Preliminary Draft

August 2002

For presentation at the 2002 annual meetings of the

American Political Science Association in Boston, MA

The Role of Capital Controls and Currency Regimes in the Asian Crisis[1]

Isriya Nitithanprapas, Sunil Rongala, and Thomas D. Willett[2]

School of Politics and Economics
Claremont Graduate University

160 East 10th Street
Claremont, CA 91711

Tel: 909- 621-8787
Fax: 909-621-8460

[1] Financial assistance from the Freeman Program in Asian Political Economy at The Claremont Colleges and from the National Science Foundation is greatly acknowledged.
[2] Corresponding author: Email: Thomas.Willett@cgu.edu

I. Introduction

While debates continue over the causes of the Asian crisis, several propositions have developed considerable currency. Two of these are that pegged exchange rates and the liberalization of capital controls played major roles in generating the crisis and its spread. A related argument frequently made is that the maintenance of highly restrictive controls helped countries such as China and India weather the storm. While rather widely held, these propositions have been subjected to relatively little systematic empirical analysis. The major purpose of this paper is to help fill this void.

Our results offer several challenges to conventional wisdom. While it is undoubtedly true that China and India had restrictive controls and that they were not hit hard by the crisis, there could well be other causes for their insulation. For example, China had very high reserves and prior to the crisis, India had substantially increased the flexibility of its exchange rate regime. These issues need to be investigated within the framework of multi-variate analysis so that a number of possible influences can be taken into account. In this paper we draw upon a fundamentals based crisis model of the Asian and Mexican crises to examine the roles of exchange rate regimes and capital controls in the Asian crisis. We combine our formal statistical analysis with emphasis both on the conceptual foundations of the institutional measures used and on case study analysis of a number of the countries involved. Beyond the particular conclusion offered we hope that this analysis illustrates how case study and large N statistical analysis can complement each other.

While not looking separately at the Asian crisis, several recent large statistical studies have reached the (surprising to many) conclusions that capital controls are positively, not negatively correlated with currency crises. These studies, however, have tended to use quite

crude measures of capital controls typically reflected in a zero-one dummy. Several more fine-grained measures of capital controls have been developed in recent years and we make use of several of these. One of the surprises to us was that, contrary to general impressions, several of these measures indicated that capital controls remained high in the hardest hit countries such as Indonesia, Korea, and Thailand. This may help explain the tendency of previous studies to find a positive effect of capital control measures in crisis equations.

The core crisis countries certainly were not fully free of capital controls, but the high levels of capital flows into these countries prior to the crisis suggests that many categories of capital flows were not tightly regulated. Thus one of our major conclusions is that a much more thorough evaluation of capital controls measures is needed.

This also applies with respect to classifications of exchange rate regimes. It is now widely recognized by researchers in this field that the official classifications published by the IMF are highly suspect. For example, many countries that list themselves as following managed floats in practice maintain de facto adjustable or crawling pegs. This indeed is the case for many of the Asian crisis countries. As a result of this problem, researchers have begun to develop behavioral measures of exchange rate regimes. Two of the authors of this study have developed one of these measures. We discuss its rationale and apply it to our analysis of the Asian crisis along with several measures that have been developed by others. We find that there is even greater variance among measures of exchange rate regimes than there is of capital controls. By changing among these various measures, one can find substantially significant estimates that pegged rates did contribute to the crises or alternatively that flexible rates did. This reflects not so much sloppiness of research in previous studies but rather that the Asian countries had a particularly high proportion of managed exchange rate regimes which fell into gray areas that are

difficult to classify. Thus we are reluctantly forced to conclude that the Asian crisis experience can shed relatively little light on the important debate over how wide is the unstable middle of regimes that compromise between genuinely fixed and highly flexible exchange rates. The Asian case does nicely illustrate, however, many of the important issues involved in classifying exchange rate regimes.

The following section provides a brief overview of aspects of the debate over the Asian crises that are relevant to our study. Section III shows the methodology, the dependent and independent variables. Section IV provides the results and Section V offers conclusions.

II. An Overview of the Debate over the Asian Crises.

Few developments have caused more debate among economists and policy officials than the Asian currency and financial crisis. Both the origins and spread of the crisis have been the subject of considerable research, but despite the number of studies that have been completed, there are still widely varying interpretations. Miles Kahler (2000) has suggested that it is helpful to distinguish between two main schools of thought – the fundamentalist and the panic-stricken. Not surprisingly, these two schools of thought reflect differences in policy prescriptions as well as diagnosis. The fundamentalist school tends to favor genuinely fixed or highly flexible exchange rates and freedom of capital controls, while adherents of the panic-stricken view tend to look more favorably on capital controls and substantial government management of the exchange rate.

This is indeed helpful, but does not go far enough. The attraction of the bad speculation view rests heavily on the absence of bad macro-economic fundamentals in the crisis countries. Thus it is east to see how they would consider themselves the innocent victims of irrational behavior by the international investors that Tom Friedman has labeled the ‘electronic herd’.

This view takes too narrow a view of the relevant fundamentals, however. Overvalued currencies are a part of the fundamentals and there is little question that the epicenter for the crisis, the Thai baht, was substantially overvalued. The same cannot be said for the Indonesian rupaih, or the Korean won, however. To explain their crises in terms of rational speculation one must include political instability and financial sector problems as important fundamentals. These clearly should be included, although doing so does not prove that there was no element of perverse speculation present. Indeed, where financial sector issues are in question self-fulfilling speculation need not imply that such speculation is destabilizing in the technical sense. Modern crisis theory emphasizes that fundamentals come in three varieties – not two. Between good and bad fundamentals there is an intermediate range in which crisis aren't inevitable, but a country is vulnerable to adverse shocks. The poorly supervised financial liberalizations in many of these countries helped create financial positions that were overextended and highly vulnerable to bank runs.

One common interpretation of the crisis is that they primarily reflect the problems of one-way speculative gamble in a world of adjustably pegged exchange rates and high capital mobility. In this view the underlying cause of the Asian crisis was the same as of the breakdown of the Bretton Woods adjustable peg system in the early 1970s and the crisis in the European Monetary System in the early 1990s. In other words, these are examples of the unstable middle hypothesis. Economists are generally agreed that with high capital mobility and no capital controls, narrow band adjustable peg systems such as were practiced during the Bretton Woods years and by Thailand are accidents waiting to happen. However, here is where the consensus ends. Many prominent economists have embraced the two-corners hypothesis under which the unstable middle is so wide that one must go all the way to one extreme or the other – genuinely

fixed or highly flexible rates--in order to avoid currency crises. Others argue that intermediate systems such as crawling bands can be stable and point to examples such as Chile, Israel, and Poland to support their point. Clearly this is an issue which requires serious empirical attention.

How much pegged rates contributed to the Asian crisis depends in no small part on what one means by pegged rates. Many have talked of all of the hardest hit Asian currencies as having pegged exchange rates. Thailand clearly fit the bill of the Bretton Woods type narrow band adjustable peg. The baht was pegged to a basket of currencies rather than to the dollar alone, but while the weights of the basket were never officially announced, there is general agreement that the weight given to the dollar was at least eighty or ninety percent. A wide range of countries list themselves as independent or managed floats, but display what Calvo and Reinhart (2002) have labeled "fear of floating" and intervene heavily in the foreign exchange markets. While commentators frequently refer to the pegged rates of Indonesia and Korea, both officially listed themselves as having managed floats. Behaviorally Indonesia and Korea both had crawling bands. Thus little weight is given to official classification. The IMF has begun to produce an alternative classification based on staff judgments of actual exchange rate policies but the backdating of these measurements to the Asian crisis years has not yet been made public. The problem with official classification has lead several economists to develop behavioral classifications of exchange rate regimes based on statistical measures. Two of the authors have been entrants into this derby and we draw upon our own as well as several other measures of exchange rate regimes. We find substantial differences in the classifications for a number of countries. To compare only two recent studies, Levy-Yeyati and Sturzenegger (2000) classify both India and Malaysia prior to the Asian crisis as floating, while Grier and Grier (2001)

classify them as having pegged rates. Clearly such differences can have a major influence on the lessons drawn from the experience of the Asian crisis.

Another key area of dispute is the role of capital controls. There is wide-spread agreement that poorly designed and ineptly implemented financial liberalization played a major role in the Asian crisis, but the implication of the crisis for the desirability and effectiveness of capital controls are less clear. There is no question that the Asian crisis halted the momentum that had been building in support of freedom of capital flows. Indeed, this crisis has quite appropriately focused attention on the dangers of poorly managed financial liberalization, but what lessons we should draw about capital controls are much less clear.

