EXCHANGE RATE REGIME CHOICE AND THE EXTERNAL SECTOR

By

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Chapter 1

Introduction

The choice of exchange rate regime and its consequences is arguably the central concern for small open economies. Currently, we are witnessing a great intensity of research on both the theoretical and empirical aspects of exchange rate economics. The current theoretical debate centers on the hollowing out hypothesis where it is believed that intermediate exchange rate regimes cannot survive in an era of very high capital mobility. Based on the classic impossible trinity doctrine of open economy macroeconomics, the hollowing out hypothesis predicts that only hard pegs or floating regimes are possible in the long run.

There are competing paradigms about which variables (economic, political, institutional) enter the decision to choose the exchange rate regime. These theories include one that emphasizes country characteristics (optimum currency area theory or OCA) and another, the potential tradeoffs between macroeconomic goals (political economy approach). The empirical literature is also undergoing a revolution of sorts as economists acknowledge the importance of contrasting de facto from de jure exchange rate regimes. There is also a political economy element in this as countries may announce a particular official exchange rate regime (de jure) but do another thing (de facto) for strategic reasons. Colorful names have been given to these discrepancies such as fear of floating and fear of pegging. This insight is creating a fresh wave of research on the appropriate exchange rate regime classification.

The first goal of this study is to apply one of the most well known de facto classification schemes, namely the Reinhart and Rogoff (2002) classification or RR, in an

analysis of de facto exchange rate regime choice for selected Southeast Asian and Latin American countries. This classification scheme is based on country chronologies at a monthly frequency. However, as monthly exchange rate regime transitions are not the norm for the countries under consideration, I choose to conduct the study on a quarterly basis. This choice of frequency makes data availability less problematic and can still accommodate the occasional regime changes that occur within a particular year. I use variables suggested by the competing paradigms of exchange rate regime choice as explanatory variables.

The second goal of this study is to determine whether the choice of exchange rate regime has impacts on several external sector performance variables (i.e. the change in international reserves, the level of international reserves, the level of inward foreign direct investment, and foreign capital flows) and one domestic objective (i.e. the output gap). I lean more heavily on the external sector variables since most of the countries included in this study are small open economies – the ASEAN-5 comprised of Indonesia, Malaysia, the Philippines, Singapore, and Thailand on one hand, and the countries of MERCOSUR comprised of Argentina, Brazil, Paraguay, and Uruguay plus Chile. The investigation of the link between the exchange rate regime and the output gap provides a nice comparison and also addresses the issues of contractionary devaluation and the output-inflation tradeoff. My concentration on external sector variables complement studies such as those of Ghosh, Gulde, and Wolf (2002) (GGW) and Glick et al. (1999) where the focus is on domestic economic objectives such as inflation and output. The econometric methodology I employ to investigate the two-way relationship between exchange rate regime choice and macroeconomic performance is the two-stage

simultaneous equations model with a limited dependent variable used by GGW. This choice of technique is motivated by a proposition I wish to prove in this study: that the political economy approach to exchange rate regime choice provides a more complete analysis of the issues by endogenizing both the exchange rate regime and the target macroeconomic variable.

The study is organized as follows: Chapter 2 is a survey of the literature on the theoretical issues and recent empirical studies. Chapter 3 presents the structures of some formal political economy models. I discuss in detail one particular model, the Welch and McLeod (1993) model as this one explicitly tackles the tradeoff between inflation stabilization and the targeting of an external sector variable - international reserves. I extend the model by allowing for other timings of moves in the basic sequential game framework. Chapter 4 presents country chronologies providing a historical background for each country in the study. The theme of the country chronologies is the impossible trinity doctrine, which is the main policy constraint for the choice of exchange rate regime. I attempt to trace the evolution of exchange rate policy, the degree of capital account restrictions, and average interest differentials representing monetary independence. Chapter 5 contains the empirical framework. It describes the two-stage simultaneous equations procedure as the general methodology of choice and explains the many applications I perform in this study. Alternative methodologies, such as the use of seemingly unrelated regression (SUR) and specifications with interaction effects, are also discussed. Chapter 6 discusses the estimation results. Chapter 7 summarizes the main empirical findings of the study and concludes.

Chapter 2

Survey of Literature

2.1 The Main Branches

The recent literature on exchange rate regime choice and consequence has many branches. Among these branches are purely theoretical contributions seeking to explain the issues and tradeoffs involved, empirical contributions that seek to identify forces governing the de facto choices made, empirical contributions that focus on the macroeconomic consequences of exchange rate regime choice (including the issues of contractionary devaluation and the potential pitfalls of floating exchange rates), and those that seek to explain exchange rate regime transitions.

Many of the works I review in this chapter are empirical contributions since the present study is also empirically based. This reflects the present state of affairs whereby no single theoretical approach seems to have overwhelming empirical victory over another. For example, while some studies may find support for the importance of optimum currency area variables such as country size and trade openness, others do not. The same goes as well for the variables suggested by the political economy approach such as current inflation, inflation history, and the degree of international competitiveness.

I start by examining the general issue of exchange rate regime choice in the context of emerging market and less developed economies. Due to the voluminous amount of writing on this subject, I have no other recourse but to apply selective sampling for each branch of the literature focusing on the most recent writings of leading scholars in the field. Edwards (2000), Frankel (2003), Joshi (2003), and Calvo and

Mishkin (2003), are just some of the more recent contributions addressing the issue of choosing the optimal exchange rate regime for emerging economies. It is not surprising that many of the recent papers on exchange rate regime choice are geared towards emerging economies. It is these countries' experiences with collapsing exchange rate regimes in the late 1990s that revitalized the exchange rate regime choice research agenda in the first place.

Second, I review some recent empirical findings on the determinants of actual exchange rate regimes selected by emerging economies. Poirson (2001), Von Hagen and Zhou (2002a), and Von Hagen and Zhou (2004) reflect the current trend in empirical work whereby cross-section and panel data on many countries are used. These studies typically use the country year as the basic unit of observation, owing to the difficulty of obtaining monthly or quarterly series on some economic variables, especially for emerging and less developed economies. Once again, the usual approach in selecting potential explanatory variables is to draw from the main theoretical approaches to exchange rate regime choice: optimum currency area theory and political economy theory. The latter draws its methodological foundation from the famous model of time inconsistency due to Barro and Gordon (1983). The ultimate choice of explanatory variable set depends on what different authors consider as relevant for their sample. I also review studies that examine exchange rate regime choice for single countries over a period of time. Leon and Oliva (1999) study the Chilean experience while Agbola and Kunanopparat (2003) study Thailand. Unlike the multi-country studies, these papers employ time-series methods to interpret country historical experiences.

Some contributions like Ghosh, Gulde, and Wolf (2002) and Rogoff, Husain, Mody, Brooks, and Ooomes (2003) also discuss consequences of exchange rate regime choice. We can also place Reinhart and Rogoff (2002) in this category since they raise the question of whether exchange rate regimes matter. However, the paper of Reinhart and Rogoff is really a presentation of their new classification method rather than an examination of consequences.

Another branch of the literature are those studies that seek to explain exchange rate regime transitions. These include Masson (2001) and Masson and Ruge-Murcia (2003). The methodology in these two papers is the Markov-switching approach. The latter is more ambitious as it seeks to combine the Markov-switching approach with the explanatory variables used in the multi-country empirical studies. The investigation of exchange rate regime transitions, by itself, is a direct test of the bi-polar view or hollowing-out hypothesis. When combined with tests involving determinants of exchange rate regimes, such studies hope to present both static and dynamic features of the problem.

Finally, I review one of the latest trends in the literature namely, the new problems that arise in an era of generalized floating and high capital mobility, particularly the roles that international reserves and capital controls play. While international reserves and capital controls are traditionally considered to be relevant for fixed exchange rate regimes, recent trends suggest that they are also potentially useful instruments in a floating exchange rate regime, particularly if the regime is a managed float. Aizenmann, Lee, and Rhee (2004) and Aizenmann and Lee (2005) take the position that recent reserve accumulation by some emerging market countries are not mainly motivated by

exchange rate considerations but more by precautionary motives. Hviding, Nowak, and Ricci (2004) and Garton (2005) take the contrary position. Mohanty and Scatigna (2005) and McKinnon and Schnabl (2005) examine the role played by capital controls as a complementary strategy in managing flexible exchange rate regimes.

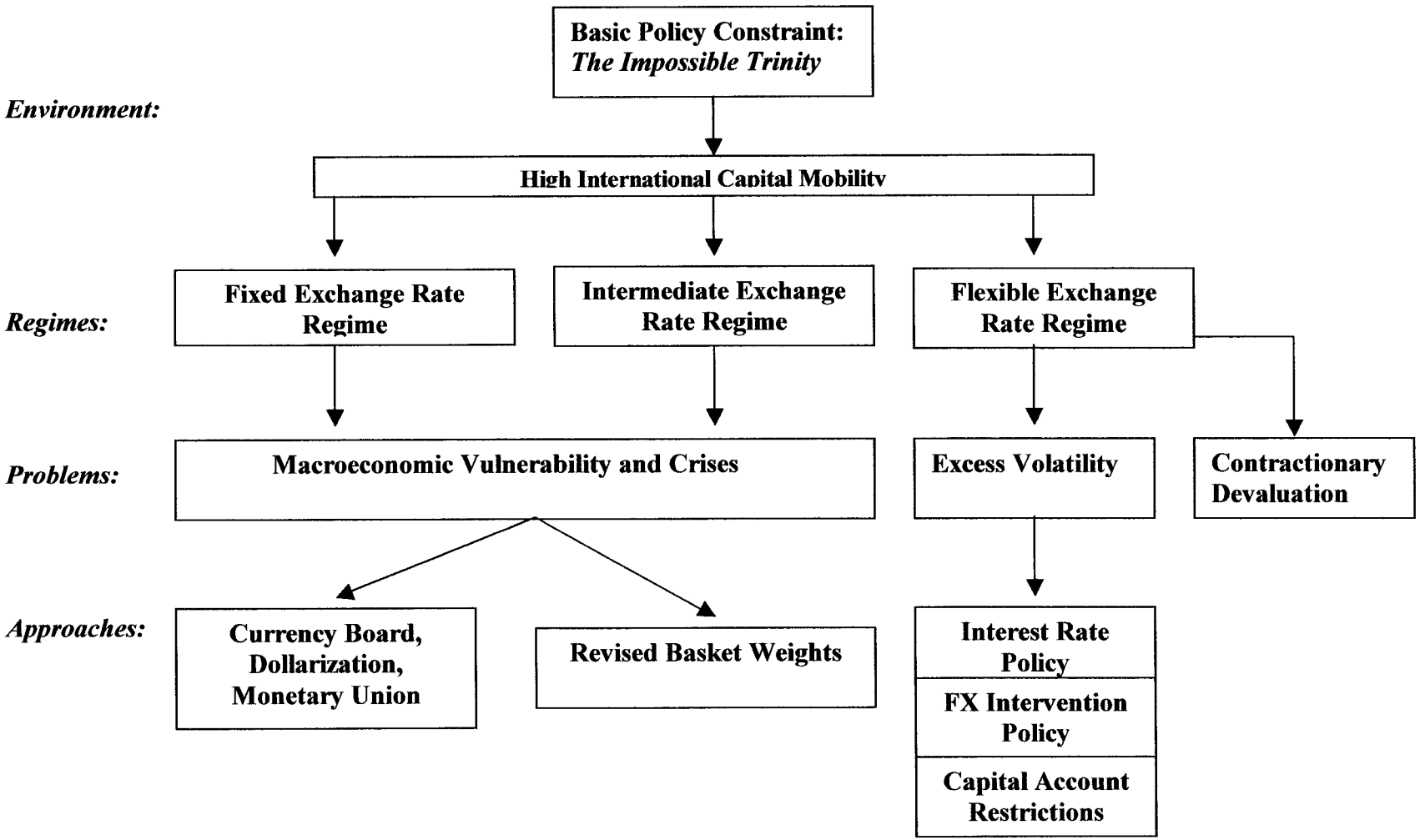
2.2 The Evolution of the Literature

Before I begin the task of presenting the opinions and findings found in each branch of the literature, it is helpful to have some kind of road map that traces the path that leads to the present study. In Figure 2.1, I provide a schematic framework that shows the progression of the various branches.

