test	**Brazil**	**Malaysia**	**Thailand**	**Philippines**	**South Korea**
1. Principal components: **Did its loading factor decline during the control or crisis period?**					
Interest rates	No	Yes	Yes	No, increased	Yes
Stock returns	Yes	Yes	No, about the same	No, about the same	No, about the same
Changes in the exchange rate	No, increased	Yes	No, about the same	No, increased	Yes
2. VARs: **Did causality from other countries diminish during the control or crisis period?**					
Interest rates	No, increased	No, the same	No, increased	Yes	No, increased
Stock returns	No, increased	Yes	No, the same	Yes	No, increased
Changes in the exchange rate	No, increased	Yes	No, increased	No, increased	No, increased
3. GARCH: **Was the control or crisis dummy significant in the variance equation?**					
Interest rates	No	Yes, reduced the variance	No	No	No
Changes in interest rates	No	Yes, reduced the variance	No	No	No
Stock returns	No	No	Yes, increased the variance	Yes, increased the variance	No
4. Wald tests: **Did the date(s) of the structural break coincide with the control or crisis period?**					
Interest rates	No	No	No (close)	No (close)	No (close)

Appendix table 1. Causality Tests and Capital Controls: Probability Values for Interest Rates
Hubert/White Robust Standard Errors

	Brazil	**Malaysia**	**Philippines**	**South Korea**	**Thailand**
Brazil: Pre-controls, January 1995-February 28, 1999					
F-test		0.773	0.934	0.935	0.636
Log Likelihood		0.731	0.918	0.919	0.582
Brazil: Controls, March 1, 1999-present					
F-test		0.779	0.883	*0.078**	*0.014**
Log Likelihood		0.219	0.657	*0.021**	*0.000**
Malaysia: Pre-controls, January 1995- August 30, 1998					
F-test	0.803		0.708	0.212	*0.000**
Log Likelihood	0.763		0.657	0.165	*0.000**
Malaysia: Controls, September 1, 1998- present					
F-test	*0.073**		0.795	0.354	0.449
Log Likelihood	*0.022**		0.689	0.261	0.277
Thailand: Pre-controls, January 1995- May 13, 1997					
F-test	0.707	*0.000**	0.314	0.879	
Log Likelihood	0.598	*0.000**	0.203	0.817	
Thailand: Controls, May 14, 1997- January 30, 1998					
F-test	0.820	0.443	0.197	*0.000**	
Log Likelihood	0.636	0.207	*0.055**	*0.000**	
Thailand: Post-controls, January 31, 1998-present					
F-test	0.430	0.616	0.863	*0.069**	
Log Likelihood	0.191	0.361	0.701	*0.010**	

Appendix table 2. Causality Tests and Crises: Interest Rates
Hubert/White Robust Standard Errors

	Brazil	**Malaysia**	**Philippines**	**South Korea**	**Thailand**
Philippines: Pre-crisis, January 1995-July 1, 1997					
F-test	0.902	0.411		0.396	*0.001**
Log Likelihood	0.855	0.299		0.285	*0.000**
Philippines: Crisis, July 1, 1997-July 31, 1998					
F-test	0.325	0.982		0.890	0.326
Log Likelihood	0.187	0.965		0.815	0.188
Philippines: Post-crisis, July 31, 1998-present					
F-test	0.154	*0.034**		*0.084**	*0.063**
Log Likelihood	*0.000**	*0.000**		*0.000**	*0.000**
South Korea: Pre-crisis, January 1995-July 1, 1997					
F-test	0.846	0.739	0.845		0.432
Log Likelihood	0.779	0.646	0.779		0.311
South Korea: Crisis, July 1, 1997-July 31, 1998					
F-test	0.494	*0.000**	0.527		0.468
Log Likelihood	0.336	*0.000**	0.370		0.312
South Korea: Post-crisis, July 31, 1998-present					
F-test	0.115	*0.074**	*0.056**		0.105
Log Likelihood	*0.000**	*0.000**	*0.000**		*0.000**

Appendix table 3. Causality Tests: Probability Values for Stock Returns
Hubert/White Robust Standard Errors

	Brazil	**Malaysia**	**Philippines**	**South Korea**	**Thailand**
Brazil: Pre-controls, January 1995-February 28, 1999					
F-test		0.000*	0.545	0.115	0.177
Log Likelihood		0.000*	0.494	0.087*	0.141
Brazil: Controls, March 1, 1999-present					
F-test		0.881	0.982	0.064*	0.240
Log Likelihood		0.133	0.571	0.011*	0.000*
Malaysia: Pre-controls, January 1995- August 30, 1998					
F-test	*0.000**		*0.071**	*0.029**	0.173
Log Likelihood	*0.000**		*0.048**	*0.018**	0.131
Malaysia: Controls, September 1, 1998- present					
F-test	*0.051**		0.909	0.965	0.365
Log Likelihood	*0.008**		0.803	0.914	0.163
Thailand: Pre-controls, January 1995- May 13, 1997					
F-test	0.461	0.217	0.227	0.125	
Log Likelihood	0.334	0.126	0.133	*0.063**	
Thailand: Controls, May 14, 1997- January 30, 1998					
F-test	0.986	0.993	0.726	0.167	
Log Likelihood	0.961	0.979	0.502	*0.042**	
Thailand: Post-controls, January 31, 1998-present					
F-test	0.392	0.434	0.190	0.663	
Log Likelihood	0.272	0.311	0.107	0.548	