There is a widespread perception that it was capital controls which played an important role in protecting China and India from the Asian contagion. For example, the Wall Street Journal has noted that "some of the holdout nations that refused to adopt the free-flow-of-money orthodoxy of the 1990s -- China, India and, to a lesser degree, Chile -- now stand out as the countries least affected by the current crisis" while Paul Krugman has argued that "nearly everyone is glad that not all developing countries managed to liberalize their capital accounts before the 1997 crisis hit; in particular, China, thank heavens, still has a nonconvertible capital account." The data is, of course, consistent with this conjecture, but its validity is far from obvious. For example, China had huge reserves and this may have been what really protected them, and while China did have a tightly pegged exchange rate; India in the years between the Mexican and Asian crisis had adapted more flexible exchange rates. Might this not have been what gave India its real protection? We may never be able to answer such questions to the satisfaction of all sensible people, but it is clear that our only hope of providing answers is to undertake multi-variate analysis for a substantial number of countries. Otherwise there is almost

no possibility of having enough degrees of freedom to distinguish among alternative plausible hypotheses.

Indeed several recent large N studies have investigated the relationship of capital controls to currency crises and have tended to find that the prevalence of capital controls tends to make currency crises more rather than less likely. The standard explanation for such a positive correlation is that capital controls may signal bad policy and hence make crises more likely, while the absence of controls signals good policy and is associated with fewer crises. Leblang (2001a) makes the important distinction between successful and unsuccessful speculative attacks and finds that, while capital controls make speculative attacks more likely, they also help countries maintain their exchange rate regimes in the face of speculative attacks. Such results would be consistent with capital controls being more effective in the sense of having some restraining power on capital flows, but also being subject to bad signaling effects.

One of the typical problem with large N studies is that a good deal of institutional detail and nuance is lost. This can be provided by careful case studies. Thus we see case studies and large N empirical studies as complements rather than substitutes. A major theme of our paper is that the value of large N studies can sometimes be greatly enhanced by paying careful attention to the quantitative variables being used. We argue that there are important conceptual issues raised in the measurement of both exchange rate regimes and capital controls. Until recently most of the empirical studies of capital controls used zero-one dummies based on information provided by the IMF. It has become increasingly recognized, however, that most of the interesting policy issues cannot be addressed with such a blunt proxy. Unfortunately, most of the studies of the relationships between currency crises and capital controls have used such limited proxies. One contribution of this paper is to compare the results from using such zero-one

proxies with two more differential approaches – the procedure for proxying the intensity of capital controls developed by Dennis Quinn and measures of the depth of controls developed by Barry Johnston and others at the IMF[3].

While it is clear that domestic financial liberalization played a major role in the crisis, the role played by international liberalization per se is not as obvious. There is a general impression of substantial international liberalization by the Asian countries and there were undoubtedly large capital inflows. Thus it is not uncommon to encounter arguments such as Joseph Stiglitz's given at a speech in Manila where he said that "even with the buildup of vulnerability, it is unlikely that the crisis could have occurred without the liberalization of capital accounts. It is worth observing that some of the countries with the weakest financial sectors and the greatest lack of transparency were hardly touched by the contagion from East Asia. These were countries with closed, or at least more closed, capital accounts." (1998)

The data from the quantitative indicators of capital controls suggests another story, however. For example, using a zero-one dummy variable, Glick and Hutchison (2000) classify only Hong Kong and Singapore among the Asian crisis countries as having liberalized capital accounts while the IMF's more detailed measure of the breadth of capital controls lists Indonesia, Korea, and the Philippines at 0.92, Malaysia at 0.85 and Thailand at 0.77 out of a maximum at 1.0. (For example, India was 1.0 and China 0.85, while Hong Kong was 0.08, and Singapore was 0.23).

[3] The debate over whether Malaysia's adoption of capital controls helped speed its recovery is outside the scope of this study. For discussion on that, see Edison & Reinhart (2000) and Kaplan & Rodrik (2001). Our focus is on the effects of controls (and exchange rate regimes) on the strength of speculative pressures, i.e. capital flight, felt by countries during the Asian crisis. We likewise do not investigate the costs of these crises in terms of the lost output (and human suffering) generated. The latter were heavily influenced by the degree of financial sector problems, not just the extent of the currency crises.

III. Methodology

Our econometric model controls for what has now become a widely used set of variables in crisis models. The inclusion of measures for credit booms and the ratio of short-term foreign debt to international reserves are quite straightforward. Our non-standard variable, labeled 'composite' was developed because many earlier studies tended to find inconsistent results when using measures of the appreciation of the real exchange rate and size of current account deficits. Therefore, in an earlier work, Nitithanprapas and Willett (2002) suggested the use of a composite variable to suggest the presence of the combination of both real exchange rate appreciation and current account deficits. These proxies were based on the size of the current account deficit if real appreciation was above a threshold and alternatively if the amount of real appreciation in the current account deficit is above a threshold. Both proxies were found to be significant in explaining the patterns of contagion during the Mexican and Asian crises.[4] In Nitithanprapas, Nitithanprapas and Willett (2002), a third proxy suggested by a referee that simply interacts between the values of the extent of appreciation and current account deficits is used. (Depreciation and surpluses are entered as zero). This also proved to be quite successful. For this study we use the composite variable defined as the amount of real exchange rate appreciation when the current account deficit is above five percent. We also test the sensitivity of the result of the composite variables using the second and third proxies. The results did not change dramatically, so we do not report the result of those measures.

Most studies of emerging markets have used crisis indices based on weighted averages of changes in exchange rates and international reserves, where the weights are based on the previous variances of each variable. We have shown elsewhere that this weighting system tends

to give a downward bias to estimates of the strength of unsuccessful speculative attacks on fixed rate systems[5]. In this paper we stress another problem, which is the need to take the behavior of interest rates into account. While interest rates were included in the indices developed for the industrial countries, they have typically been left out of studies on developing countries because of problems of data availability and quality. Without looking at interest rates, however, one would entirely miss the important unsuccessful speculative attacks on Hong Kong in October 1997. The peg was saved and measured reserves actually rose – in large part because of the sky-high increase in interest rates forced on the monetary authorities by strong speculative attacks triggered by the devaluation of the Taiwanese currency.

Determining the appropriate weight for interest rates in a crisis index is, if anything, even more difficult than determining the relative weights of exchange rate versus reserve changes. First we would need to distinguish what proportion of the changes in nominal interest rates was due to changes in policy, i.e., is exogenous, as is assumed in the Mundell-Fleming model and the Keynesian analysis versus the portion that was endogenous due to private sector expectations as is assumed in monetary models. Then, for the exogenous change, we would need to determine the degree of capital mobility under a pegged rate system or the resulting change in the exchange rate under a freely flexible system. The former is extremely difficult to estimate while under flexible rate estimates of the interest rate-exchange rate nexus. This has proven to be highly unstable with the suggestion of the Dornbusch overshooting model that an initial change in the exchange rate is a multiple of the interest rate change contrary to Stiglitz's view that the effects may quite often be negative rather than positive.

---

[4] Note that this definition of contagion carries no connotation of market factors and destabilizing speculation. These are often termed pure contagion.

[5] Nitithanprapas, Nitithanprapas, and Willett (2002).

The general statistical results for crisis models tend to not be highly sensitive to these variations in the measurement of crises, but they can be quite important for the interpretation of particular episodes such as the attacks on Hong Kong. This in turn is key for a full understanding of the Asian crisis. It is still not widely enough appreciated that there were two important waves of contagion during the Asian crisis. The first round went mainly from Thailand, to Indonesia, Malaysia, and the Philippines. The fallout on Korea, for example, was quite mild. The strong contagion that hit Korea came from Hong Kong in October, not Thailand in July. (As a consequence we use both a four-month and a six-month window for the Asian crisis to include both waves).

Careful measurement of the strength of crises is also relevant for testing fine-grained hypotheses about the relationships between exchange rate regimes and currency crises. One of the most interesting developments of recent international financial behavior is the finding that hard pegs of the currency board variety are not in themselves sufficient to protect countries from currency crises. This was evidenced by the unsuccessful attack on Hong Kong in 1997 and by several unsuccessful attacks on Argentina before the final abandonment of its currency board in 2001. These important developments could easily be missed in large N statistical studies that paid insufficient attention to the proxies being used.

To examine the conditional link between currency crisis and capital control/ exchange rate regime, we regress the crisis index on capital control measures, exchange rate regime measures, composite variable, lending boom, and the ratio of short-term debt to reserves. The analysis is based on a two-way classification of exchange rate regimes, a three-way classification of exchange rate regimes, and interactions between capital controls and pegged exchange rate

regimes. The two-way classification distinguishes between float regimes and peg regimes while the three-way classification allows for pegged, crawling peg/band, and floating.