The question of the appropriate exchange rate regime for a country at a point in time faces one basic policy constraint called the *impossible trinity doctrine* of open economy macroeconomics. The basic message of this doctrine is that the choice of exchange rate regime cannot be made independently of the choices regarding the degree of international financial integration and the desired level of monetary autonomy. The relevant lesson for most emerging market countries is that continued openness of the capital account comes with a price. With an open capital account and fixed exchange rate regime, monetary independence is sacrificed. If the country wants to retain monetary independence, it must then sacrifice the exchange rate target in favor of a flexible exchange rate arrangement. For countries that are imperfectly integrated into the world capital markets, an intermediate exchange rate regime may be possible while retaining some degree of monetary independence. Faced with the constraint of the impossible trinity, countries choose their exchange rate regime but must be prepared to accept the

Figure 2.1

Exchange Rate Regime Choice in Emerging Market and Less Developed Economies: Environment, Regimes, Problems, and Approaches



consequences of such choices and devise ways to cope with the problems that each arrangement entails.

The hollowing-out hypothesis or bi-polar view is a direct result of the impossible trinity doctrine under conditions of high international capital mobility. It predicts a movement away from intermediate regimes as such regimes become targets of speculative attacks. Driven by numerous cases of disastrous currency crises, emerging market and less developed economies then scramble to find alternative exchange rate arrangements at the corners. Those who choose the path of fixed exchange rates or persist with intermediate regimes must still contend with macroeconomic vulnerability and crises. Those who choose the path of flexible exchange rate regimes must contend with the problem of excess volatility and also the potential for contractionary devaluation.

In response to the problems posed by destabilizing capital flows brought about by choosing financial integration as part of the trinity, countries must be aware of the implications of their chosen regimes. Fixers must ensure that their regimes are hard enough giving rise to different approaches to ensure credibility - currency board, dollarization, monetary union. Intermediate regime holdouts can fine-tune their arrangements such as revision of basket pegs to be more reflective of true international trade and investment patterns. Flexible exchange rate regimes cope with excess exchange rate volatility through numerous methods: (a) the sacrifice of monetary policy by letting the domestic interest rate react to exchange rate movements, (b) foreign exchange market intervention and the use of international reserves policy, and (c) the creation of varying degrees of capital account restrictions.

The two policies that are attracting the most attention in the recent literature are international reserves policy and capital account restrictions. This is due in part to the paradoxical nature of their roles within a flexible exchange rate system. However, it is also due to the fact that the interest rate response cannot be a permanent solution. Raising interest rates to stem currency depreciation can have deleterious effects on output while lowering interest rates to prevent appreciation can lead to overheating and inflation. While it is true that foreign exchange intervention and capital controls are not perfect solutions, the costs are lesser known.

The concentration on fine-tuning floating regimes may be attributed to the fact that one of the most successful currency boards in recent history (Argentina) ended in failure. For all emerging markets and less developed economies, this is a signal that there may be only one way to go – to float. This is especially true for the Asian countries where hard fixes such as monetary union and dollarization are not feasible, nor preferred at the moment. The recent interest on the topics of international reserves and capital controls provides inspiration for the present study. The literature on exchange rate economics for emerging and less developed countries follow the branches of Figure 2.1.

2.3 Theoretical Issues in Exchange Rate Regime Choice

The sudden explosion of many currency crises episodes among emerging market economies in the late 1990s has called for a rethinking of whether there is such a thing as an optimal exchange rate regime for such economies. The most famous quote in this regard is that of Frankel (1999) where he claims that "no single exchange rate regime is right for all countries at all times (p.4)." While this idea may be in the minds of economists very early on, the harsh lessons are only now being placed in the forefront. In

Edwards (2000), the author points to what he calls a new consensus about exchange rate policy in emerging countries. According to Edwards, this new consensus view includes the following: (a) the use of the exchange rate as a nominal anchor tends to result in acute real appreciation, (b) when using the exchange rate as a nominal anchor, the country should prepare an exit strategy, (c) exchange rate overvaluation is very costly in terms of the crises that usually follows, and (d) due to the inherent instability of pegged but adjustable regimes, countries should opt for a floating regime or a hard peg (such as currency board or dollarization). In light of these observations, the strongest policy recommendation made by Edwards deals with alleviating the moral hazard problem when countries choose inconsistent macroeconomic and exchange rate policies. Edwards emphasizes the hazards involved in pegging at an artificial level and at the same time having an inconsistent fiscal stance. The IMF is given a prominent role in finding a solution through its control of financial assistance and it is suggested that such assistance be made conditional on whether countries' de facto exchange rate policies are consistent with other macroeconomic policies.

Edwards also gives some advice to countries that choose to adopt either a floating exchange rate system or a hard fix. These include opting for a clean float instead of a dirty float (for credibility reasons), fiscal balance, modernization of the banking system, and the necessity for still holding large amounts of international reserves. For those who adopt either a currency board or dollarization, Edwards warns that fiscal prudence is still required. This leads to the requirement that good monetary and fiscal institutions be in place. Regarding the recommendation on the holding of excess international reserves even during floating exchange rate episodes, it is interesting to note that most emerging

countries seem to heed Edward's advice (see Flood and Marion (2001), Aizenmann, et al. (2004), Aizenmann and Lee (2005), and Garton (2005)). Regarding the advice on the need for fiscal prudence even in the context of hard fixes, most post-mortem analyses of the Argentine currency board collapse (Salvatore (2004), Powell (2002), Hausmann and Velasco (2002), de la Torre, et al. (2003), and Galiani, et al. (2003)) do ascribe a large role to the failure to restrain debt.

Like Edwards (2000), Frankel (2003) surveys the current trends in the theory and practice of selecting exchange rate regimes in emerging economies. However, unlike Edwards (2000), the paper is highly critical of the hollowing out hypothesis and cites evidence that the proportion of countries in each category (fixed, intermediate, and floating) has roughly remained the same through time even after the creation of new states. It also discusses some of the current reasons for selecting where to locate on the scale of exchange rate regime flexibility. Frankel enumerates the advantages of choosing a fixed regime: (a) the nominal anchor function of the exchange rate, (b) increased trade and investment, (c) prevention of competitive depreciations, and (d) avoidance of speculative bubbles. The advantages of greater flexibility he cites are (a) monetary independence, (b) automatic adjustment to trade shocks, (c) the retention of seigniorage and lender-of-last-resort capability, and (d) the avoidance of speculative attacks.

In response to the recent popularity of flexible exchange rate regimes over hard fixes, Frankel also discusses the wide array of possible alternative nominal anchors from which emerging economies can choose, if they decide to float. These alternative approaches include targeting the growth of the money supply (monetarism), nominal income targeting, inflation targeting, as well as other lesser-known proposals such as

targeting a commodity basket or targeting the price of gold. Frankel explains how each candidate for nominal anchor has advantages and disadvantages depending on the nature of the shock hitting the economy at any particular time. The anchor he recommends in his paper is to target the price of the export good. The rationale for this novel choice is its supposed robustness to import price shocks since most emerging economies are oil importers.

The Asian financial crises brought to the table the issue of encouraging countries to implement basket pegs in the case where they were previously linked to only one currency such as the U.S. dollar. Japanese economists (for example, Ogawa and Ito (2002)) also took this opportunity to voice out their own policy recommendations, particularly their suggestion to increase the weight of the yen in the baskets of many Southeast Asian countries. In the case of East Asia, Frankel offers that a basket peg is the obvious solution but its implementation is plagued by many problems. He points to the necessity of one leader country making the first move to peg to a diversified basket with explicit weights. The other countries can then peg to the leader's currency.

McKinnon and Schnabl (2005) are less enthusiastic about the recommendation of basket pegging. They give evidence that many countries in Southeast Asia are returning to pegging to the U.S. dollar if one examines the high-frequency data on exchange rates. They argue that the return of pegging to the dollar is rational from the point of view of these small open Southeast Asian economies primarily citing the importance of dollar invoicing of much of international trade. Furthermore, McKinnon and Schnabl cast doubt on the ability of a basket peg to shield countries from excess volatility in the dollar/yen exchange rate. Because of this, they go so far as to point out that the way to

prevent a repeat of the Asian crisis is to prevent real appreciation of the Southeast Asian currencies (brought about by yen depreciation against the U.S. dollar) by securing the cooperation of these large countries. This may well be true but unlikely to happen since the U.S. and Japan cannot be expected to put aside their own domestic agenda just for the sake of exchange rate stability in the Southeast Asian region.

On the issue of re-assigning weights so that the Japanese yen is given more weight in the basket for the Asian currencies, Lincoln (2004) disagrees. Lincoln presents evidence from trade and investment data that Japan's links with the Southeast Asian countries are very weak. He claims that Japan is an extremely closed economy with respect to Southeast Asia and most Japanese trade and investment flows (especially after the 1997 crisis) are concentrated in the United States and Europe.

The discussion above about the search for nominal anchors in the case of floating exchange rate regimes and the issue of basket pegging are natural consequences of the fact that Asian countries have shown no indication that they prefer hard fixes like Argentina's currency board (with the exception of Hong Kong, which also operates a currency board). Nevertheless, any amount of exchange rate management will necessarily raise the issue of the appropriate basket weights.

Going beyond exchange rate policy and moving towards a more comprehensive approach to open economy macroeconomic policy, Calvo and Mishkin (2003) argue that the choice of optimal exchange rate regime is of secondary importance compared to the issue of creating strong macroeconomic institutions. The authors argue that the standard theory of exchange rate regime choice (which compares the costs and benefits of flexible versus fixed regimes) may not be applicable for the case of emerging and less developed

economies because of the different institutional backgrounds. The unique characteristics of these economies include weak fiscal, monetary, and financial institutions; significant currency substitution and liability dollarization; and vulnerability to sudden stops of capital flows. Calvo and Mishkin cite several examples where the lack of the proper institution may not deliver desired results even if the exchange rate regime in place is perceived to be correct. For example, a floating exchange rate regime is selected if the country plans to use counter-cyclical monetary policy. However, as Calvo and Mishkin argue, the benefits of an independent monetary policy can only be realized if the central bank has enough credibility. Otherwise, an expansionary monetary policy will not lead to output expansion during a recession but only a sudden rise in inflation. Likewise, a country that fixes the nominal exchange rate to combat inflation may resort to fiscal devaluation instead to boost exports. Yet, this requires that the proper fiscal institutions for such operations be in place.

2.4. Empirical Studies on Regime Choices, Consequences, and Transitions

The aspect of the exchange rate regime question that has received the greatest empirical attention is that pertaining to the determinants of the choice of regime (such as Edwards (1996), Poirson (2001), Von Hagen and Zhou (2002a), and Von Hagen and Zhou (2004).) Consequences for the economy and the frequency of regime transitions attract comparatively less attention in the recent literature. An exception is Ghosh, Gulde, and Wolf (2002) or GGW where both choice and consequence are equally addressed. However, the analysis of consequences in GGW is limited to a very specific set of macroeconomic indicators, namely, inflation, output growth, and output growth volatility. Unfortunately, the link between the exchange rate regime and output growth is

found to be weak. On the other hand, the interest in exchange rate regime transition has also slowed down due to the lack of definitive evidence confirming the hollowing out hypothesis (see for example, Masson (2000), Masson and Ruge-Murcia (2003)). Thus, while the empirical work on consequences and transitions are still very much at the infancy stage, corresponding work on the determinants of choices do give some consistent lessons.

It is not surprising that most empirical studies find a link between inflation and the choice of exchange rate regime. A central finding of GGW, for example, is that lower inflation tends to be associated with pegged exchange rate regimes. This result provides support to the hypothesis that countries may use exchange rate policy to provide a nominal anchor for the economy. In addition, Leon and Oliva (1999), Poirson (2001), Rogoff, et al. (2003), and Von Hagen and Zhou (2004) also find some evidence that inflation and exchange rate regime flexibility tend to be positively linked. The observed diversity in terms of exchange rate regime arrangements across countries suggests that using the exchange rate as a nominal anchor can be a potent instrument for securing price stability, but as to whether countries are overly concerned about inflation is another matter. The recent trend towards generalized floating among many emerging markets, including the Southeast Asian and Latin American countries included in this study, is an indication that inflation is being kept at bay. Unless a country is in a state of hyperinflation, the exchange rate might as well be used to target a real variable such as output or the balance of payments. Nevertheless, it appears from these previous studies that there is more of a direct link between the exchange rate regime and inflation rather than with a real target variable.

Given the difficulty of finding a link between the exchange rate regime and output growth, one can look at other macroeconomic indicators such as the balance of payments or the international reserves. The recent findings on the role of international reserves in the exchange rate regime decision tend to confirm what is theoretically expected from the political economy point of view – a negative relationship. This finding is confirmed in Poirson (2001), Von Hagen and Zhou (2002a), and Leon and Oliva (1999). The latter has a simple explanation for this finding. They claim that the evidence of a negative relationship between international reserve accumulation and exchange rate regime flexibility reflects avoidance of balance of payments crises when losing reserves but avoidance of severe monetization when gaining reserves. Agbola and Kunanopparat (2003) is one study where the contrary finding emerges such that increased international reserves go hand in hand with increased exchange rate regime flexibility. The possibility of a positive relationship between exchange rate regime flexibility and international reserve accumulation has recently emerged as a phenomenon seeking to be explained, especially in the aftermath of the recent wave of currency crises among many emerging market countries in the late nineties. This has also brought into the discussion the role that other exchange-related policies play, such as the degree of capital account restrictions. The severity of recent currency crises brings back the idea of capital controls – that some form of regulation of international capital markets may still be necessary despite past structural reforms aimed at economic liberalization.