Appendix table 4. Causality Tests and Crises: Probability Values for Stock Returns
Hubert/White Robust Standard Errors

	Brazil	**Malaysia**	**Philippines**	**South Korea**	**Thailand**
Philippines: Pre-crisis, January 1995-July 1, 1997					
F-test	*0.046**	0.123		0.219	0.631
Log Likelihood	*0.020**	*0.066**		0.135	0.522
Philippines: Crisis, July 1, 1997-July 31, 1998					
F-test	*0.043**	0.264		0.368	0.497
Log Likelihood	*0.013**	0.141		0.222	0.340
Philippines: Post-crisis, July 31, 1998-present					
F-test	*0.007**	*0.000**		0.660	0.248
Log Likelihood	*0.001**	*0.000**		0.464	0.101
South Korea: Pre-crisis, January 1995-July 1, 1997					
F-test	0.463	*0.096**	0.828		0.903
Log Likelihood	0.348	*0.049**	0.883		0.855
South Korea: Crisis, July 1, 1997-July 31, 1998					
F-test	0.173	*0.086**	0.754		0.368
Log Likelihood	*0.079**	*0.031**	0.626		0.222
South Korea: Post-crisis, July 31, 1998-present					
F-test	0.104	0.251	0.227		*0.042**
Log Likelihood	*0.028**	0.103	*0.088**		*0.008**

Appendix table 5. Causality Tests: Probability Values for Exchange Rate Changes
Hubert/White Robust Standard Errors

	Brazil	**Malaysia**	**Philippines**	**South Korea**	**Thailand**
Brazil: Pre-controls, January 1995-February 28, 1999					
F-test		0.999	0.903	0.991	0.996
Log Likelihood		0.999	0.884	0.989	0.995
Brazil: Controls, March 1, 1999-present					
F-test		0.018	0.411	0.126	0.061*
Log Likelihood		0.000*	0.006*	0.080*	0.033*
Malaysia: Pre-controls, January 1995- August 30, 1998					
F-test	0.968		0.132	*0.000**	0.641
Log Likelihood	0.959		*0.096**	*0.000**	0.542
Malaysia: Controls, September 1, 1998- present					
F-test	0.999		0.983	0.234	0.928
Log Likelihood	0.999		0.956	*0.080**	0.837
Thailand: Pre-controls, January 1995- May 13, 1997					
F-test	0.707	*0.000**	0.314	0.879	
Log Likelihood	0.597	*0.000**	0.202	0.816	
Thailand: Controls, May 14, 1997- January 30, 1998					
F-test	0.430	0.615	0.864	*0.000**	
Log Likelihood	0.191	0.361	0.701	*0.000**	
Thailand: Post-controls, January 31, 1998-present					
F-test	0.430	0.615	0.863	*0.069**	
Log Likelihood	0.191	0.361	0.701	*0.010**	

Appendix table 6. Causality Tests and Crises: Probability Values for Exchange Rate Changes
Hubert/White Robust Standard Errors

	Brazil	**Malaysia**	**Philippines**	**South Korea**	**Thailand**
Philippines: Pre-crisis, January 1995-July 1, 1997					
F-test	0.911	0.056*		0.425	0.072*
Log Likelihood	0.867	0.025*		0.312	0.034*
Philippines: Crisis, July 1, 1997-July 31, 1998					
F-test	0.933	0.138		*0.008**	*0.001**
Log Likelihood	0.881	*0.059**		*0.002**	*0.000**
Philippines: Post-crisis, July 31, 1998-present					
F-test	0.160	*0.000**		0.660	0.248
Log Likelihood	*0.053**	*0.000**		0.464	0.101
South Korea: Pre-crisis, January 1995-July 1, 1997					
F-test	0.921	0.513	0.592		0.995
Log Likelihood	0.880	0.398	0.480		0.992
South Korea: Crisis, July 1, 1997-July 31, 1998					
F-test	*0.016**	0.217	0.126		0.872
Log Likelihood	*0.003**	0.108	*0.052**		0.788
South Korea: Post-crisis, July 31, 1998-present					
F-test	0.999	0.002*	0.000*		0.429
Log Likelihood	0.998	0.001*	0.000*		0.381