Our basic estimating equation based on two-way grouping of exchange rates is:

$$CRISIS = b1 + b2\,(COMPOSITE) + b3\,(LB) + b4\,(STD/RES) + b5\,(CONTROL) + b6\,(FLOAT) + \varepsilon$$

Our estimating equation based on three-way grouping of exchange rates is:

$$CRISIS = b1 + b2\,(COMPOSITE) + b3\,(LB) + b4\,(STD/RES) + b5\,(CONTROL) + b6\,(FLOAT1) + b7\,(CRAWL1) + \varepsilon$$

Our estimating equation based on interaction between the capital controls variable and pegged exchange rate regime is:

$$CRISIS = b1 + b2\,(COMPOSITE) + b3\,(LB) + b4\,(STD/RES) + b5\,(PEG*CONTROL) + \varepsilon$$

CRISIS = An equal weighted average of the maximum value of the percentage change in exchange rate with respect to the U.S. dollar, the maximum value of the percentage change in foreign reserves, and the maximum value of the percentage points change in interest rates within six months of June 1997.[6] To check the robustness of our results, we also use a version of crisis index that excludes the interest rate. The results did not change significantly. We also compare the results when the crisis index is calculated

[6] Money market rates are generally used for most countries. Lending rates are used where money market rates are not available. In the case of Hong Kong, the T-bill rate is used.

within four months of June 1997 to separate the effects of Thai contagion from the Taiwan and Hong Kong contagion.

COMPOSITE = Real effective exchange rate appreciation if (Current Account/GDP) < y percent, where y is initially taken as –5 percent[7], and 0 if otherwise.

LENDING BOOM = Percentage change in the ratio of the increase in banking sector credit to the non-government sector (in real term) over the preceding thirty-six month period

STD/RES = The ratio of short-term debt to reserves. (using the data from the joint database of the of OECD, BIS, and IMF).

(For data on the above four variables, please see table 5.)

CONTROL = The controls on capital transactions. There are four different controls used. The Glick & Hutchison controls are dummy variables, while the IMF variable measures the breadth of controls. The Quinn openness variables and the Magnitude variable measure the intensity of controls. (For a detailed explanation for the measures, please see Appendix I and II. The data for the controls is in table 1.)

FLOAT = The dummy for floating regimes in the two-way classification.

FLOAT1 = The dummy for floating regimes in the three-way classification.

CRAWL1 = The dummy for crawling regimes in the three-way classification.

PEG = The dummy for pegged regimes.

(For a more detailed discussion, please see Appendix III. Please see tables 3 and 4 for classifications of countries in sample.)

IV. Results

2-Way Classification

In the two way classification of exchange rate regimes, with the 6 month crisis index, we found that no matter which way the exchange rate regime is classified, the estimated effect of the capital controls depends on the measure used. The IMF and Glick & Hutchison measures both increase the severity of the crises and are significant at the 10% level. The Quinn measure is also positive, but the co-efficient is much smaller and is insignificant. The Magnitude measure, however, has a negative coefficient, although insignificant. The Magnitude measure reduces the severity of the crisis, but is, however, insignificant. This is likely because the IMF and Glick & Hutchison measures indicate a high level of controls for the countries that were heavily hit during the Asian crises while the Quinn and Magnitude measures have a lower level of controls for those countries.

No matter how controls are classified, the estimated effects of exchange rate regimes are determined by whether countries have been classified as floating or pegged. When crisis hit countries such as Indonesia, Korea, Brazil and some other ambiguous countries which are classified as flexible, there is a positive relationship, although insignificant, between floating rates and currency crises. However, when those same countries are classified as having a pegged regime, there is a negative relationship between flexible rates and currency crises. These negative coefficients are significant at the 10% level when all but the Magnitude capital controls measure is used.

We used a four-month crisis index as the dependent variable in order to look separately at the first phase of contagion. As far as the capital controls measures are concerned, the results are

[7] The real exchange rate appreciation is calculated as the 3-year log change of 12-month pre-crisis average of real

independent of whether exchange rate regimes are classified towards pegged or flexible. The IMF, Glick & Hutchison, and Quinn measure have a positive sign, but the co-efficient of the Quinn measure is very small. The Magnitude measure exhibits a negative relationship. Only the IMF measure is significant at the 10% level.

The results for exchange rate regimes are generally same as when the six-month crisis index is used. However, when the classification is biased towards floating and the IMF controls measure is used, there is a negative relationship between floating exchange rate and currency crises. The coefficient is very small and insignificant, however. For results, please see tables 6-9.

3-Way Classification

For the three-way classification, we also add a dummy for crawling regimes in the crisis regression. The effect of capital controls does depend to some extent on the way exchange rates have been classified. Both the IMF and Glick measures have positive coefficients no matter which way the exchange rate classification has been biased to, or whether the index has been calculated with the four and six-month window. Both the measures are significant at the 10% level in all categories except when the exchange rate is biased towards crawling peg/band regimes and the crisis index is in calculated in the four month window. The Magnitude measure has a negative, but insignificant, coefficient for all categories. However, the coefficient of the Quinn measure does depend on the classification of exchange rate regimes and different time windows on the crises index. The Quinn measure has a positive coefficient in the six-month crisis measure when exchange rates are biased towards floating and crawling band, but it is negative when rates are biased towards pegged regimes. In the four-month crisis measure, it has

effective exchange rate(from IMF database). The current account deficit is calculated as the 4-year pre-crisis average of current account balance to GDP (from world development indicator database).

a positive coefficient when the rates are biased towards floating rates and negative in the other two. The Quinn measure is insignificant for all classifications and crisis windows.

Using the three-way classification, the effect of exchange rate regimes on currency crises depends on whether the crisis index is calculated with a six-month window or a four-month window. If the crisis index is calculated with a six-month window, the coefficient dummy for float regimes are negative and insignificant in all measures of controls except when the classification is biased toward crawling regimes and the IMF capital control measure is used. The coefficient of the dummy for crawling regimes is significant at the six percent level or better for all control measures. However, when the four-month window is used, the coefficient for crawling regime becomes insignificant, although still positive when all measures of controls are used. The sign and significance of the coefficient for floating regime depends on the measure of controls and whether classifications are biased toward peg or crawling or floating regimes.

Since the pegged regimes are the omitted classification, the signs of the dummies give the difference from the pegged regimes. Thus the positive signs on the crawling regimes carry the surprising implication that crawling peg regimes are even more crisis prone than simple pegs. This most likely reflects the tendency in our sample for many crawling peg systems such as Indonesia and Korea to be hit hard during the crises. For results, please see tables 10-15.

Interaction between Pegged Regime and Capital Controls

One could argue that there are likely to be important differences between the effects of controls under pegged and flexible exchange rates and that pegged exchange rates should be crisis prone only in the absences of capital controls. Therefore, we also test directly for the effects of controls under pegged exchange rate regimes. In order to do so, we delete the float

dummy and add the multiplication between capital control and pegged dummy in the crisis regression.

When the exchange rate classifications are biased toward pegged regime, we find strong support for the proposition that capital controls increase the vulnerability of currency crisis of countries with pegged regimes using the IMF, Glick and Hutchison, and Magnitude measures. When the Quinn measure is used, the coefficient of the interaction between capital control and pegged regime is negative, but small and insignificant. These results hold for both the six-month and four-month windows.

When the classifications are biased toward flexible regimes, and using the four-month window, we find positive coefficients on the IMF, Glick, and Hutchison measures, while the coefficient of the Magnitude measure is negative. However, all are insignificant. When the sixth month window is used, the sign of the interaction coefficient changes for the IMF, Glick, and Hutchison measures. All four measures are negative but insignificant.

Overall this evidence provides little support for the view that capital controls help protect pegged exchange rates. The opposite view that capital controls make crisis more likely for pegged exchange rate regimes appears to be strongly supported when some measures of controls and exchange rate regimes are used, but this is not robust with respect to other measures. Generally the Quinn openness measure provides more or less favorable evidence than the other control measures for the view that controls are helpful for pegged rate regimes. For results, please see tables 16-19.

V. Conclusion

From a methodological standpoint we have several powerful findings. One is an illustration of the dangers of drawing conclusions about complex phenomena based on simple

correlation. China and India did have strong capital controls and indeed they were not hard hit by the Asian crisis, but our multi-variate analysis raises strong doubts about whether these controls were the major factor that insulated China and India from the crisis.

A second finding is that we need to give careful attention to the construction of proxies for institutional variables. Different classifications of both capital controls and exchange rate regimes tell quite different stories. We clearly need more interactions between large-scale statistical coding projects and careful case-study type analysis of the variables being used.

In general, our results suggest that capital controls have not been very effective in protecting countries from currency crises, but these results rely on measures that tell a different story from the conventional wisdom that capital accounts in the main crisis countries had been substantially liberalized.[8] Clearly more work on classifying the tightness of capital controls is needed.

On the exchange rate side we do find some support for the conventional wisdom that substantial government management of exchange rates makes countries more crisis-prone, but not for the sub-hypothesis that narrow band adjustable pegs are more crisis prone than more flexible crawling bands. Our analysis suggests that the dividing lines among types of regimes can sometimes be extremely difficult to draw. The Asian experience provides clear evidence that just moving from adjustable pegs to de-facto crawling bands is not sufficient to avoid currency crises, but from the limited sample we cannot strongly conclude about the conditions necessary for crawling bands to avoid crises.

[8] See Johnston et al (1997) and Ariyoshi et al (2000).