2.5 International Reserves and Capital Controls Under Floating Regimes

The role of international reserves for fixed exchange rate regimes is well understood. A higher stock of international reserves is normally seen as contributing to

the durability of a fixed regime. According to this logic, decreased flexibility should be associated with the accumulation of reserves while increased flexibility should lead to declining reserves. When the accumulation of reserves continues despite the move to greater flexibility, further explanation is needed. Such is the case in much of Asia after the 1997 crisis.

Aizenmann, Lee, and Rhee (2004) and Aizenmann and Lee (2005) present evidence that this observed trend is not due to what they call the mercantilist motive (i.e. exchange rate considerations). Both studies claim that the surge in international reserves is not due to governments' attempts at preventing currency appreciation in the face of high capital flows. The first study examines the case of Korea during the pre-crisis period as well as during the post-crisis period. They find that before the crisis, the only significant variable affecting reserve accumulation is trade openness while international reserves seems to be weakly positively related to exchange rate volatility. After the crisis, trade openness cease to be a significant determinant and a host of other factors become strong predictors of international reserves. These factors include export volatility and short-term external debt. Exchange rate volatility has a negative impact on international reserves. Because of the above, Aizenmann, Lee, and Rhee conclude that post-crisis situations tend to support the precautionary motive for reserves rather than the mercantilist motive. The second study, Aizenmann and Lee (2005), uses Asian and Latin American countries and reaches the same conclusion regarding the absence of an international competitiveness motive. In addition, they find that while international reserves shows a rising trend in Asia after 1997, the reverse holds true for Latin America in the same period. Interestingly, they also find the same surge in reserve accumulation

in Latin America after the Mexican crisis of 1994 but also a declining trend in Asia during the same period.

On the other side of the debate, Hviding, Nowak, and Ricci (2004) and Garton (2005) present evidence that the surge in reserve accumulation in Asia can be explained by concerns with exchange rate stability. The first study presents evidence that there is a negative and nonlinear relationship between international reserves and exchange rate volatility. They do qualify their result and warn that the finding is just for a select sample of floaters during the mid-nineties. They interpret the non-linearity as an indication that not all countries benefit equally from holding greater stocks of reserves. They argue that only countries with initially low reserves benefit more from a high reserves policy. The second study, Garton (2005), reveals that reserve accumulation is a successful strategy for the Asian countries in resisting currency appreciation. He claims that the precautionary motive cannot be the reason behind the surge since standard reserve adequacy indicators, such as the ratio of reserves to short-term external debt, are mostly past the one hundred percent coverage. He also notes that although most countries in the region are unfazed by the low fiscal costs (except Indonesia and the Philippines), the present trend may soon come to an end due to high cumulative sterilization costs.

Mohanty and Scatigna (2005) discuss the possible limitations of using international reserves for managing exchange rates. The first limitation, that already pointed to by Garton(2005), is the inevitable and large monetary expansion that comes when cumulative sterilization reaches very high levels. Eventually, excessive money creation feeds into higher inflation causing pressures for depreciation. We may add to this the possible shortage of sterilization instruments in the long run. Second, there is a

danger that reserve accumulation can signal future currency appreciation that can lead to large unhedged foreign currency borrowings. Third, a continuous rise in reserves can create the illusion of a wealthy government, thereby artificially raising domestic spending. Fourth, excessive reserve accumulation can have negative effects on the central bank's balance sheet, not only because of the pure fiscal cost involved, but also because of the potential for exposure to currency and maturity mismatches.

Since most economists agree that the accumulation of reserves to better manage floating regimes is not a sustainable strategy in the long run, Mohanty and Scatigna also look towards capital controls. Restrictions on capital outflows, for example, are instituted to prevent large currency depreciations owing to sudden capital flight. A number of limitations also exist for such a strategy including the difficulty of enforcement, the increasing need to accommodate foreign direct investment (FDI), and also changing circumstances. With respect to the last, it is possible that many emerging market countries actually want to prevent appreciation rather than depreciation.

McKinnon and Schnabl (2005) call unwanted appreciation "the problem of conflicted virtue." As a reaction to past currency crises and large devaluations, countries may start living virtuously by running continuous trade surpluses. This enables domestic residents to hold foreign currency assets and become net lenders to the rest of the world. However, as the stock of foreign currency claims (i.e. dollar claims) mounts, there is increasing concern among these asset holders about pressures from trade partners to appreciate the domestic currency. The government finds itself in a dilemma as appreciation can potentially induce deflation and liquidity traps but not accommodating

the pressures from trade partners can result in trade sanctions. Hence, in cases of "conflicted virtue," capital outflows should be encouraged.

Another example of capital controls is anti-speculative control such as those instituted in Malaysia and Singapore. This type of control is intended to prevent short selling of the domestic currency to prevent speculative attacks. Kapur (2005) notes that such controls have contributed to Singapore's resiliency to crisis since the government discouraged the internationalization of the Singapore dollar. On the other hand, the cost of such an approach is the negative impact on capital market liquidity and the slow development of a domestic bond market.

Finally, Joshi (2003) predicts on theoretical grounds that intermediate regimes disrupted by currency crises are going back to the middle, but this time with more stringent capital controls. He believes that intermediate regimes with capital account convertibility are by nature not sustainable but the introduction of capital controls can make intermediate regimes optimal for small open economies.

2.6 An Assessment

As seen in this survey, the renewed interest on the topic of exchange rate regime choice offers a variety of theoretical perspectives and empirical approaches. Edwards (2000) provides arguments that support the hollowing-out hypothesis while Frankel (2003) and Joshi (2003) take the opposing view that intermediate regimes are not at all obsolete. One empirical finding by Masson (2000) is that there is no convincing evidence to support the hollowing out hypothesis. Also, McKinnon and Schnabl (2005) argue that Asian countries devastated by crises due to adjustable pegs are soon returning to the same practice and that such a trend is individually rational. On the other hand,

another opinion expressed by Alexander, Melitz and von Furstenberg (2004) is that the issue of monetary union should not be dismissed immediately even if the countries in a certain geographic region do not conform to traditional optimum currency area criteria. Rather, these countries should think about where they want to locate on a financial vulnerability versus monetary independence tradeoff. Similarly Salvatore (2004) believes that the most workable arrangement for most Latin American countries is to dollarize. However, Salvatore points out that exchange rate regime choice may not matter much if countries do not first attempt to put their houses in order by having sound fiscal and monetary policies.

Given the present trends, I am inclined to believe that emerging and less developed countries have not given up on intermediate regimes nor should they give up the middle so quickly. Now that the threat of currency crises brought about by capital flow reversals is beginning to be fully appreciated, innovations in policy are sure to respond to the challenge. This is why understanding the tradeoffs involved are crucial. The political economy approach to exchange rate regime choice, complemented by insights from optimum currency area theory, is a valuable tool in understanding the relationship between policy choices and macroeconomic outcomes. For these reasons, I will discuss models such as Devarajan and Rodrik (1992), Edwards (1996), and Welch and McLeod (1993).

The empirical research on exchange rate regime choice and consequence for emerging countries is only now beginning to take off. Already, there are some patterns that stand out. One result that emerges from the literature is that exchange rate flexibility tends to be associated with higher inflation especially if the sample time frame weighs

more heavily on the present. Poirson (2001) and Von Hagen and Zhou (2004) are just some examples of this. Otherwise, inflation tends to be of secondary importance in regime choice such as that in Agbola and Kunanopparat (2003). The notion that exchange rate regimes are not being used primarily for inflation control is instead indicative of the variety of other macroeconomic goals available. A case in point is the role of international reserves, which is also one of the main concerns of the present study. Poirson (2001), Von Hagen and Zhou (2002a), and Leon and Oliva (1999) all indicate that exchange rate regime flexibility is negative associated with international reserves. This negative relationship is consistent with the political economy approach where reserves are being used in a strategic manner to manage exchange rates.

Other findings that seem to emerge from the literature are the robustness of the optimum currency area variable, economic size, and also the increasing importance of macroeconomic vulnerability indicators. In most of the empirical studies surveyed, economic size tends to be associated with increased exchange rate flexibility while increasing macroeconomic vulnerability tends to be associated with reserves accumulation. There are also studies such as those by Hviding, Nowak, and Ricci (2004) and Garton (2005) that associate reserves accumulation with greater exchange rate stability.

To be sure, there will be continuous revisions of theories and empirical results. The tradeoff between inflation and international competitiveness, the role of international reserves, and the importance of the capital account seem to be some of the more important topics at present. This is why the present study devotes a great deal to these aspects as well.

Chapter 3

Theoretical Framework

3.1 Introduction

In this chapter, I provide expositions of various formal models of exchange rate regime choice that are identified with the political economy approach. I shall use the insights from these models as guides in interpreting the empirical results presented in Chapter 6.

Political economy models of exchange rate regime choice take the existence of inevitable tradeoffs as their starting point. While economic variables are affected by the exchange rate regime in place, the policy maker also continues to revise the regime in response to shifting trends in the economic conditions. In fact, economic agents' responses to policy are manifested by such macroeconomic conditions and policy makers must incorporate this in their decision. The choice of exchange rate regime normally involves sacrificing one goal so as to obtain another. One of the earliest contributions to point out this dilemma is Aghevli, Khan and Montiel (1991). They discuss the possibility that stabilizing any single macroeconomic variable can perturb another. This suggests that the exchange rate regime cannot be unambiguously determined and that the correct approach to policy is to specify a general welfare function that considers these tradeoffs. The advantage of using the political economy approach over traditional optimal currency area theory is that in political economy, causation runs both ways between the exchange rate regime and the macro-economy. The wide diversity of exchange rate regimes across countries and across time may be a testament to this idea.

The task of this chapter is to describe the basic structures of some political economy models of exchange rate regime choice that are widely cited in the literature. These include the seminal contributions of Welch and McLeod (1993), Devarajan and Rodrik (1992) and Edwards (1996). The first model serves as my theoretical framework for analyzing the link between the exchange rate regime and the external sector of the economy through the use of international reserves. The latter two models complement the first by looking at domestic output instead, thus providing some background for the analysis of the link between exchange rate regime and the output gap. While I present the Welch-McLeod model in great detail (since the focus of this study is on the external sector), I present only the basic elements of the latter two models to illustrate the important similarities with Welch and McLeod (1993).

The Welch-McLeod model is originally cast in continuous time. For ease of exposition, the presentation I use in this study follows the simpler discrete-time version found in Agenor (2004).

3.2 Agenor (2004)'s Discrete Time Version of Welch and McLeod (1993)

To illustrate the game-theoretic approach to exchange rate policy in a small open economy, we borrow the version of the McLeod-Welch model found in Agenor (2004). It is one of the simplest models dealing with the issue of time inconsistency in the context of exchange rate policy.

3.2.1 Players, Strategies, and Payoff Functions

The game consists of two players, the central bank (CB) and the private sector (PS). The CB can choose one of two strategies, to fix the exchange rate ($e = 0$) or not to fix the exchange rate ($e \neq 0$). The variable, e, is the logarithm of the nominal exchange

rate where the nominal exchange rate is expressed as the amount of domestic currency per unit of the foreign currency. The PS can also choose one of two strategies, to anticipate a fixed exchange rate ($s = 0$) or not ($s \neq 0$), where s stands for the private sector's anticipation or expectation of the logarithm of the nominal exchange rate. The CB's loss function is quadratic where the arguments include the nominal exchange rate and the deviation of the change in international reserves from its target.

$$(3.1) \quad L = \frac{e^2}{2} + \frac{\beta}{2}\left(\Delta R - \Delta \overline{R}\right)^2 \qquad \beta > 0$$

In equation (3.1), the parameter β represents the weight attached by the CB to its real objective, the change in international reserves. If $\beta > 0$, then the CB cares about a real objective in addition to the growth of the nominal exchange rate (and inflation). If $\beta = 0$, then the CB is not pursuing any real objective and is just using the nominal exchange rate as a nominal anchor for the economy. Hence, β can also be interpreted as the parameter in the model that represents the policy intention or central bank type.

Targeting the change in international reserves rather than some other real objective like unemployment or growth can be interpreted as an indication that the CB in a small open economy may care more about the balance of payments than traditional domestic macroeconomic objectives. Also, in light of the recent rash of foreign exchange crises in many emerging markets, $\beta > 0$ can indicate the CB's aversion to balance of payments crises. The target level for the change in international reserves, $\Delta \overline{R}$, is assumed to be exogenous. A separate and growing literature tackles the issue of what is the optimal target for international reserves. (See, for example the seminal contribution of Frenkel and Jovanovic (1981) and the recent attempt at replication of Frenkel and

Jovanovic by Flood and Marion (2001). From a practitioner's view regarding optimal reserve management, see Reddy (2003).)

The loss function for the PS is also assumed to be quadratic but contains only one argument, (e-s). In other words, the only objective of the PS is to correctly anticipate the exchange rate policy. This characterization of the PS can be summarized by the following reaction function:

(3.2) $s = E(e)$

In equation (3.2), the symbol E is the expected value operator. For a solution to the game to be model-consistent, the PS has to set its expectation of exchange rate policy to the mathematical expectation of the CB's setting for e. It is assumed that price-setting by the PS is governed by $p = s$.

To complete the model, the structure of the economy is represented by a reduced form equation for ΔR. It is assumed that the actual change in reserves depends linearly on (e-p), where p is the logarithm of the domestic aggregate price level, and an external white noise shock, μ.

(3.3) $\Delta R = \alpha(e - p) + \mu \qquad \alpha > 0 \qquad \mu \sim \text{iid}(0, \sigma_\mu^2)$

Note that in equation (3.3) (e-p) stands for the logarithm of the real exchange rate. The parameter α measures the sensitivity of the change in international reserves to changes in the logarithm of the real exchange rate. The assumption that $\alpha > 0$ means that a real depreciation of the domestic currency leads to an increase in international reserves. This may be interpreted as the result of increased competitiveness in international trade

and that the Marshall-Lerner conditions are satisfied.[1] The formulation in equation (3.3) also suggests that only surprise devaluations can actually increase international reserves. If either $\alpha = 0$ or $(e-p) = 0$, then the change in international reserves is white noise.

3.2.2 Timing and Information

The McLeod-Welch model (and Agenor's presentation as well) has the following timing of moves: (i) the PS chooses s, (ii) nature determines the external shock, μ, and (iii) the CB chooses e. It can be discerned from the assumed timing that the PS does not have information about μ whereas the CB can observe the external shock and the move of the PS. This characterization of the sequential move stage game is formally equivalent to a Stackelberg game where the PS is the leader (first-mover). It can be shown that the backwards induction solution of this game is observationally equivalent to the Nash equilibrium where the CB chooses $e \neq 0$ and $s \neq 0$ (see Cellini and Lambertini, (2003)).

3.2.3 Equilibrium When the Private Sector Moves First

To obtain a solution to the PS problem, we first derive the CB reaction function. The reaction function of the CB can be derived by first substituting equation (3.3) into equation (3.1) before minimizing equation (3.1) with respect to e.

$$(3.4) \qquad L = \frac{e^2}{2} + \frac{\beta}{2}\left(\alpha e - \alpha s + \mu - \Delta\bar{R}\right)^2$$

$$(3.5) \qquad \frac{\partial L}{\partial e} = e + \alpha\beta\left(\alpha(e-s) + \mu - \Delta\bar{R}\right) = 0$$

$$(3.6) \qquad e = \frac{\alpha^2\beta}{1+\alpha^2\beta}s + \frac{\alpha\beta\left(\Delta\bar{R} - \mu\right)}{1+\alpha^2\beta}$$

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[1] Mathematically, α can also be zero or negative. If it is zero, then changes in the real exchange rate have no effects on the change in international reserves. If it is negative, then real depreciations actually worsen the country's external position.

Equation (3.5) is the first-order condition while equation (3.6) is the reaction function of the CB. The PS then solves the following problem using equation (3.6) as the constraint.

$$(3.7)\quad \underset{s}{\text{Min}}\, E\left[\frac{1}{2}(e-s)^2\right] \qquad \text{s.t.} \quad e=\frac{\alpha^2\beta}{1+\alpha^2\beta}s+\frac{\alpha\beta(\Delta\overline{R}-\mu)}{1+\alpha^2\beta}$$

The backward induction solution to (3.7) is:

$$(3.8)\quad \text{PS strategy}: s=\alpha\beta\Delta\overline{R}$$

$$(3.9)\quad \text{CB strategy}: e=\alpha\beta\Delta\overline{R}-\frac{\alpha\beta}{1+\alpha^2\beta}\mu$$

Note that the equilibrium strategy of the PS differs only from that of the CB in that it does not include the external shock, μ. This is because the PS lacks complete information about the shock and takes its mean to be zero. Note that e and s will both be positive if $\alpha\beta > 0$ and if the target change in reserves is large enough relative to the external shock.[2] The expected payoffs to the two players under the strategy combination are:

$$(3.10)\quad \text{PS payoff}: \ 0$$

$$(3.11)\quad \text{CB payoff}: \ -\frac{\beta}{2(1+\alpha^2\beta)}\left[(1+\alpha^2\beta)^2\Delta\overline{R}^2+\sigma_\mu^2\right] \qquad \text{where } \sigma_\mu^2 = \text{variance of } \mu$$

The derivation of the equilibrium payoff to the CB proceeds as follows. Note that the difference between e and s can be expressed as:

$$(3.12)\quad (e-s)=-\frac{\alpha\beta}{1+\alpha^2\beta}\mu$$

Using the above in equation (3.3), we have

[2] Note that in general, $e \neq 0$ in equation (3.9). The case of devaluation is $e > 0$ and we can see that this depends on the values of the parameters.

$$(3.13)\qquad \Delta R = \alpha\left(e - e^{a}\right) + \mu$$
$$= \alpha\left(-\frac{\alpha\beta}{1+\alpha^2\beta}\mu\right) + \mu$$
$$= \frac{\mu}{(1+\alpha^2\beta)}$$

Substituting the equilibrium value for e and the above expression for ΔR in equation (3.1), we have:

$$(3.14)\qquad L = \frac{1}{2}\left[\alpha\beta\Delta\bar{R} - \frac{\alpha\beta}{(1+\alpha^2\beta)}\mu\right]^2 + \frac{\beta}{2}\left[\frac{\mu}{(1+\alpha^2\beta)} - \Delta\bar{R}\right]^2$$

After some algebra and noting that $E(\mu) = 0$ and $E(\mu^2) = \sigma_\mu^2$, the expected loss is:

$$(3.15)\qquad E(L) = \frac{\beta}{2}\left[\alpha^2\beta\Delta\bar{R}^2 + \frac{\alpha^2\beta}{(1+\alpha^2\beta)^2}\sigma_\mu^2 + \frac{\sigma_\mu^2}{(1+\alpha^2\beta)^2} + \Delta\bar{R}^2\right]$$

Equation (3.15) can further be simplified as:

$$(3.16)\qquad E(L) = \frac{\beta}{2(1+\alpha^2\beta)}\left[\left(1+\alpha^2\beta\right)^2\Delta\bar{R}^2 + \sigma_\mu^2\right]$$

Since the above expression is an expected loss, I take the negative of this expression as the payoff to the CB in equation (3.11).

3.2.4 Equilibrium When the Central Bank Moves First

The CB solves the following problem:

$$(3.17)\qquad \underset{e}{\text{Min}}\ L = \frac{e^2}{2} + \frac{\beta}{2}\left(\alpha(e-s) + \mu - \Delta\bar{R}\right)^2 \qquad \text{s.t.}\quad s = E(e)$$

In this case, the timing is reversed such that the CB moves first. The backward induction solution to the problem is for the CB to set e = 0. The best-response strategy for the PS is then to set s = 0. The resulting expected payoffs are as follows:

(3.18) PS payoff : 0

(3.19) CB payoff : $-\frac{\beta}{2}\left[\Delta\overline{R}^2 + \sigma_\mu^2\right]$

3.2.5 Cheating by the Central Bank When the Private Sector Moves First

When there is an opportunity for a player to announce its intentions *prior* to the start of the game, there is scope for cheating. The classic case is that of the CB announcing that it intends to select the e = 0 strategy so that the PS will choose s = 0 and thereby engineer a surprise devaluation later on. In the McLeod-Welch model, the CB has an incentive to cheat but the PS does not. The reason is that the CB has a dominant strategy ($e \neq 0$) but the PS does not. Thus, even if the PS can somehow be less atomistic and announce a particular intention, it knows that the CB will choose the $e \neq 0$ option.

It can be shown that when the CB cheats, the expected payoffs for the game are the following:

(3.20) PS payoff : $-\frac{1}{2}\left(\alpha\beta\Delta\overline{R}\right)^2$

(3.21) CB payoff : $-\frac{\beta}{2(1+\alpha^2\beta)}\left[\Delta\overline{R}^2 + \sigma_\mu^2\right]$

This case, however, is not an equilibrium outcome since $e \neq s$.

Note that the payoff to the CB in equation (3.21) is greater than the payoff to the CB in equation (3.19) as well as the payoff to the CB in equation (3.11). Thus, from the point of view of the CB, cheating always provides a better outcome for itself. However, we cannot rank unambiguously the non-cheating payoffs of the CB if the variance of the external shock is non-zero. If this variance is zero, the CB's payoff from being a Stackelberg leader (i.e. it sets e = 0) is greater than the payoff from being a Stackelberg follower. It therefore pays for the CB to fix the exchange rate.

If the variance of the external shock is non-zero, ranking the two CB non-cheating payoffs depends on the parameters α and β, the target level of reserves and σ_μ^2 itself. To show this, we examine the payoff differential to the CB from a fixed exchange rate regime and a floating exchange rate regime. Let the payoff to the CB under the fixed exchange rate regime be Π_{fix} and let Π_{float} be the payoff under a floating exchange rate regime. Then,

$$(3.22) \qquad \Pi_{fix} - \Pi_{float} = \frac{(\alpha\beta)^2}{2}\left[\Delta\overline{R}^2 - \frac{\sigma_\mu^2}{(1+\alpha^2\beta)}\right].$$

It can be seen that the payoff differential from favoring a fixed exchange rate regime increases with the target level of reserves but decreases with the variance of the external shock. The first observation suggests that a fixed exchange rate regime is preferable to the CB if its target level of reserves is high, ceteris paribus. The logic of this is that a high reserves target raises the temptation to float the exchange rate. Therefore, fixing the exchange rate gives high returns in terms of raising credibility. The second result means that the CB will prefer to have exchange rate flexibility when external shocks are volatile so that it can cushion these shocks.

The payoff differential in favor of a fixed exchange rate regime is preferred if $(1 + \alpha^2\beta)$ is "high enough" such that

$$(3.23) \qquad (1+\alpha^2\beta)\Delta\overline{R}^2 > \sigma_\mu^2$$

The inequality (3.23) shows that higher values of α and β, like the target change in reserves, favor a fixed exchange rate regime. Since these parameters also raise the temptation of surprise devaluation, the same logic applies in terms of the need to raise

credibility for being tough. However, they must be high enough such that the left side of the inequality dominates the variance of the external shock.

3.2.6 Simultaneous Moves

The possibility of simultaneous moves can be explored by collecting the payoff combinations for each pair of strategies in a payoff matrix. In Table 3.1, the first term in each pair of payoffs is the payoff of the CB and the second term is the payoff to the PS:

Table 3.1

The Simultaneous-Move Payoff Matrix

		Private Sector (PS)	
		$s = 0$	$s \neq 0$
Central Bank (CB)	$e = 0$	$-A(1+\alpha^2\beta)B,\ 0$	$-A(1+\alpha^2\beta)C,\ -D$
	$e \neq 0$	$-AB,\ -D$	$-AC,\ 0$

where $A = \frac{\beta}{2(1+\alpha^2\beta)}$, $B = \Delta\bar{R}^2 + \sigma_\mu^2$, $C = (1+\alpha^2\beta)^2\Delta\bar{R}^2 + \sigma_\mu^2$, $D = \frac{1}{2}\left(\alpha\beta\Delta\bar{R}\right)^2$

We see that as long as $1+\alpha^2\beta > 1$, the CB has a dominant strategy, $e \neq 0$. Floating the exchange rate is a dominant strategy for the CB as long as it cares about the balance of payments ($\beta > 0$) and that real depreciations have real effects ($\alpha \neq 0$). If $1+\alpha^2\beta \geq 1$, then the CB has a weakly dominant strategy. Assuming $\alpha \neq 0$, $\beta > 0$, and knowing that the PS does not have a dominant strategy, the solution in a simultaneous-move game (a la Cournot) is obtained by iterated elimination of dominated strategies. The resulting Nash equilibrium is found on the lower-right quadrant where $e \neq 0$ and $s \neq$

0. As noted before, this is the same equilibrium in a sequential or Stackelberg game where the PS is the leader.

The McLeod-Welch model thus gives rise to two pure strategy equilibria depending on the timing of moves and which player has more information. If the game is played simultaneously or played as a Stackelberg game with the PS as leader, we get the discretion outcome or a floating exchange rate regime. If the game is played as a Stackelberg game with the CB as the leader, we get the rules outcome or fixed exchange rate. In other words, if the PS does not have any information advantage over the CB (as it usually does), there is a potential for expected devaluations to be realized. On the other hand, if the CB can commit (by moving first) to a hard fix, expectations of devaluation can be suppressed. This then opens the door for the CB to either honor its commitment or renege. The model is silent on where this commitment technology might come from except from the leadership role of moving first. One can imagine a pre-announcement strategy or the appointment of a conservative central banker even before the private sector can have a chance to form expectations.