References:

Ariyoshi, Akira et al. 2000. “Capital Controls: Country Experiences With Their Use and Liberalization.” Occasional Paper 190. International Monetary Fund.

Calvo, Guillermo, and Carmen Reinhart. 2002. “ Fear of Floating.” Quarterly Journal of Economics CXVII(2):379-409.

Caramazza, Francesco, Luca Ricci, and Ranil Salgado. 2000. “Trade and Financial Contagion in Currency Crises.” IMF Working Paper No. 00/55. Washington D.C.: International Monetary Fund, March.

De Gregorio, José, and Rodrigo O. Valdes. 1999. “Crisis Transmission: Evidence from the Debt, Tequila, and Asian Flu Crises,” Paper presented at the Conference on International Financial Contagion: How It Spreads and How It Can Be Stopped, Washington, DC , February 1999. available at <http://www.worldbank.org/research/interest/confs/past/papersfeb3-4/papers.htm>.

Edison, Hali and Carmen Reinhart. 2000. Capital Controls During the Financial Crises: The Case of Malaysia and Thailand.” International Financial Discussion Papers No. 662. Board of Governors of the Federal Reserve System.

Edison, Hali et al. 2002. “Capital Account Liberalization and Economic Performance: A Review of the Literature.” Working Paper. International Monetary Fund.

Eichengreen, Barry, Andrew Rose, and Charles Wyplosz. 1997. “Contagious Currency Crises.” NBER Working Paper 5681.

Eichengreen, Barry et al. 1998. “Capital Account Liberalization: Theoretical and Practical Aspects.” Occasional Paper 172. International Montary Fund

Glick, Reuven and Michael Hutchison. 2000. “Stopping ‘Hot Money’ or Signaling Bad Policy? Capital Controls and the Onset of Currency Crisis." Paper presented at the Claremont Conference on the Political Economy of International Financial Crises, Claremont, December 2000. available at <http://spe.cgu.edu/econ/peifcconference/papers/index.htm>.

Grier Kevin, and Robin Grier. 2001. “Macroeconomic Indicators, Exchange Rate Regimes, Currency Depreciation and Stock Market Performance in the 1997 Crisis.” Economic Inquiry, January:139-48.

Johnston et al. 1997. “Sequencing Capital Account Liberalization: Lessons from the Experiences in Chile, Indonesia, Korea, and Thailand” Working Paper No. WP/97/157. International Monetary Fund.

Johnston, Barry et al. 1999. "Exchange Rate Arrangements and Currency Convertibility: Development of Issues." International Monetary Fund.

Kahler, Miles. 2000. "The New International Financial Architecture and Its Limits," in Gregory W. Noble and John Ravenhill, editors, The Asian Financial Crisis and the Structure of Global Finance (Cambridge: Cambridge University Press, 2000), pp. 235-260

Kaplan, Ethan and Dani Rodrik. 2001. "Did the Malaysian Controls Work?" Working Paper. Harvard University.

Krugman, Paul. 1999 "The Return Of Depression Economics." Foreign Affairs v.78 no. 1 (Jan/Feb 1999)

Levy-Yeyati, Eduardo, and Federico Sturzenegger. 2000. "Classifying Exchange Rate Regimes: Deeds vs. Words." Mimeo. Universidad Torcuato Di Tella, available at http://www.utdt.edu/~ely.

Leblang, David. 2001a. "The Political Economy of Speculative Attacks in the Developing World," Manuscript, Department of Political Science, University of Colorado.

_____. 2001b. "To Devalue or to Defend: The Political Economy of Exchange Rate Policy in the Developing World. Manuscript, Department of Political Science, University of Colorado.

Miniane, Jacques. 2000. "A New Set of Measures on Capital Account Transactions." Manuscript, John Hopkins University. November 2000.

Nitithanprapas, Ekniti. 2000. "Composite Fundamental Indicators of Vulnerability to Financial Contagion." Ph.D. Dissertation, Claremont Graduate University.

_____, Isriya Nitithanprapas, and Thomas Willett. 2002. "A Composite Variable Approach to Analyzing Currency Crises: The Role of Exchange Rate, Current Account, and Reserves in the Mexican and Asian Crises." Working Paper, Claremont Graduate University.

_____ and Thomas D. Willett. 2000. "A Currency Crisis Model that Works: A Payments Disequilibrium Approach." Claremont Working Paper No. 2000-25. Claremont: Claremont Graduate University, August.

Quinn, Dennis. 2000. "Correlates of Change in International Financial Regulation" American Political Science Review, Vol. 91, No. 3, September 1997.

Quinn, Dennis and Carla Inclán 1997. "The Origins of Financial Openness: A Study of Current and Capital Account Liberalization". *American Journal of Political Science* 41(3): 771-813.

Reinhart, Carmen, and Kenneth Rogoff. 2002. "The Modern History of Exchange Rate Arrangements: A Reinterpretation." Mimeo, International Monetary Fund.

Stiglitz, Joseph. 1998. “Sound Finance and Sustainable Development in Asia.” Keynote Address to the Asia Development Forum, Manila, the Philippines, March 12, 1998

Wessel, David and Robert Davis. 1998. “Currency Controls Are Getting A Hearing Amid Asian Crisis.” The Wall Street Journal. September 4, 1998.

Zhang, Hui. 2001. *The Causes and Impacts of International Financial Liberalization.* Ph.D. dissertation, Claremont Graduate University.

TABLES

FOR TABLES 5-18
* = SIGNIFICANT AT 5% LEVEL.
** = SIGNIFICANT AT 10% LEVEL.

Table 1
Capital Controls

								Non FDI Pvt. Flows/GDP as a %	
Countries	**IMF**	**G&H**	**Q-U**	**Q -M**	**C - M**	**C-M O**	**C-M I**	**1980-89**	**1994-96**
ARGENTINA	0.38	0	12.25	0.13	1.5	1.5	0		
BRAZIL	0.77	1	7.65	0.45	2.3	1.3	1		
CHILE	1	1	8.6	0.39	2.5	0.5	2		
CHINA, HONGKONG	0.08	0	12.5	0.11	0	0	0		
CHINA,P.R.: MAINLAND	0.85	1	6	0.57	3.7	2	3.7	0.8	1.4
COLOMBIA	0.85	1	10	0.29	n/a	n/a	n/a		
EGYPT	0.38	1	11.75	0.16	0	0	0		
HUNGARY	1	1	5.1	0.64	3	1.5	1.5		
INDIA	1	1	6.1	0.56	2.7	1	1.7	0.9	1.2
INDONESIA	0.92	1	12	0.14	1.5	1.5	0	1	3.7
JORDAN	0.92	1	6.8	0.51	3	1.5	1.5		
KOREA	0.92	1	7.75	0.45	2	1	1	1	2.9
MALAYSIA	0.85	1	12	0.14	2	1	1	2.9	6.6
MEXICO	0.85	1	11.3	0.19	2	1	1		
MOROCCO	0.77	1	n/a	n/a	n/a	n/a	n/a		
PAKISTAN	0.92	1	3.3	0.76	2.3	1.3	1		
PERU	0.31	0	12.55	0.10	3	1.5	1.5		
PHILIPPINES	0.92	1	10.2	0.27	2	1	1	1	3.8
SINGAPORE	0.23	0	12.5	0.11	1	1	0	-11.1	-21.2
SOUTH AFRICA	0.92	1	6	0.57	2	1	1		
SRI LANKA	1	1	n/a	n/a	n/a	n/a	n/a	1.1	0.4
THAILAND	0.77	1	8.85	0.37	2	1	1	1.8	4.3
TURKEY	0.69	1	9.1	0.35	2	1	1		
URUGUAY	0.08	0	9.5	0.32	0	0	0		
VENEZUELA, REP.	0.31	0	7.2	0.49	2	1	1		

IMF = IMF Capital Controls
G&H = Glick & Hutchison
Q-U = Quinn Updated
Q-M = Quinn Modified
C-M = Cheryl Magnitude
Net Private Flows exclude FDI
C-M O = Cheryl Magnitude Outflows
C-M I = Cheryl Magnitude Inflows

Table 2
Correlations between the Different Capital Controls Measures

	IMF MEASURE	GLICK & HUTCHISON	QUINN MEASURE	MAGNITUDE MEASURE
IMF MEASURE	**1.00**	**0.89**	**0.47**	**0.16**
GLICK & HUTCHISON	**0.89**	**1.00**	**0.36**	**0.07**
QUINN MEASURE	**0.47**	**0.36**	**1.00**	**-0.04**
MAGNITUDE MEASURE	**0.16**	**0.07**	**-0.04**	**1.00**

Table 3
Classifying Exchange Rate Regimes

					Coefficient	Interven Index	Interven Index	
Country	**Official**	**LYS-Jan-Dec96**	**GrierJ-Feb97**	**Reinhart and Rogoff**	**Time Trend**	**Average meas**	**Variance Meas**	**% Range**
Argentina	Pegged to $	fix	Peg	Currency board	0.000	1.00	1.00	0.05
Brazil	Managed Float	Dirty/cp	Peg	Jun95-Jan99pre-announced CB/dual	0.006	0.95	1.00	9.47
Chile	MF (+_10%) weight$ =45%	Float	Peg	de facto CB(+-5%)/dual Mk	0.007	0.62	0.67	4.46
China	Managed Float	NA	Peg	jan94-dec01 de facto peg	0.000	0.98	0.31	0.50
Colombia	Managed Float	Float	Float	Jan94-Jun99 de facto CB (+-5%)	0.011	0.47	0.94	8.60
Egypt	Managed Float	Inc	NA	de facto peg/multiple rate	0.000	0.94	0.84	0.18
HK	Peg to Dollar	Fix	n/a	Currency board	0.000	1.00	0.99	0.26
Hungary	MF (+-2.25%)	NA	Float	May94-Jan99 de facto CB (+-2%) w/ DM	0.015	0.74	0.98	26.11
India	Indep Float	Float	Peg	Jul95-Dec01 de facto CP	0.000	0.71	0.87	6.29
Indonesia	Managed Float	Dirty/Cp	Peg	Nov78-Jul97 de facto CP	0.003	0.86	0.96	5.58
Jordan	Pegged to composite	fix	NA	Mar93-Aug95 de facto CP	0.000	1.00	0.84	0.00
Korea	Managed Float	fix	Peg	Dec95-Nov97 de facto CP	0.008	0.66	0.99	15.20
Malaysia	Managed Float	Dirty/Cp	Peg	Sep75-July97 de facto moving band	0.000	0.77	1.00	3.39
Mexico*	Indep Float	Diry	Float	Dec94-Mar96 free falling/free floating	0.005	0.68	0.90	7.25
Morocco	Pegged to composite	NA	NA	Jan86-Jan99moving band franc	0.000	0.58	0.95	11.20
Pakistan	Managed Float	Float	NA	May94-July98 de facto CP/parallel mk	0.000	0.94	0.94	17.65
Peru*	Indep Float	Float	NA	Nov93-Mar99 de facto CB(+-2%)	0.006	0.57	0.99	13.14
Philippines	Indep Float	Fix	Peg	Sep95-Jun97de facto peg	0.000	0.97	0.57	0.77
S.Africa	Indep Float	Float	Float	Mar95-Dec01 freely floating	0.011	0.88	1.00	28.75
Singapore	Managed Float	Dirty/Cp	Peg	Jun73-Nov98 de facto moving band (+-2%)	-0.001	0.61	0.99	3.24
Srilanka	Managed Float	Dirty/Cp		95m3-98m2 preannouced cb +-2%	0.006	0.85	0.99	8.71
Thailand	Pegged to composite	Inc	Peg	Mar78-Jul97 de facto peg	0.000	0.74	0.82	3.65
Turkey	Managed Float	float	Float	May84-Jan98 free falling/ managed float	0.043	0.74	1.00	123.52
Uruguay	Managed Float	na	NA	Oct95-Dec98 de facto CB(+-2%)	0.016	0.86	1.00	29.19
Venezuela	Managed Float	dirty/cp	Float	Jul96-Jul97 preannounced CB	0.008	0.83	0.90	2.60
Zimbabwe	Indep Float	fix	NA	July94-Nov97 MF	0.012	0.92	0.94	19.82

Table 4

Classification of exchange rate regimes based on two-way and three-way grouping of exchange rate

	Two-Way Classification	Three-Way Classification
ARGENTINA	Peg	Peg
BRAZIL	Float/Peg	Crawl
CHILE	Float/Peg	Float/Crawl
CHINA	Peg	Peg
CHINA, HONGKONG	Peg	Peg
COLOMBIA	Float	Float
EGYPT	Peg	Peg
HUNGARY	Float	Float/Crawl
INDIA	Float/Peg	Crawl
INDONESIA	Float/Peg	Crawl
JORDAN	Peg	Peg
KOREA	Float/Peg	Crawl
MALAYSIA	Peg	Crawl
MEXICO	Float	Float
MOROCCO	Float	Float
PAKISTAN	Peg	Peg
PERU	Float	Float
PHILIPPINES	Peg	Peg
SINGAPORE	Float/Peg	Crawl/Peg
SOUTH AFRICA	Float	Float
SRI LANKA	Float	Crawl
THAILAND	Peg	Peg
TURKEY	Float	Float/Crawl
URUGUAY	Float	Float
VENEZUELA	Float/Peg	Crawl
ZIMBABWE	Float	Crawl

Table 5
Dependent and Independent Variables

					Crisis Index		
					6 Month	6 Month	4 Month
					0.5:0.5	1/3:1/3:1/3	1/3:1/3:1/3
Country	**REER***	**CA/GDP**	**LB3YR**	**STD/RES**	**ER:R**	**ER:R:I**	**ER:R:I**
ARGENTINA	-4.62	-2.86	15.62	1.44	1.18	1.36	1.36
BRAZIL	22.14	-0.84	42.36	0.82	7.23	11.91	5.20
CHILE	12.83	-3.70	41.92	0.51	4.39	4.55	2.29
CHINA, HONGKONG	7.67	2.49	17.11	2.72	2.02	3.38	0.03
CHINA,P.R.: MAINLAND	22.80	0.25	39.52	0.25	-0.49	-0.32	-0.94
COLOMBIA	18.89	-3.17	50.65	0.67	4.24	3.66	3.03
EGYPT	9.99	4.00	43.06	0.17	0.54	0.73	0.51
HUNGARY	0.34	-5.86	-21.04	0.48	4.41	2.94	2.07
INDIA	-4.25	-1.17	24.46	0.31	6.56	5.07	2.27
INDONESIA	3.22	-2.29	49.37	1.78	18.53	28.74	25.18
JORDAN	-3.31	-8.29	17.51	0.42	0.34	0.34	-1.98
KOREA	3.81	-1.62	44.09	2.12	32.84	24.39	4.47
MALAYSIA	7.93	-5.77	104.62	0.60	15.40	11.69	11.69
MEXICO	-19.62	-4.12	-43.18	1.23	3.77	3.34	0.15
MOROCCO	5.32	-1.87	29.81	0.40	4.98	3.32	3.32
PAKISTAN	-1.16	-4.35	12.19	2.52	15.00	11.90	10.77
PERU	1.87	-5.83	127.10	0.64	3.11	2.28	2.28
PHILIPPINES	17.29	-3.90	127.06	0.93	15.03	11.07	10.05
SINGAPORE	6.83	13.78	52.96	2.43	4.74	4.39	2.85
SOUTH AFRICA	-7.65	-0.01	26.27	3.03	3.81	2.67	1.13
SRI LANKA	5.28	-5.12	18.06	0.23	2.39	5.51	5.37
THAILAND	6.71	-6.50	55.41	1.51	20.47	16.46	16.01
TURKEY	30.06	-0.97	76.46	0.86	7.14	6.86	3.35
URUGUAY	5.52	-1.46	26.32	2.71	2.13	1.82	1.25
VENEZUELA	17.82	2.03	-50.94	0.27	4.69	3.67	1.97
ZIMBABWE	15.00	-5.62	-2.33	1.66	34.67	24.70	15.03

* = 3 year log change of 12 month precrisis average of REER
CA/ GDP = CA/GDP Avg92-96
LB3YR = LendingBoom3yr

STD/RES = Short term debt to reserves

ER = Exchange Rate
R = Reserves
I = Interest Rate

Table 6
Using a 2-way classification (countries are classified biased toward floating regime) Dependent variable : Crisis Index (within six-month crisis window)
Numbers in parentheses are heteroscedasticity consistent p-value

Independent Variable	IMF measure	Glick-Hutchison measure	Quinn measure	Magnitude measure
Composite	0.83* (.005)	0.89* (.002)	0.95* (.020)	0.45** (.051)
Lending Boom	0.03 (.182)	0.02 (.210)	0.04 (.195)	0.06* (.018)
Short term debt to reserves	3.57** (.096)	3.60 (.105)	2.26 (.200)	2.07 (.296)
Control measures	10.78* (.034)	7.33* (.048)	0.37 (.558)	-0.52 (.733)
Dummy Float	1.74 (.282)	2.48 (.167)	2.65 (.255)	4.18 (.121)
Adjusted R^2	0.36	0.35	-0.00	0.03

Table 7
Using a 2-way classification (countries are classified biased toward pegged regime) Dependent variable : Crisis Index (within six-month crisis window)
Numbers in parentheses are heteroscedasticity consistent p-value

Independent Variable	IMF measure	Glick-Hutchison measure	Quinn measure	Magnitude measure
Composite	0.95* (.005)	1.01* (.003)	0.81** (.098)	0.60** (.053)
Lending Boom	0.01 (.442)	0.01 (.572)	0.02 (.396)	0.03 (.150)
Short term debt to reserves	3.33** (.067)	0.31** (.081)	2.26 (.111)	2.06 (.222)
Control measures	10.32* (.041)	6.67** (.080)	0.33 (.631)	-0.19 (.888)
Dummy Float	-3.73* (.026)	-3.36* (.040)	-4.84** (.078)	-3.74 (.190)
Adjusted R^2	0.41	0.38	0.07	-0.02

Table 8
Using a 2-way classification (countries are classified biased toward floating regime) Dependent variable : Crisis Index (within four-month crisis window)
Numbers in parentheses are heteroscedasticity consistent p-value

Independent Variable	IMF measure	Glick-Hutchison measure	Quinn measure	Magnitude measure
Composite	0.74* (.001)	0.78* (.000)	1.16* (.014)	0.82* (.000)
Lending Boom	0.03** (.086)	0.03** (.088)	0.03 (.139)	0.05* (.019)
Short term debt to reserves	2.01 (.182)	2.00 (.196)	1.35 (.254)	1.31 (.366)
Control measures	6.94** (.088)	4.48 (.116)	0.15 (.764)	-0.80 (.508)
Dummy Float	-0.36 (.818)	0.11 (.950)	0.42 (.840)	1.80 (.456)
Adjusted R^2	0.31	0.29	0.08	0.03

.