3.2.7 Implications of the Model for Exchange Rate Regime Choice

The McLeod-Welch model gives conditions for the choice of exchange rate regime based on the strategic interaction between the CB and the PS. One implication of the model is that the floating exchange rate regime emerges as the preferred regime when external shocks are highly volatile. A second implication is that the fixed exchange rate regime is preferred if the temptation to engineer a surprise devaluation is high. However, even if the CB starts out with an intention to choose the fixed exchange rate regime, it is not clear that this regime will materialize. It requires that the parameter describing the

structure of the economy (α) and the weight attached to the real target (β) are high enough. If the variability of the external shock overpowers these parameters, the CB will be tempted to use its dominant strategy of choosing the floating exchange rate regime.

It is also interesting to note that the exchange rate regime that emerges depends on whether the game is a Stackelberg or Cournot game. In the case of the Stackelberg formulation, the fixed exchange rate regime can be realized if the CB acts as the leader but the floating exchange rate regime materializes if the PS acts as the leader. If the game is played with simultaneous moves as in a Cournot game, the resulting Nash equilibrium is the floating exchange rate regime. What we have here is a form of second-mover advantage because the player that moves second (i.e. the follower) observes the external shock while the first-mover does not. Thus, when the CB moves first it loses its information advantage and might prefer a fixed exchange rate regime because it is unaware of the external shock. When the CB moves second, it observes the shock and can react to it by adopting more exchange rate flexibility. If neither the CB nor the PS has any informational advantage over the other as in the simultaneous-move game, the CB decides to use its dominant strategy of choosing the floating exchange rate regime. However, the floating exchange rate regime is dominant only if the parameters describing the temptation to devalue are greater than zero.

3.3 Exchange Rate Regime Choice: Alternative Real Targets

In this short section, I present the basic structures of political economy models of exchange rate regime choice that focus instead on alternative targets such as output and unemployment. The seminal contributions in this regard are Devarajan and Rodrik

(1992) and Edwards (1996). The purpose of this section is to provide a glimpse of other kinds of macroeconomic tradeoffs.

3.3.1 The Devarajan-Rodrik Model (1992)

One of the earliest contributions to explicitly model exchange rate regime choice in an optimizing framework is that of Devarajan and Rodrik (1992) in relation to the experience of the CFA Franc Zone. The political economy element is present in the sense that a policy maker is assumed to make a choice involving the tradeoff of one macroeconomic goal over another. At the same time, the private sector's response is captured by what happens to the deviation of actual output from potential. Devarajan and Rodrik's model is a classic example of the inflation-output tradeoff in an open economy where the policy maker's instrument is the exchange rate regime.

The objective function in this model is

$$(3.24) \quad W = -\{(\pi - \pi^*)^2 + \varphi(y - y^*)^2\}$$

where the welfare function, W, is quadratic in the deviation of inflation from its target as well as the deviation of growth from its target. The structure of the economy is described by the following equation for output growth

$$(3.25) \quad y = \bar{y} + \alpha(e - p) + \beta(\tau - \bar{\tau}) \qquad \alpha, \beta > 0$$

Output growth is assumed to be equal to a natural level plus two terms that include the log real exchange rate and the deviation of the log terms of trade from its mean level.

The log price level is given by

$$(3.26) \quad p = E(e) + \omega E(\tau - \bar{\tau})$$

Thus, the log price level is equal to the expectation of the log of the nominal exchange rate plus a term that captures the expected terms of trade shock. Note that this equation reduces to p = E(e) when p is set before the shock is revealed (since the private sector takes the expectation of the terms of trade shock to be zero.

The model is closed by writing the following equation for inflation:

(3.27) $\pi = \mu p + (1-\mu)e$

Inflation is considered as a weighted average of the home good price and the tradable goods price.

3.3.2 The Edwards Model (1996)

The basic structure of the political economy approach to modeling exchange rate regime choice is also illustrated in Edwards (1996). Instead of using the deviation of actual output from potential as in Devarajan and Rodrik (1992), the assumed real target of exchange rate policy is to close the gap between actual unemployment and the natural level of unemployment.

The objective function is the following

(3.28) $L = E(\pi^2 + \mu(u-u^*)^2); \quad \mu > 0$

The loss function of the policy maker is quadratic in inflation and the deviation of unemployment from its target value. Note that the function implicitly assumes that the target inflation rate is zero.

The structure of the economy is given by

(3.29) $u = u' - \theta(\pi - \omega) + \psi(x - x'); \qquad E(x) = x' \qquad V(x) = \sigma^2 \qquad u^* < u'$

Equation (3.29) says that actual unemployment is equal to the natural rate, u′, and two other terms. The second term captures the deviation of inflation from the rate of

increase of wages, ω. The last term is the deviation of the external shock, x, from its mean, x'.

The rate of wage increase is modeled as follows

(3.30) $\omega = E(\pi) + \alpha E(x - x')$

Wage-setting is assumed to depend on the expected rate of inflation and wage-setters expectations regarding the terms of trade shock. Finally, inflation is modeled as

(3.31) $\pi = \beta d + (1-\beta)\omega$

Inflation is assumed to be a weighted average of the rate of devaluation, d, and the rate of wage increase, ω.

3.4 A Short Appraisal of the Models

The structures of the three models are very similar. All choose to use the quadratic functional form for their objective functions and all see a tradeoff between inflation stabilization and some real objective. For the real objective, the Devarajan-Rodrik model chooses output growth, the Edwards model chooses unemployment, and the Welch-McLeod model chooses the change in international reserves. The three models employ parsimonious characterizations of the economic structure such that the economy is modeled as one equation for the real variable. The third major ingredient is that the rate of inflation is often treated as a weighted average of domestic and external factors. In the Devarajan-Rodrik model, the domestic factor is the log price level (goods market) and the external factor is the log of the nominal exchange rate. In the Edwards model, the domestic factor is in the labor market (wage increases) while the external factor is the rate of currency depreciation. Both models also employ the simplifying technique of assuming zero expected terms of trade shocks in their analysis. In the

Welch-McLeod model, inflation is simply equal to the expected rate of currency depreciation. The simplicity of all three models is a huge advantage in highlighting what really is involved in the decision regarding the exchange rate regime.

The solution techniques employed are also very similar. The timing of moves is such that domestic price (or wage) setters get to choose their strategy before the shock is revealed. It is only after the private sector moves and the external shock is observed that the policy maker chooses its setting for the exchange rate. While this sequence of moves may be realistic in cases where asymmetric information favors the central bank, such a timing convention is not necessarily general. This is the reason why I explored other sequences of moves in the context of the Welch-McLeod model. Given the recent emphasis in the theory of central banking on the importance of transparency as well as improvements in dissemination of economic information to private agents, there is scope for partial elimination of asymmetric information. In fact, the term emerging market has replaced the term developing country to describe countries that, although not belonging to the advanced country category yet, shows significant improvements in domestic financial structure and monetary institutions.

Overall, the valuable contribution of the three models is that they completely address the exchange rate regime issue by looking at both sides, characterizing the policy maker as a social welfare maximizer involved in settling macro tradeoffs while the private sector is treated as an active rational player. The important role given to strategic factors distinguishes these models from purely structural explanations. Furthermore, even though these previous studies have used specific variables such as output growth, unemployment, and changes in international reserves, it is equally possible for other

objectives to be considered. For small open economies dependent on international trade and investment, it is equally plausible that policymakers in these countries may target other variables that impact external macroeconomic performance. In the present study, not only do I look at the role of reserves and domestic output, but I also consider the roles played by direct foreign investment or FDI and foreign capital flows.

3.5 Empirical Digression: A Simple Test of the Link between Information Disclosure by the Central Bank and Cheating

In the Welch-McLeod model, one of the main theoretical results suggests that if the private sector (PS) does not have any information advantage over the central bank (CB), the latter can cheat by engineering surprise devaluations. This particular scenario is the outcome when the game is played simultaneously or when the central bank has a second-mover advantage. On the other hand, if the CB can pre-commit to a fixed exchange rate with a credible announcement or move to a hard fix, private sector devaluation expectations are reduced to zero.

In this short note, I test this proposition by tying the degree of central bank information disclosure with the concepts of fear of floating and fear of pegging. Fear of floating occurs when the official regime is flexible but policymakers secretly manage the exchange rate through market interventions to prevent excess volatility. On the other hand, fear of pegging is the practice of secretly allowing some degree of flexibility despite an officially pegged regime, possibly for competitiveness reasons. With the aid of de jure and de facto exchange rate classification schemes, cheating by the CB can be detected by comparing the two. The following table, Table 3.2, illustrates the four possibilities:

Table 3.2

Four Possible Combinations of de jure and de facto Regimes

de jure Fix, de facto Fix (No Cheating)	de jure Fix, de facto Flexible (Fear of Pegging)
de jure Flexible, de facto Fix (Fear of Floating)	de jure Flexible, de facto Flexible (No Cheating)

The data on the degree of information disclosure is taken from Table A.7 of Fry et al. (2000), which is based on a 1998 survey of central banks conducted by the Bank of England. I use three information disclosure variables: (a) the degree of policy explanation, (b) the explanation of forecasts, and (c) the dissemination of information regarding the state of the economy. All are continuous indices that are weighted averages of responses to several questions. The policy explanation variable covers timeliness, frequency, and breadth of announcements. Explanation of forecasts covers the extent to which the central bank publishes forecasts, explains risks to the forecast, and explains past forecasting errors. Lastly, the dissemination of information on the state of the economy covers public speeches by bank officials, regular bulletins, and the publication of bank research. The data set on information disclosure includes 92 countries.

To capture fear of pegging and fear of floating, I use the information found in the IMF's 1998 *Annual Report on Exchange Arrangements and Restrictions* (AREAR) for the de jure regime and Reinhart and Rogoff's classification scheme for the de facto

regime. If the de jure regime is fixed but the de facto regime is more flexible, I consider this as fear of pegging. If the de jure regime is flexible but the de facto regime is relatively fixed, I consider this as fear of floating. For a sample of 76 countries where both de jure and de facto regime data are available, 10 show fear of pegging while 20 show fear of floating. The presence of cheating is represented by a binary variable where 1 is assigned to cheating and 0 is assigned to the absence of cheating. The dependent variables in two separate cross-section models are:

Fear of Pegging

C_{FP} = 1 if flexibility of de facto regime > flexibility of de jure regime

= 0 otherwise

and

Fear of Floating

C_{FF} = 1 if flexibility of de facto regime < flexibility of de jure regime

= 0 otherwise

The probit equation for fear of pegging has C_{FP} as the dependent variable while the probit equation for fear of floating has C_{FF} as the dependent variable. The two equations share the same set of independent variables, including the information disclosure variables and several control variables. The control variables are inflation, total stock of international reserves, trade openness and GDP per capita. The results of the estimation are given in Table 3.3.

Table 3.3
Fear of Pegging and Fear of Floating

	Dependent Variable	
Independent Variables	C_{FP} (fear of pegging)	C_{FF} (fear of floating)
Constant	-1.3740 (-1.2370)	-1.3763 (-1.3549)
Explanation of Policy	0.0159 (1.5344)	-0.0129 (-1.5239)
Explanation of Forecasts	-0.0131 (-1.6039)	0.5782E-02 (0.8215)
State of Economy Reporting	-0.3340E-02 (-0.2378)	0.0186 (1.4843)
CPI Inflation	-0.1807E-02 (-0.7838)	0.2553E-02 (1.6366)
Total International Reserves (minus gold)	0.1135E-11 (0.1197)	-0.1240E-10 (-0.9526)
Trade Openness	0.4926E-02 (1.2395)	-0.2757 (-0.6253)
GDP per capita	-0.2401E-04 (-0.7415)	-0.2603E-05 (-0.1136)
R-squared	0.1080	0.0823
Fraction of Correct Predictions	0.8630	0.7123

Note: Numbers in parentheses are t-statistics.