Table 9
Using a 2-way classification (countries are classified biased toward pegged regime) Dependent variable : Crisis Index (within four-month crisis window)
Numbers in parentheses are heteroscedasticity consistent p-value

Independent Variable	IMF measure	Glick-Hutchison measure	Quinn measure	Magnitude measure
Composite	0.82* (.000)	0.86* (.000)	1.13* (.026)	0.90* (.000)
Lending Boom	0.02** (.099)	0.02 (.106)	0.02 (.282)	0.03* (.030)
Short term debt to reserves	1.83 (.192)	1.81 (.205)	1.33 (.234)	1.31 (.346)
Control measures	8.93* (0.04)	6.24 (0.28)	0.4 (0.5)	-1.06 (0.53)
Dummy Float	-2.47** (.051)	-2.44** (.068)	-3.10 (.144)	-1.96 (.379)
Adjusted R^2	0.36	0.34	0.15	0.03

Table 10
Using a 3-way classification (countries are classified biased toward floating regime) Dependent variable: Crisis Index (within six-month crisis window)
Numbers in parentheses are heteroscedasticity consistent p-value

Independent Variable	IMF measure	Glick-Hutchison measure	Quinn measure	Magnitude measure
Composite	0.53** (0.1)	0.55** (0.09)	0.6 (0.43)	-0.14 (0.25)
Lending Boom	0.02 (0.31)	0.02 (0.39)	0.02 (0.39)	0.04** (0.09)
Short term debt to reserves	3.18** (0.09)	3.23** (0.09)	1.92 (0.19)	2.00 (0.27)
Control measures	8.93* (0.04)	6.24 (0.28)	0.4 (0.5)	-1.06 (0.53)
Dummy for float regime	-1.39 (0.35)	-0.19 (0.58)	-1.52 (0.41)	1.09 (0.62)
Dummy for crawl regime	5.62** (0.06)	6.43* (0.03)	8.02* (0.01)	10.59* (0.02)
Adjust R2	0.47	0.47	0.25	0.27

Table 11
Using a 3-way classification (countries are classified biased toward crawling band/peg regime) Dependent variable : Crisis Index (within six-month crisis window)
Numbers in parentheses are heteroscedasticity consistent p-value

Independent Variable	IMF measure	Glick-Hutchison measure	Quinn measure	Magnitude measure
Composite	0.64* (0.04)	0.65* (0.05)	0.6 (0.37)	-0.14 (0.66)
Lending Boom	0.03* (0.04)	0.03* (0.05)	0.04 (0.15)	0.05* (0.05)
Short term debt to reserves	4.13* (0.03)	4.28* (0.03)	3.33** (0.08)	2.83 (0.18)
Control measures	9.43* (0.02)	6.83* (0.04)	0.17 (0.79)	-0.52 (0.67)
Dummy for float regime	-3.15** (0.08)	-2.84 (0.16)	-3.9 (0.22)	-0.79 (0.75)
Dummy for crawl regime	4.19** (0.06)	5.04** (0.03)	5.47* (0.05)	7.7* (0.4)
Adjust R2	0.48	0.5	0.21	0.19

Table 12
Using a 3-way classification (countries are classified biased toward pegged regime) Dependent variable : Crisis Index (within six-month crisis window)
Numbers in parentheses are heteroscedasticity consistent p-value

Independent Variable	IMF measure	Glick-Hutchison measure	Quinn measure	Magnitude measure
Composite	0.68* (0.01)	0.7* (0.01)	0.96* (0.03)	0.37 (0.43)
Lending Boom	0.05* (0.04)	0.05* (0.04)	0.04 (0.15)	0.06** (0.06)
Short term debt to reserves	4.39* (0.02)	4.57* (0.01)	3.93* (0.02)	3.52** (0.06)
Control measures	7.73* (0.03)	5.77* (0.02)	-0.08 (0.89)	-0.68 (0.61)
Dummy for float regime	-2.73 (0.12)	-2.58 (0.16)	-3.52 (0.28)	-0.73 (0.77)
Dummy for crawl regime	6.36* (0.02)	6.96* (0.01)	8.77* (0.02)	9.08* (0.01)
Adjust R2	0.56	0.57	0.38	0.33

Table 13
Using a 3-way classification (countries are classified biased toward floating regime) Dependent variable : Crisis Index (within four-month crisis window)
Numbers in parentheses are heteroscedasticity consistent p-value

Independent Variable	IMF measure	Glick-Hutchison measure	Quinn measure	Magnitude measure
Composite	0.63** (0.07)	0.67* (0.02)	1.04 ** (0.1)	0.46 (0.16)
Lending Boom	0.03 (0.31)	0.03* (0.02)	0.02 (0.36)	0.04* (0.04)
Short term debt to reserves	1.97 (0.15)	2.43 (0.11)	1.38 (0.19)	1.54 (0.27)
Control measures	5.35 (0.11)	5.48** (0.1)	0.07 (0.87)	-1.01 (0.47)
Dummy for float regime	-2.05 (0.18)	-3.15* (0.05)	-2.38 (0.18)	-0.35 (0.89)
Dummy for crawl regime	1.12 (0.74)	0.67 (0.8)	2.48 (0.49)	4.26 (0.38)
Adjust R2	0.32	0.35	0.17	0.09

Table 14
Using a 3-way classification (countries are classified biased toward crawling peg/band regime) Dependent variable : Crisis Index (within four-month crisis window)
Numbers in parentheses are heteroscedasticity consistent p-value

Independent Variable	IMF measure	Glick-Hutchison measure	Quinn measure	Magnitude measure
Composite	0.67* (0.02)	0.69* (0.02)	1.03 ** (0.09)	0.66* (0.02)
Lending Boom	0.03* (0.02)	0.03* (0.02)	0.03 ** (0.09)	1.94* (0.02)
Short term debt to reserves	2.44 (0.11)	2.5 (0.11)	2.19 (0.14)	1.94* (0.02)
Control measures	5.48* (0.11)	3.79 (0.12)	-0.06 (0.91)	0.76 (0.49)
Dummy for float regime	-3.15* (0.05)	-2.98 ** (0.07)	-4.13 ** (0.09)	-1.26 (0.56)
Dummy for crawl regime	0.67 (0.79)	1.17 (0.66)	1.45 (0.6)	2.84 (0.43)
Adjust R2	0.35	0.35	0.2	0.06

Table 15
Using a 3-way classification (countries are classified biased toward pegged regime) Dependent variable : Crisis Index (within four-month crisis window)
Numbers in parentheses are heteroscedasticity consistent p-value

Independent Variable	IMF measure	Glick-Hutchison Measure	Quinn measure	Magnitude measure
Composite	0.67* (0.01)	0.7* (0.01)	1.16* (0.03)	0.8 (0.02)
Lending Boom	0.04* (0.05)	0.04* (0.05)	0.03** (0.09)	0.05* (0.04)
Short term debt to reserves	2.52** (0.1)	2.61** (0.1)	2.5** (0.1)	2.26 (0.19)
Control measures	4.94** (0.09)	3.47** (0.09)	-0.17 (0.76)	-0.86 (0.45)
Dummy for float regime	-2.82** (0.06)	-2.72** (0.07)	-3.52 (0.14)	-0.95 (0.62)
Dummy for crawl regime	1.66 (0.59)	2.08 (0.50)	3.75 (0.35)	3.94 (0.28)
Adjust R2	0.36	0.36	0.27	0.12

Table 16
Interaction between pegged exchange rate regime dummy and capital control measure where the classification is biased toward floating regime.
Dependent Variable Crisis index (within six-month crisis window)
Numbers in parentheses are heteroscedasticity consistent p-value

Independent Variable	IMF measure	Glick-Hutchison measure	Quinn measure	Magnitude measure
Composite	1.04* (0.00)	1.13* (0.00)	0.99* (0.00)	0.51* (0.00)
Lending boom	0.03 (0.32)	0.03 (0.32)	0.04 (0.27)	0.06 (0.03)
Short term debt to reserves	2.46 (0.12)	2.45 (0.11)	2.12 (0.19)	2.19 (0.24)
Control* dummy for peg	-0.86 (0.74)	-0.54 (0.79)	-0.35 (0.17)	-1.35 (0.29)
Adjust R2	0.2	0.2	0.05	0.01

Table 17
Interaction between pegged exchange rate regime dummy and capital control measure when the classification is biased toward pegged regime.
Dependent Variable Crisis index (within six-month crisis window)
Numbers in parentheses are heteroscedasticity consistent p-value

Independent Variable	IMF measure	Glick-Hutchison measure	Quinn measure	Magnitude measure
Composite	1.19* (0.00)	1.15* (0.00)	0.7 (0.14)	0.39 (0.34)
Lending boom	-0.003 (0.83)	-0.003 (0.79)	0.02 (0.41)	0.03 (0.12)
Short term debt to reserves	2.83* (0.02)	3.21* (0.01)	2.05 (0.21)	1.82 (0.12)
Control* dummy for peg	8.8* (0.03)	7.52* (0.00)	-0.35 (0.33)	1.67* (0.04)
Adjust R2	0.43	0.43	0.06	0.04

Table 18
Interaction between pegged exchange rate regime dummy and capital control measure where the classification is biased toward floating regime.
Dependent Variable Crisis index (within four-month crisis window)
Numbers in parentheses are heteroscedasticity consistent p-value

Independent Variable	IMF measure	Glick - Hutchison measure	Quinn measure	Magnitude measure
Composite	0.85* (0.00)	0.85* (0.00)	1.17* (0.03)	0.72* (0.00)
Lending boom	0.03 (0.15)	0.03 (0.15)	0.03 (0.22)	0.04* (0.04)
Short term debt to reserves	1.63 (0.11)	1.69** (0.1)	1.56 (0.17)	1.37 (0.26)
Control* dummy for peg	1.82 (0.48)	1.48 (0.49)	0.08 (0.68)	-0.04 (0.96)
Adjust R2	0.26	0.26	0.15	0.06

Table 19
Interaction between pegged exchange rate regime dummy and capital control measure where the classification is biased toward pegged regime.
Dependent Variable Crisis index (within four-month crisis window)
Numbers in parentheses are heteroscedasticity consistent p-value

Independent Variable	IMF measure	Glick - Hutchison measure	Quinn measure	Magnitude measure
Composite	0.95* (0.00)	0.93* (0.00)	1.05** (0.07)	0.70 (0.25)
Lending boom	0.01 (0.52)	0.01 (0.54)	0.01 (0.58)	0.03 (0.28)
Short term debt to reserves	1.78** (0.10)	2.20** (0.07)	1.44 (0.27)	1.27 (0.33)
Control* dummy for peg	5.52* (0.03)	4.71* (0.03)	- 0.30 (0.22)	0.81** (0.10)
Adjust R2	0.40	0.40	0.21	0.21

APPENDIX I

Capital controls data explanation

Glick and Hutchison

The dummy variable index is coded based on the IMF's *Annual Report on Exchange Restrictions and Exchange Restrictions.* The data is from the paper 'Stopping Hot Money or Signaling Bad Policy? Capital Controls and the Onset of Currency Crises' by Reuven Glick and Michael Hutchison. They coded the capital controls index from 1975-1997 for 90 developing and emerging-market countries.

A value of one is assigned if there are controls and zero if otherwise. However, in 1996, after the IMF disaggregated the controls on capital, Glick and Hutchison improved on the dummy variable index. The IMF initially had 10 separate categories for controls on capital transactions which has since been increased to 13 separate categories. A value of one is assigned if countries had restrictions on five or more categories and zero if there were restrictions on less than five categories. They used this new method of coding for 1996 and 1997.

Quinn Approach Openness Variable

The original data coded by Dennis Quinn & Carla Inclán was for 21 developed countries from 1950-1993 and for 44 developing countries for only two years (1980 and 1987). This variable intended to measure intensity of controls. Using the Quinn methodology, Hui Zhang of Claremont Graduate University coded the data for the 44 developing countries from 1970 to 1994. Lewis Snider and Cheryl Van Den Handel of CGU are currently coding this data making it more current. The Quinn openness measure is different from other capital controls measures because it includes restrictions on payments or current account as well as capital account

transactions. This measure is ranges from 0 to 14 where a higher number means an economy is more open. For a more detailed explanation, please see the Appendix II.

The IMF Based Capital Controls Index

This has been coded based on the new IMF disaggregated approach. The formula used to calculate the capital controls index is

$$KCI = 1/N_{CI} \ \Sigma_1^N CI$$

Where **KCI** is the indices of controls on capital while $\mathbf{N_{CI}}$ denotes the number of categories and **CI** refers to the individual categories. $\mathbf{\Sigma_1^N\ CI}$ is the aggregate of the different categories. The different categories are:

1. Capital Market Securities
2. Money Market Instruments
3. Collective Investment Securities
4. Derivatives and other Instruments
5. Commercial Credits
6. Financial Credits
7. Guarantee, Sureties, and Financial Backup Facilities
8. Direct Investment
9. Liquidation of Direct Investment
10. Real Estate Transactions
11. Personal Capital Movements
12. Commercial Banks and Other Credit Institutions
13. Institutional Investors

A value of one is assigned if there are controls on that particular category and 0 if otherwise. The index of capital controls ranges from 0 to 1 where a higher number indicates more controls. This index thus measures the breath of capital controls.

Magnitude Measure

This measure has been coded by Cheryl Van Den Handel of Claremont Graduate University. The index ranges from 0 to 4 where a higher number refers to more controls on capital transactions. This measure is inspired from the Quinn measure of openness but is a more fine-grained measure. For a more detailed explanation, please see Appendix II.

Appendix II

The Quinn Openness Scale

and

The Magnitude of Restrictions

On Current and Capital Accounts

Cheryl Van Den Handel

Claremont Graduate University

August 2002

The Quinn Openness Scale and The Magnitude of Restrictions

on Current and Capital Accounts

Following development of the economic Openness scale by Dr. Dennis Quinn, Carla Inclán, and Maria Toyoda of Stanford University, the Magnitude of Restrictions scale was developed in pursuit of finer-grained measure. Both scales are based upon restrictions to the current and capital accounts as outlined in the International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions (hereafter the *Annual*) begun in 1950 and continuing currently. Exchange arrangements are reviewed in relationship to other countries and general rules regarding inflows and outflows of trade goods and capital transactions.

Inflows and outflows from the current account are broken down as payments and receipts on imports and exports, and invisibles. The capital account is divided into purchases and sales of securities, guarantees, derivatives, real estate, direct investment by individuals (or individual firms and banks), and currency transactions by financial institutions.

Quinn's scale runs in increments of .5 from 0 to 2, with 0 being totally blocked and 2 being totally open, generating a financial 'openness' scale. The composite total of current and capital account is 0-14. For all restrictions, 0 to .5 was reserved for quantitative and regulatory restrictions and licenses that curtail economic activity. Approvals and heavy taxes were scored as 1 and simple taxation of exchanges scored at 1.5.[9] International arrangements that structure relationships between countries and moderate restrictions are a feature of Dennis Quinn's scale, where agreement with IMF Chapter VIII is coded as 1, membership in a free trade zone or common currency area is coded as .5, and European Union membership is coded as 1.

[9] Quinn, Dennis. 1997. *The correlates of change in international financial regulation*. The American Political Science Review. 91:3, pgs. 535-544.

For Current Account transactions:

If receipts or payments are surrendered or blocked, X=0,

If transfers require approval (unless automatic), $X \leq 1$,

If transfers require approval (usually automatic) and are heavily taxed, X =1,

If transfers are affected through the market mechanism and taxed, $X \geq 1$,

The degree of taxation determines Y where X = 1+Y,

If transfers are unrestricted, X=2.

For Capital Account transactions:

If approval is required and rarely given and surrender of receipts is required X=0,

If approval is required and sometimes given X=.5

If approval is required and frequently given X=1

If approval is not required and taxed, X= 1.5, if heavily taxed, X=1

If not restricted X=2.

The Magnitude of Restrictions scale is differentiated from Quinn's in that the M.R. scale's direction is reversed so that 0 indicates no restrictions and 2 denotes the greatest degree of restrictions. A finer-grained scale than Quinn's, it measures combinations of restrictions as well as degrees of change, capturing small changes in restrictions over time. The decision rules are as follows:

Current Account:

Where 0 = no restrictions and 2 is the greatest degree of restrictions

0	No restrictions
.5	Taxes
1	Heavy Taxes
1	Approval is required
1.3	Approval and tariffs
1.5	Licenses or quantitative restrictions
1.5	Repatriation required
1.6	Combination of licenses and quantitative restrictions
1.7	Combination of license or quantitative restrictions with tariffs or approvals
1.8	Combination of licenses, quantitative restrictions and tariffs, or licenses, quantitative restrictions and approval
1.9	Repatriation and graduated surrender requirements
2	Surrender of profits required

Capital Account:

Where 0 = no restrictions and 2 is the greatest degree of restrictions

0	No restrictions
.5	Taxes
1	Approval

1.3 Approval and taxes

1.5 Repatriation required or

quantitative restrictions on institutional investors or on foreign participation

1.7 Unspecified combinations of restrictions, or a combination of approvals, quantitative restrictions, or blocked flows.