In the case of fear of pegging, two of the information disclosure variables have the expected sign (negative). Explanation of forecasts and dissemination of information about the state of the economy are associated with less cheating. On the other hand, explanation of policy has a positive impact on cheating. These results suggest that the private sector in most countries place more weight on information regarding the present and future path of the economy rather than what policy makers say they do. In a sense, this ties in with the Welch and McLeod model since the differential advantage of the

central bank over the private sector is observance of external shocks. As expected, inflation exerts a negative influence on the temptation to devalue. International reserve exerts a positive influence suggesting that accumulation of reserves and increased exchange rate regime flexibility can go side by side. The positive coefficient of trade openness can be interpreted to mean that surprise devaluations generate more benefits if the country is more open. Finally, the higher the GDP per capita or level of development, the temptation to devalue is lessened.

The signs of the coefficients of the fear of pegging equation conform to economic intuition. However, care must be taken in making general conclusions since none of these coefficients are statistically significant.

In the fear of floating equation, only the policy explanation variable deters cheating. This result suggests that policy makers find it more difficult to secretly manage or fix the exchange rate if the private sector is informed about policy decisions. On the other hand, information about the economy and forecasts seem to support the policy maker's cheating strategy. Again, one can impute some logic to these conclusions. The announcement and explanation of current policies may be effective in binding the policy maker's actions. Thus, an announcement that there will be no exchange rate intervention actually commits the central bank to be more flexible. It can also be observed from the results that, except for GDP per capita, all the control variables reverse signs compared to fear of pegging. Since cheating in the form of fear of floating entails secretly fixing the exchange rate, the positive sign of inflation suggests that higher inflation requires that the central bank cheat. On the other hand, the negative sign of international reserves suggests that clandestine fixing is less necessary if reserves are high. The negative

coefficient of trade openness reveals that a higher engagement with international trade lessens the motive for artificially introducing rigidity in the exchange rate. Finally, GDP per capita again reduces the motive for cheating.

As with the fear of pegging case, the results for fear of floating conform to economic intuition although none of the coefficients are statistically significant. Hence, these conclusions cannot be considered definitive and more work needs to be done when more data like the Bank of England data set are available. It is interesting to note that GDP per capita, signifying level of economic development, deters cheating on both counts. It is the only variable that consistently has negative coefficients. This is very intuitive since the decision to cheat must be higher the greater the possible gains. If a country already has a high level of economic development, then the marginal gains from cheating should be small.

Despite the interesting insights obtained above, it is still difficult to make generalizations particularly why the three information disclosure variables behave differently with respect to one another.

Chapter 4

Country Chronologies

4.1 Introduction

The theoretical models presented in chapter 3 see the exchange rate regime as the outcome of rational choice. In practice, most emerging market and less developed countries experiment with different types of exchange arrangements over time. It is not uncommon for a single country to go from one type of regime to another in a short period of time. The process of experimentation is the real-life counterpart of the optimizing policy maker. In this chapter, I study the evolution of actual exchange rate regimes and policies regarding the capital account against the backdrop of the impossible trinity doctrine of open economy macroeconomics. The impossible trinity doctrine, which claims that fixed exchange rates, open capital accounts, and monetary independence cannot all co-exist at the same time, provides the basic constraint on the selection of the exchange rate regime.

I provide country histories or chronologies for the ten countries in the sample that covers the period 1984-2004 (see Appendix A for the tables). My concentration is focused on the three main components of the impossible trinity theorem: (a) the exchange rate regime, (b) the degree of monetary autonomy or independence proxied by average interest differentials, and (c) the degree of openness of the capital account. The exchange rate regimes reported for 1981-2001 are still based on the de facto classification scheme of Reinhart and Rogoff while I rely on the AREAR for the years 2002-2004. To repeat, the latter is not necessarily de facto since these exchange rate regimes are based on countries' self-declarations. The indicators of monetary autonomy I

present are twelve-quarter averages of the interest rate differential defined as the domestic money market rate minus a comparable international or foreign interest rate (3-month U.S. T-bill rate). The third element of the trinity, the degree of capital account openness, is the variable that has a wide variety of opinions regarding the correct way of measurement. In the country chronologies I present three indices of capital account openness. The binary 0/1 measure and the VHZ or Von Hagen-Zhou index are both based on countries' self-declarations. Hence, they are both to be considered as de jure measures of capital account openness. The 0/1 measure is reported for 1984-1997 since AREAR only had a two-way classification during this period. The value of 0 indicates, "closed" or zero flexibility while 1 stands for "open" or flexible. Starting in 1998, I report the VHZ index where a higher value (on a scale that ranges from –1.99 to +1.99) indicates greater intensity of capital controls. Unlike the 0/1 measure, VHZ is a continuous index and takes advantage of the finer classification of capital account transactions that became available in AREAR after 1997. Lastly, the variable GPKF or Gross Capital Flows (as a % of GDP) is a de facto measure of capital account openness.

4.2. ASEAN-5 (Tables A.1 to A.5)

The Asian financial crisis of 1997 divides the most recent twenty-year period (1984-2004) into two distinct phases. Before the crisis, all of the ASEAN-5 countries had either intermediate exchange rate regimes or pegs. Indonesia had a crawling peg, Malaysia and Singapore operated moving bands, and Thailand had a pegged exchange rate. Only the Philippines experimented with more than one type of exchange rate regime. It started with a float, then a crawling peg, then a band, and finally ended the pre-crisis period with a peg. After the crisis, Indonesia, the Philippines, Singapore, and

Thailand went towards the more flexible end of the exchange rate regime spectrum. Malaysia is the well-known exception, as it decided to go the other way and pegged its currency to the U.S. dollar.

The flight to greater flexibility by the four countries differs slightly as shown by their respective preferences for either independent float or managed float. Indonesia, being the hardest hit among the crisis countries, immediately went for independent float that extended from 1998-2001. It has since chosen a managed float from 2002 to 2004. The Philippines, on the other hand, had the reverse sequence. While it was also severely affected by the crisis (significant depreciation and output loss), it suffered less compared to Indonesia. Hence, it was forced to independently float only for a short period of time (July 1997-December 1997) and subsequently chose a managed float regime for the next three years. The last three years, however, showed a move to greater flexibility and the exchange rate regime is now an independent float. The remaining two, Singapore and Thailand, both chose to adopt managed floats.

With the selection of a particular exchange rate regime, the ASEAN-5 countries must also choose policies with respect to their capital accounts. I first discuss the de jure indices. Before the 1997 crisis, the 0/1 index shows that Indonesia, Malaysia and Singapore kept their capital accounts open while the Philippines and Thailand were closed. After the crisis, and with the AREAR's new classification system, the VHZ index indicates that the most open economy is still Singapore, followed by Thailand and Indonesia. The Philippines and Malaysia had the least open capital accounts in the post-crisis period. The latter's imposition of strong capital controls as a response to the crisis is a complete reversal of its earlier policy stance on capital flows. It can be said that the

overall present trend among the ASEAN-5 countries is one of greater caution. Even Singapore, which has historically been one of the most economically open countries in the world, applied selective capital account restrictions during the post-crisis period.

If we are to combine our observations regarding exchange rate regime flexibility and capital account openness, then the following shifts seems to have occurred:

(a) Indonesia shifted from Intermediate Exchange Rate Regime + Capital Account Convertibility to Flexible Exchange Rate Regime + Capital Control,

(b) Malaysia shifted from Intermediate Exchange Rate Regime + Capital Account Convertibility to Fixed Exchange Rate Regime + Capital Control,

(c) the Philippines shifted from Intermediate Regime + Capital Control to Flexible Exchange Rate Regime + Capital Control,

(d) Singapore shifted from Intermediate Exchange Rate Regime + Capital Account Convertibility to Flexible Rate Regime + Capital Account Convertibility,

and

(e) Thailand shifted from Fixed Exchange Rate Regime + Capital Control to Flexible Exchange Rate Regime + Capital Control.

These policy shifts largely support the contention that Intermediate Exchange Rate Regime + Capital Account Convertibility is an unsustainable policy mix. Eventually, Indonesia, the Philippines, Singapore and Thailand chose to be more flexible while Malaysia chose a fixed exchange rate. It must also be pointed out that since the 0/1 and VHZ measures of capital account openness are de jure, the true extent of openness may not be actually captured. In fact, for the case of the Philippines, Gochoco-Bautista and Canlas (2003) report that the capital account was actually very open in the nineties

since formal liberalization of capital transactions began in 1992. Hence, the value of 0 reported in AREAR for the Philippines may be inaccurate.[1] This further strengthens the case that intermediate regimes with open capital accounts are unsustainable since we can add the Philippines to the pre-crisis list with Indonesia, Malaysia, and Singapore.

In order to assess the validity of the impossible trinity theorem for ASEAN-5, I consider next the question of monetary autonomy by looking at the trend in interest differentials. I pay closer attention to the de facto measure of capital account openness, Gross Private Capital Flows as a percent of GDP (GPKF) rather than the de jure indices, since this reflects the surge of capital inflows characteristic of much of the period.

In the case of Indonesia, GPKF was monotonically increasing in the pre-crisis period while it operated an intermediate regime (crawling peg). In the same time period, the interest differential shows modest movement except when the crisis actually hit. This suggests that if foreign exchange intervention was conducted, it was not sterilized to a large degree. Otherwise, sterilization would have resulted in domestic credit contraction that results in high interest rates. In the post-crisis period, the interest rate differential started to fall since there is no need to maintain an exchange rate target. At this time, capital flows showed a marked decline.

The experience of Thailand seems to mirror that of Indonesia. In the pre-crisis period, GPKF increased monotonically and then falls off after the crisis. Similarly, the average interest differential for Thailand remained relatively stable despite the fact that it

[1] I tend to agree with Gochoco-Bautista and Canlas (2003). One of the consistent policy features of past development plans is the continuous relaxation of rules pertaining to foreign investment. Also, the recognition of the importance of open capital markets is also evidenced by the move to full currency convertibility in the nineties (see for example, National Economic Development Authority, 2001).

had a pegged exchange rate regime during the pre-crisis period when capital flows were still strong.

In the Philippine case, the interest differential has been relatively high compared to Thailand but has a very noticeable downward trajectory. Given that it has also been operating an intermediate exchange rate regime for most of the period and GPKF has been monotonically increasing, one might expect heavy sterilized foreign exchange intervention to result in high interest rates. However, the data does not show this since capital flows to the Philippines have actually been modest in comparison to its close neighbors. The seemingly large increases in GPKF can be explained through the denominator since output growth in the Philippines has been stagnant ever since its first major BOP crisis of 1984.

The two countries with relatively more developed domestic financial sectors, Malaysia and Singapore, have modest interest rate differentials compared to the other three countries comprising ASEAN-5. It is also interesting to note that these two countries are the only ones in the group that have had *negative* interest rate differentials. The case of Singapore may be the easiest to explain in terms of the impossible trinity. Being the most open economy in the region on both the trade and capital accounts, it is not surprising that it's average interest rate differential for most of the period is low. The relative absence of manipulation of the domestic interest rate may be justified by the fact that inflation has never been a large concern of the Singapore economy. Hence, there is little need to use either the exchange rate or the interest rate for domestic objectives. In the case of Malaysia, the seeming lack of monetary autonomy can also be attributed to its policy of openness before the imposition of capital controls. Like Singapore, Malaysia

has relatively little use of the interest rate as an instrument since the economy does not have any built-in inflationary tendency.

The relatively higher levels of the interest rate differential for Indonesia, the Philippines, and Thailand during the pre-crisis period as well as for Indonesia in the post-crisis period suggests that monetary policy has been and continues to be an important tool. One further explanation for this is that many developing countries show a strong aversion towards the threat of capital flight. If this is true, then it may be rational for some developing countries to keep the interest rate at high levels to ensure the flow of foreign capital (Hashimoto, 2001). Looking back at the historical record, this explanation may be credible given that the early eighties was a period of debt crises in many developing countries. It is therefore possible that the memory of this period generated the aversion to capital flight in the mid-eighties up to the early-nineties. Another explanation provided by Alba, et al. (1999) is that a high interest rate can help keep the real exchange rate at a depreciated level through its effect on price stability, thereby safeguarding international competitiveness. This is a real possibility since Indonesia and the Philippines operated intermediate exchange rate regimes while Thailand had a pegged exchange rate. It is also the case that Indonesia and the Philippines have had problems with constraining inflation relative to the other countries in the region. The high interest rates in the pre-crisis period can also be said to be partly responsible for magnifying the trend towards increased capital flows that preceded the reversal of 1997. Hence, the leveling of interest rates observed after the crisis can be interpreted as market corrections after peaking in 1997-1998.

4.3. MERCOSUR + Chile (Tables A.6 to A.10)

The experiences of the Latin American countries in the period 1984-2004 with respect to exchange rate regimes show greater diversity relative to their Southeast Asian counterparts. Most of these countries experienced frequent changes in their choice of exchange rate regime, the exception being Argentina, which operated a currency board for the latter half of the period before it collapsed in 2002. As the chronologies show, Brazil has been alternating between a floating regime and a pegged regime for much of the first half of the period before operating a crawling band for the next four and a half years (July 1994-January 1999). However, in keeping with the global trend towards exchange rate flexibility among many emerging market countries, it also instituted a floating exchange rate regime in 1999. The experience of Chile is close to that of Brazil although it started its experiment with a crawling band much earlier. And just like Brazil, Chile began the move towards greater exchange rate regime flexibility in 1999. The popularity of the intermediate exchange rate regime can also be seen in the two smaller countries, Paraguay and Uruguay. The crawling band has been observed in Paraguay between 1986 and 1989 and the crawling peg between 1991 and 1999. For Uruguay, the exchange rate regime was a float up until the nineties. This gave way to the crawling band, which persisted up to 2002. Eventually, both countries went the way of the others and decided to float at the end of the twenty-year period. The dominance of intermediate exchange rate regimes in the region, punctuated by occasional floats, is regarded by many, as due to the region's past experiences with high inflation and frequent balance of payments crises.[2]

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[2] Rojas-Suarez (2003) discusses the circumstances surrounding the experiments with different exchange rate regimes across much of Latin America in the nineties. She traces the diversity of choices to two main

The choice of policy with respect to the capital account also shows great variation. Using the de jure 0/1 measure from AREAR, one can see that the Latin American countries imposed capital account restrictions for most of the period with the exception of Uruguay. The greater openness of the Uruguayan capital account may be due to the fact that it is the one of the smallest economies in the region. It has no other recourse but to open its economy to trade and investment flows. The most famous case of capital controls in the recent history of the region is that of Chile. Many economists point to the Chilean experience with capital controls as a success since Chile has not been hit by any major financial crisis in recent years. Using the Von Hagen-Zhou index for the tail end of the period, once can see that there is a general trend towards greater openness except for Argentina. The index for Argentina has been increasing (indicating greater intensity of capital controls) especially after the collapse of its currency board in 2002. Using the de facto measure, GPKF, all five countries show an increasing tendency towards greater openness. In fact, even Argentina, which may have increased the policy restrictions on capital transactions, had a substantial jump in the ratio. Again, this might be due to the output losses suffered during the crisis that ensued after the collapse of its exchange rate regime.

With respect to the issue of monetary autonomy, a glance at the figures for average interest rate differentials in the region shows a marked difference from Southeast Asia. The hyperinflations that plagued the region in the eighties made the interest rates in Argentina and Brazil extremely high in the first half of the period. It can be seen from

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factors: (1) the evolving constraints imposed by international capital markets, particularly the increased securitization of international debt started with the Brady Plan, and (2) the disillusionment with central banks' ability to secure price stability and prevent speculative attacks. Combined, the increasing

the chronology that the introduction of the currency board in Argentina had a dramatic effect in terms of bringing interest rates down. However, even after the stabilization efforts, relatively high interest rate differentials still existed in Brazil. The interest rate differentials in Paraguay and Uruguay are also relatively high through most of the period when compared to Southeast Asia. Only Chile seems to be on a downward trajectory as far as the interest rate differential is concerned.

Some observations do not seem to support the predictions of the impossible trinity theorem. For example, Uruguay, which is supposed to have a very open capital account through most of the period, has had significant interest differentials. On the other hand, Chile had declining interest differentials even though it is relatively closed compared to its neighbors. Within the strict confines of the impossible trinity, such falling interest differentials in Chile can be interpreted as declining monetary autonomy. However, as in the case of the ASEAN-5 countries, explanations beyond this theorem may shed light on the behavior of the actual interest rate differentials. De Gregorio (2001), for example, traces the evolution of exchange rate policy in Chile. He points to the Chilean government's efforts throughout most of the nineties to prevent real appreciation of the exchange rate for competitiveness reasons. However, as De Gregorio claims, despite the imposition of capital controls to prevent appreciation, large conglomerates with access to international capital markets were able to obtain long-term financing at low cost as the length of borrowing increased.

Uruguay, like most of its neighbors, has a high-inflation history and the existence of high interest rates reveals its pre-occupation with achieving price stability. As stated

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importance of foreign capital flows and the perceived ineffectiveness of monetary policy can explain the move to hard fixes such as full dollarization (Ecuador) and currency boards (Argentina).

for example by Marengo (1998), one of the reasons why Uruguay has had poor investment rates on a consistent basis is that it has the largest welfare system in Latin America. Thus, it is not conceivable to think that while output suffers from low investment rates, demand pressures continue from the consumer sector. There are therefore reasons to believe that supply-side and demand-side inflationary tendencies are built into the system. Inflation history is also responsible for why countries like Brazil and Chile are on the forefront of the inflation-targeting movement that seems to have taken over much of the developing world.

One explanation that goes beyond the confines of the impossible trinity theorem is the case made for Brazil, that high interest rates can be attributed to what is called "cousins risk" or the correlation between exchange rate risk and country risk (Garcia and Didier, 2003). These authors acknowledge the role played by the exchange rate/capital control regime as in the case of the impossible trinity, but believe that more factors are involved. In a controlled environment as in the Brazilian Real Plan era, rigidity of the exchange rate regime coupled with initially low interest rates can cause massive capital flight that consequently results in interest rate overshooting. In a more flexible environment, low interest rates can cause incipient capital flight leading to significant currency depreciation and high exchange rate risk. The case of Brazil's very high interest rates in the mid nineties is traced to the strong interplay of country risk (i.e. capital controls) and exchange rate risk during that time.

Chile's declining interest differentials, on the other hand, is not so much the loss of monetary autonomy but is the product of an economy with a high degree of inflation

indexation (Landerretche, et al. 2000). Hence, the decline in interest rates can be attributed to its own success in the fight against inflation.

It is difficult to attribute the actual behavior of the interest rate differential solely to the policy on capital account openness, as the theory of the impossible trinity does. The theorem's predictions only hold in the case of perfect capital mobility or perfect capital immobility. It is likely that the actual experiences of countries with respect to the capital account lie somewhere in between.

4.4 Monetary Policy Frameworks (Table A.11)

There is a remarkable similarity between ASEAN-5 and MERCOSUR+Chile in terms of the historical evolution of monetary policy frameworks. The countries in both regions have had past experiences with exchange rate targeting. Even Singapore, which claims to have no single monetary policy target, is known to monitor its nominal effective exchange rate very closely, as it has done since 1981 (Tee, 2005). However, the coming of the new millennium shows that none of the ten countries in the sample use exchange rate targeting, except for Malaysia. Rather, the trend is one of inflation targeting. In ASEAN-5, both the Philippines and Thailand are now inflation-targeters while the same is true for Brazil and Chile in Latin America.

The movement away from exchange rate targeting and into inflation targeting is a direct consequence of the evolution of the exchange rate regimes. This is similar to the movement away from monetary targeting and into exchange rate targeting that went before (Rojas-Suarez, 2003). Dissatisfaction with a failed nominal anchor leads a country to experiment with other potential nominal anchors. The revealed weakness of an exchange rate target in the context of high capital mobility is responsible for the search

for a new nominal anchor. The current trend towards flexible exchange rate arrangements is forcing emerging market countries to adopt inflation targeting. However, the verdict on the search for the optimal anchor is still out since many of the emerging country inflation targeters are new to the approach. It remains to be seen whether choosing inflation targeting can exempt these countries from future macroeconomic crises.

Chapter 5

Empirical Framework

5.1 Data on Exchange Rate Regimes and other Macroeconomic Variables

For the data on exchange rate regime, I use the de facto classification scheme of Reinhart and Rogoff (2002) or RR. This data set is in the form of country chronologies at a monthly frequency and I take advantage of this to estimate the model on a quarterly basis. I choose not to use a monthly frequency, as exchange rate regime changes on a monthly basis are rare for most countries. However, there are points in some time series where regime changes occur between quarters within a year. An annual frequency does not capture this but a quarterly frequency does. The only drawback to the quarterly frequency (as opposed to the annual frequency) is the unavailability of matching macroeconomic data for some variables in the regressions.

In the cases of very short samples, I pool together the observations from selected countries. The time frame of the study is 1984Q1 to 2004Q4. Since, the RR classification scheme ends at 2001Q4, I use the information on exchange rate regimes from the IMF's *Annual Report on Exchange Arrangements and Restrictions* (AREAR) to extend the sample period. Although AREAR's classification scheme has been considered in the past as belonging to the de jure type, the IMF's revised classification scheme started in 1997 addresses this shortcoming to some extent. Hence, although there might be some slight problems with respect to the issue of comparability, this is the best that can be done given that there is as of yet no update coming from RR. It will be difficult to exactly reconstruct the RR classification as some of the steps involved in their algorithm involve subjective judgments.

The specific sources of each variable will be detailed later in the descriptions of the estimating equations.

5.2 Exchange Rate Regime Classification and Probit Modeling

I follow the traditional approach used in the literature by estimating probit equations to empirically model exchange rate regime choice. When the data permits, I choose to perform a 4-category ordered probit if there are at least four distinct exchange rate regimes in the sample. The rationale for exploring the multivariate ordered probit is to allow for intermediate regimes. The two middle categories in the four-way classification represent two kinds of intermediate regimes, one for relatively fixed intermediate regimes and another for relatively flexible intermediate exchange rate regimes. On the other hand, the use of the bivariate probit is consistent with most theoretical models of exchange rate regime choice where the choice is only between purely fixed and flexible exchange rate regimes. An attractive feature of the simpler bivariate probit is that it ties in with the two-strategy assumption of the game theory model in Welch and McLeod (1993). Recall that in that model, the two choices for the policy maker are a fixed exchange rate ($e = 0$) or a flexible exchange rate ($e \neq 0$). The probit model assigns a value of 1 to the observed variable (exchange rate regime choice) if the corresponding latent variable (desired degree of exchange rate flexibility) is greater than zero. It assigns a value of 0 to the observed variable if the corresponding latent variable is less than or equal to zero.

Whenever I have to use the bivariate probit instead of the multivariate ordered probit, the value for the dependent variable is 0 if the country has a fixed regime and 1 if it has a flexible regime. However, there are no single definitions of what fixed and

flexible mean. I consider the regime at time t to be fixed if it belongs to categories 1 to 11 in Reinhart and Rogoff (2002)'s 14-way classification scheme. I consider the regime at time t to be flexible if it belongs to categories 12 to 14. The implicit assumption I make in choosing this dichotomy is that intermediate regimes (categories 5 to 11) are closer to fixed rather than floating. This coding scheme implicitly assumes that intermediate regimes such as adjustable pegs and crawling pegs are characterized by frequent intervention. For reference, the RR exchange rate regime classification scheme is reproduced in Table 5.1.

The RR classification scheme consists of 14 categories of exchange rate arrangements using their fine grid. It also includes as a first category, countries with no separate legal tender such as dollarized economies. The coarse grid consists of 5 levels where 1 is assigned to the fixed kinds of regimes (including currency boards and pegged regimes) and the code number increases with the degree of regime flexibility. It is interesting to note that the three kinds of floating arrangements in RR are all coded differently. Managed floating with a code number of 3 is treated as an intermediate regime while freely floating (code 4) and freely falling (code 5) are considered as separate categories. In my study, I also treat managed floating as an intermediate regime. The rationale behind the distinction between freely floating and freely falling is that the latter only exists under extreme conditions of hyperinflation. For the purposes of my study, I combine freely floating and freely falling into one category since hyperinflationary episodes do not exist for the countries I study during the period 1984-2004.

Table 5.1
Reinhart and Rogoff De Facto Exchange Rate Regime Classification Scheme

Natural Classification	Number Assigned to Category in Fine Grid	Number Assigned to Category in Coarse Grid
No separate legal tender	1	1
Pre announced peg or currency board	2	1
Pre announced horizontal band narrower than or equal to +/- 2%	3	1
De facto Peg	4	1
Pre announced crawling Peg	5	2
Pre announced crawling band that is narrower than or equal to +/- 2%	6	2
De facto crawling peg	7	2
De facto crawling band that is narrower than or equal to +/- 2%	8	2
Pre announced crawling band that is wider than or equal to +/- 5%	9	2
De facto crawling band that is narrower than or equal to +/- 5%	10	3
Moving band that is narrower than or equal to +/- 2%	11	3
Managed Floating	12	3
Freely Floating	13	4
Freely Falling	14	5

Source: Reinhart and Rogoff (2002)

5.3 Simultaneous Equations with a Limited Dependent Variable

The main empirical strategy I employ is to test for the simultaneous determination of the exchange rate regime and selected macroeconomic variables. In particular, I am interested in the effects of the chosen regime on the macroeconomic variables that pertain to the *external sector*. In this study, the macroeconomic variables of interest are (a) the change in international reserves, (b) the total stock of international reserves, (c) the level of inward foreign direct investment, and (d) the openness of the capital account. In

addition, I also test whether the exchange rate regime is linked to domestic output. The motivation behind the simultaneous equations approach is the insight that the policy maker can target any one of these variables by selecting the appropriate exchange rate regime. In the spirit of the political economy approach, I assume that there are also possible feedback effects between the regime and the target variable. Hence, the appropriate econometric method to use is a simultaneous equations model.