1.9 Repatriation and graduated surrender requirements

2. 100% surrender required

If restrictions are lightened or lifted, or further restricted between January and June of the reported year, then coding is adjusted accordingly. If restrictions are lightened or lifted, or increased between July and December of the reported year, then coding is not adjusted. Since approvals are often not across the board and typically few 'approvals that are not often granted' are noted in the *Annual* text (only 2 out of 55 countries), all required approvals were given the same weight. Where 'approvals are not often granted,' typically other restrictions are in effect that must be accounted for as well. However, I do not deem this an entirely adequate method. It may be better to 1) code for bureaucratic delays based on language in the *Annual*, or 2) use other measures in combination, such as Transparency International's Bribery Index and one of several existing indexes of bureaucratic or administrative delays to express delays in the approval process.

International arrangements that structure relationships between countries and moderate restrictions in Quinn's scale remain in the Magnitude of Restrictions with the caveat that once again the scale is reversed. If a country has agreed to IMF chapter VIII, the code is 1 (many have by 2000). If a country belongs to a free trade area or a common currency zone, or a common

market area (most belong to one or more), the code is .5. If a member of the European Union, the code is .25. The current and capital accounts are tallied separately and then totaled, and finally the international arrangements are added to give a composite total.

Given that the *Annual* distinguishes between restrictions on individual transactions and restrictions on institutional investors from 1996 to the present, future research using this coding schema will seek to distinguish specifically between restrictions on the economic activities individuals and those of financial institutions.

Appendix III

Classifying Exchange Rate Regimes

Classifying exchange rate regimes involves choices about both the numbers of classifications to use and the procedures for placing countries into these categories. There is no one correct way to delineate categories. This will depend both on the purposes of the study and the degrees of freedom available. Thus, for example, concerns with influence on currency crises would imply the usefulness of a much broader range of categories than would concerns with effects on inflation or growth. For our purposes, therefore, we would like to make a number of distinctions, for example among adjustable pegs, crawling pegs, crawling bands, and managed floats, but this would require a very large scale study in order to have a number of observations under each category.[10] For the analysis of a single crisis, however, there are two few data points to allow meaningful discrimination at that level of detail. Apart from limited observations, it has also proven difficult in many cases to make clear delineation among some of these categories. This comes in part from the tendency for many countries to announce an official policy of managed or independent floating while in practice following a range of policies from de facto adjustable pegs to crawling pegs and bands with either hard or soft edges to just plain heavy of light discretionary management of the exchange rate. Using official classifications, most of the hardest hit countries during the Asian crisis were following managed floats, but as was discussed in the introduction, such official classifications can be highly misleading.

We can be fairly confident in classifying China, the Philippines, and Thailand as following Bretton-Woods type adjustable pegs, but the classification of countries such as India, Indonesia, Korea and Singapore is much more different. There has been some tendency to refer

[10] David Leblang and the latter author have initiated such a study with support from the National Science Foundation. This paper is one aspect of that larger study.

to India and Singapore as practicing managed flexibility before the crisis, while describing Indonesia and Korea as operating crawling bands. A look at the behavior of their exchange rates prior to the crises does not suggest a strong basis for distinguishing among these regimes, however. For example, over the eighteen months before the crises, the range of the exchange rate movements of the Singapore was less than 4 percent while the Indonesia rupiah at 5.6 percent moved almost as much as the Indian rupee at 6.3 percent. All of these were dwarfed by the over 15 percent movement of the Korean won. Malaysia's change was slightly larger than Singapore. As will be discussed below looking over a longer time period can sometimes offer a different picture as can taking into account our estimate of countries' propensities to intervene.

Our approach to the behavioral classification of exchange rate regimes focuses on the propensity of the authorities to affect fluctuations in demand and supply in the foreign exchange market through official intervention. Absence of actual intervention data for most countries forces us to use changes in international reserves as a crude proxy. Looking at both reserve and exchange rate changes allows us to distinguish among periods of little exchange rate fluctuation as being due to heavy intervention or to the absence of shocks. Likewise, in the face of huge shocks even considerable exchange rate movements could mask a good deal of intervention. Several recent studies have adopted a similar approach by looking at the ratio of the variances of changes in reserves and exchange rates, but in the present trends the use of simple standard deviations or variances is problematic. We argue that at least two dimensions are necessary to classify exchange rate regimes – the trend rate of change of the exchange rate and the propensity to intervene. We therefore develop two indicators to classify exchange rate regimes, a rate of crawl coefficient and a propensity to intervene coefficient.[11] The propensity to intervene is the

[11] We use the coefficient of the country-specific time trend on the log of bilateral exchange rate as a proxy of the rate of crawl. Our intervention index is the average value of the ratio of percentage change in reserves to sum of the

degree to which authorities allow pressures in the currency market to move the exchange rate versus intervening to dampen its movement. Thus if there is downward pressure on a currency, under a fixed rate the authorities would buy domestic currency in the foreign exchange market, i.e., sell international reserves, in order to keep the value of the currency constant (i.e., propensity to intervene of one) or under a completely free float let the currency depreciate with no intervention (propensity of zero). Some combination of the two implies a coefficient between zero (free float) and one (completely fixed). Note that 0.5 does not necessarily reflect a dividing line of any meaning sort since we do not know with any confidence the slope or elasticity of the excess demand functions in the foreign exchange market. The use of these rankings in cross-country or over time comparisons is valid only to the extent that there are not large differences in these elasticities. See Nitithanprapas and Willett (2002).

We have no clear theoretical basis for determining a date of exchange between these two dimensions hence we cannot meaningfully collapse these two distinct dimensions into one number. Essentially, the issue is how to rank in terms of over-all flexibility a narrow crawling peg which allows one percent fluctuations around a five percent trend and, say, a fixed band that allows five percent fluctuations in each direction against a fixed parity.

The use of our approach highlights issues of the time periods used for analysis and the problems of change in trends. Consider the case of Singapore. Looking at the behavior of the exchange rate over the whole 1990-1997 period, one would be likely to classify it as having a fairly flexible regime. However, we find only a small movement of exchange rate during 1996-1997 before the Asian crisis. From this perspective, Singapore seems to have abandoned a managed float. It could be possible that during 1996, Singapore had few shocks so that nominal

---

percentage change in reserves, plus the percentage change in the exchange rate. We also compare the index using the variance measure, the ratio of the variance of percentage change in reserves to the sum of the variance of percent

exchange rate did not have to move. Here, our intervention coefficient and the coefficient of time trend may help classifying exchange rate regimes. There is a change in trends in exchange rate during 1995 August. On average, Singapore had an intervention coefficient of 0.6 during 1996 with a downward trend of 0.001. In comparison with the intervention coefficient during 1994, Singapore had the coefficient of 0.4 with a downward trend of 0.004. Hence, during 1996, Singapore adopted a less flexible regime than during 1994.

Unfortunately, some of the recent studies that have included classifications of exchange rate regimes have not paid sufficient attention to such ambiguities. Thus, for example, Grier and Grier (2001) use a simple two-way classification of exchange rate regimes into pegged and flexible and found that their pegged rate dummy had a significant coefficient in explaining how hard countries were hit during the Asian crisis. A look at table 2 reveals substantial differences between Grier and Grier's classifications and the estimates of regime type estimated by LYS's statistical cluster analyses.

Our initial intention was to develop a "correct" classification of these countries based on applying our own type of behavioral estimates combined with judgmental assessments. We quickly found, however that this was not so easy. We started with the preconception that India and Singapore had more flexible regimes than Indonesia and Korea, but found that we could not substantiate the case for this to our own satisfaction. That made us suspect that it would be still harder to convince others. Thus we reluctantly resorted to the coward's approach –when in doubt do sensitivity analysis. (Of course this is a good rule even when you are not in doubt. Confidence does not assure correctness). Thus for the cases where Grier and Grier, LYS, Reinhart and Rogoff, and our own assessments reached conflicting results on a two-way classification of pegged versus flexible, we ran our regressions both ways. We then also tried a

---

change in reserves, and the variance of percent change in exchange rates.

three-way classification of fixed and adjustable pegs, crawling pegs and bands, and managed floats and again ran ambiguous cases both ways.

In our larger study we plan to distinguish between hard and soft peg, but for this study even a casual following of the financial news would make one aware that the currency board form of hard fix was not sufficiently credible to protect Argentina and Hong Kong from speculative attacks. Thus for the study with its quite limited degree of freedom, we combined hard and soft fixed pegs.

Singapore Exchange Rate