The simultaneous equations approach with a limited dependent variable that I use is the two-stage procedure developed by Nelson and Olson (1978). This is further explained in Maddala (1983) and applied to exchange rate regimes in Savvides (1990), Leon and Oliva (1999), Ghosh, Gulde,and Wolf (2002), and Agbola and Kunanopparat (2003). The model consists of the following structural equations, (5.1) and (5.2):

(5.1) $Y_t = \alpha_1 X_t + \beta_1 Z_{1t} + \varepsilon_{1t}$

(5.2) $X_t = \alpha_2 Y_t + \beta_2 Z_{2t} + \varepsilon_{2t}$

where Y_t = exchange rate regime at time t

X_t = target macroeconomic variable at time t

Z_{1t} = vector of exogenous regressors for Y_t

Z_{2t} = vector of exogenous regressors for X_t

ε_{1t}, ε_{2t} = error terms for (5.1) and (5.2), respectively

The model given by equations (5.1) and (5.2) can be estimated using a two-stage procedure (2SLS). The first stage consists of estimating the reduced form equations. The second stage consists of substituting the fitted values of Y_t and X_t back into the structural equations and estimating the structural equations.

The reduced form equation (5.3) for the exchange rate regime, Y_t, is as follows:

(5.3) $Y_t = \theta_1 Z_{1t} + \theta_2 Z_{2t} + \varepsilon_{3t}$

where $\theta_1 = \frac{\beta_1}{(1-\alpha_1\alpha_2)}$ $\theta_2 = \frac{\alpha_1\beta_2}{(1-\alpha_1\alpha_2)}$ $\varepsilon_{3t} = \frac{(\varepsilon_{1t} + \alpha_1\varepsilon_{2t})}{(1-\alpha_1\alpha_2)}$

The reduced form equation (5.4) for the target macroeconomic variable, X_t, is as follows:

(5.4) $X_{jt} = \phi_1 Z_{1t} + \phi_2 Z_{2t} + \varepsilon_{4t}$

where $\phi_1 = \frac{\alpha_2\beta_1}{(1-\alpha_2\alpha_1)}$ $\phi_2 = \frac{\beta_2}{(1-\alpha_1\alpha_2)}$ $\varepsilon_{4t} = \frac{(\varepsilon_{2t} + \alpha_2\varepsilon_{1t})}{(1-\alpha_1\alpha_2)}$

To implement the simultaneous equations model, it is necessary to find variables for Z_{1t} and Z_{2t}. The Z_{1t} vector represents variables that affect the choice of regime other than X_t. In choosing the variables to represent Z_{1t}, I utilize both the political economy approach and the optimal currency area approach or OCA. Most, if not all, of the models of political economy see a tradeoff between inflation and a real target. This suggests that inflation should be included in the Z_{1t} vector. In the optimal currency area approach, a multitude of variables are suggested but I select three of the more commonly used in the empirical literature: level of economic development (GDP per capita), trade openness, and the extent of trade diversification.

The Z_{2t} vector includes other variables that affect the target macroeconomic variable but are not directly linked to the exchange rate regime. For example, in the case of international reserves, the literature on the demand for international reserves often cite imports, foreign debt, and foreign currency denominated debt as likely factors that explain the hoarding of reserves (see for example, Pringle and Carver (2003), Aizenmann, Lee, and Rhee (2004), Goldstein and Turner (2004)). I shall discuss these issues in detail in the succeeding sections.

5.3.1 The Exchange Rate Regime and International Reserves

The econometric models I use for investigating the link between the exchange rate regime and international reserves consists of two alternative pairs of simultaneous equations. The first model, equations (5.5) and (5.6) uses the change in international reserves:

(5.5) Exchange Rate Regime = f(*Change* in International Reserves, CPI Inflation, Inflation Volatility, Trade Openness, GDP per capita, Trade Diversification)

(5.6) Change in Int. Reserves = f(Exchange Rate Regime, Foreign Currency Claims of BIS-reporting Banks, Export Volatility, Interest Rate Differential, Trade Openness, GDP per capita)

The second model, equations (5.7) and (5.8), uses the total international reserves:

(5.7) Exchange Rate Regime = f(*Total* International Reserves, CPI Inflation, Inflation Volatility, Trade Openness, GDP per capita, Trade Diversification)

(5.8) Change in Int. Reserves = f(Exchange Rate Regime, Foreign Currency Claims of BIS-reporting Banks, Export Volatility, Interest Rate Differential, Trade Openness, GDP per capita)

The exchange rate regime is a qualitative endogenous variable based on the country histories of Reinhart and Rogoff (2002). I use two coding schemes – a two-way classification and a four-way classification. The reason for having two schemes arises

from the data set itself. While some of the countries in this study have experiences with more than two types of exchange rate regimes within the sample period, others have experiences with at most two types of regimes. Singapore is an example of the latter. The four-way classification scheme has the following assignment of values:

Table 5.2
Coding Scheme for Exchange Rate Regimes

Four Way Classification Scheme	
Exchange Rate Regime	**Code**
Fixed Exchange Rate Regime - Single Currency Peg, Basket Peg, Currency Board	0
Intermediate Exchange Rate Regime 1 - Adjustable Peg, Crawling Peg, Crawling Band	1
Intermediate Exchange Rate Regime 2 - Managed Float	2
Flexible Exchange Rate Regime - Independent Float	3

The two-way classification scheme is entirely based on the four-way scheme such that I assign a value of 0 if the regime is either a fixed exchange rate regime or belongs to intermediate exchange rate regime 1. The value of 1 is assigned to regimes that are either managed floating or independent floating. Note that the coding schemes I use assign higher values to more flexible exchange rate regimes.

The exogenous variables for the exchange rate regime equation include CPI inflation, inflation volatility, trade openness, GDP per capita, and the extent of trade diversification. Except for the last, all data are gathered from IFS. Data for trade diversification are constructed using data from both IFS and from the United Nations Comtrade database. CPI inflation is just calculated as the percentage change of the quarterly consumer price index. The measure of inflation volatility is the standard

deviation of the previous four quarters' CPI inflation. Trade openness is measured in the usual way as the ratio of the sum of merchandise exports and merchandise imports to GDP. Since quarterly GDP series for some countries in the sample are not available, the linear interpolation routine in TSP 4.5 is used on the yearly GDP figures whenever the quarterly figures are not available. To construct the quarterly GDP per capita series, it is assumed that the yearly population figure is the population for each of the four quarters of the year. The index of trade diversification I use is the absolute value of the difference between the volatility of the bilateral exchange rate with the U.S. dollar and the volatility of the nominal effective exchange rate. In constructing this variable, I follow Dumas, Lee, and Mark (2005) in defining volatility as the mean absolute deviation of monthly percentage changes in the relevant level variable. In my study, I use the previous 12-month period. In the cases of Malaysia, the Philippines, Singapore, Chile, Paraguay, and Uruguay, series for nominal effective exchange rates can be obtained from IFS. For Indonesia, Thailand, Argentina, and Brazil, I construct the series using the data from UN Comtrade.

In the exchange rate regime equations, an independent variable that has a positive coefficient indicates that the variable tends to be associated with greater exchange rate regime flexibility. The main independent variables, changes in international reserves or the level of total reserves (minus gold), are expected to have a negative coefficient. This expectation is based on the idea that if international reserves are high relative to the target set by policy makers, then there is less need for exchange rate flexibility. Devaluation or upward exchange rate flexibility may be one of the tools used by policymakers to boost international trade competitiveness, as in section 3.2. Alternatively, the expected

negative coefficient can be interpreted as a case wherein the existence of substantial international reserves can sustain a fixed exchange rate regime. There is some slight difference in interpretation between changes and levels of international reserves. The first is an indication of policy stance while the latter is a structural feature of the economy. I discuss this issue further in Chapter 6.

The variable, CPI inflation, is also expected to have a negative coefficient. A higher level of inflation is expected to induce policymakers to use the exchange rate regime as a nominal anchor and fix the exchange rate. In addition, the previous year's inflation volatility represents the most recent inflation history. A more volatile inflation performance can act as a signal to policymakers that the exchange rate should be used for the purpose of inflation stabilization rather than for enhancing trade competitiveness. This is the basic inflation-competitiveness trade-off suggested in the political economy approach to exchange rate regimes. Hence, inflation volatility is also expected to have a negative sign.

The remaining three variables in the exchange rate regime equation are all suggested by traditional OCA theory (see Salvatore, 2003). Trade openness is expected to have a negative coefficient based on the idea that a more open economy should be more averse to frequent exchange rate changes and a relatively fixed regime is more conducive to international transactions. On the other hand, GDP per capita, which is a common indicator for the level of development, is expected to have a positive coefficient since a wealthier nation is believed to be better able to cope with exchange rate volatility. A country with a higher GDP per capita also has a more developed financial system that can hedge the exchange rate risk. The trade diversification variable I use is different

from the usual concentration indices such as the share of the largest trade partners. The idea behind using the difference in the volatilities of the bilateral and the effective exchange rates is that a country that has a less diversified trade structure will have an effective exchange rate not too distant from the bilateral rate with the U.S. (usually the largest trade partner). Thus, a smaller absolute difference indicates less diversification. According to OCA, this should be associated with greater exchange rate flexibility. (For example, see Gandolfo, 2002.)

In the international reserves equations, a negative coefficient for the exchange rate regime indicates that greater exchange rate flexibility tends to be associated with a lesser need to accumulate international reserves. This expectation is based on the behavior of policymakers in the context of capital inflows. A surge in capital inflows generates pressure for currency appreciation. Thus, a country that wants to prevent currency appreciation (for competitiveness reasons) tends to accumulate international reserves. This is the so-called "mercantilist motive" for reserves accumulation (see Aizenmann and Lee (2005) and Kohli (2005)). On the other hand, it is also conceivable from another political economy perspective that an increase in exchange rate flexibility can result in greater reserve accumulation if surprise devaluations can engineer trade surpluses that give rise to the accumulation of reserves. The first mechanism is related to the capital account while the second mechanism works through the current account. Thus, although I expect the coefficient to be negative, there is also a slight possibility that it can be positive if the current account dominates the capital account.

The other independent variables for the international reserves equation are largely based on Edison (2003). Aside from the degree of exchange rate flexibility, other

potential determinants of international reserves include trade openness, level of economic development, external trade shocks, and fiscal costs. High levels of trade openness and the level of economic development are expected to give rise to higher levels of reserves accumulation and are thus expected to have positive coefficients. The measure I use to represent external trade shocks is the volatility of exports and is simply the standard deviation of merchandise exports from the previous four quarters. This variable is expected to have a positive coefficient, as uncertainty about export earnings must lead to a greater precautionary demand for reserves. The fiscal cost of international reserve holdings is measured as the interest rate differential between a domestic interest and an international interest rate. The domestic interest rate used is the domestic money market rate while the international interest rate is the three-month interest rate on U.S. Treasury bills. A higher level of this interest rate differential represents higher fiscal cost and must have a negative coefficient. The remaining independent variable in the international reserves equation is the foreign currency claims on the country by BIS reporting banks. I include this in the model as a possible proxy for the extent of the "original sin" syndrome, which refers to the observed inability of most less developed and developing countries to borrow in their own currencies. If borrowing is done mostly in terms of foreign currency, this gives rise to another precautionary motive for holding more international reserves. The coefficient must therefore be expected to be positive. Except for the foreign currency claims variable, the data are from IFS.

5.3.1.1 Seemingly Unrelated Regression (SUR)

As an alternative to the simultaneous equations approach, I also employ the seemingly unrelated regression (SUR) technique in the case of international reserves. The

motivation behind this complementary approach is to uncover correlations between the residuals of the different individual country regressions. SUR is normally used in applications such as estimating systems of demand equations and systems of production functions. In the case of exchange rate regime choice and the accumulation of reserves, the SUR model can measure the degree of co-movement across the countries within each particular geographic region. However, it is difficult to attribute any co-movement to any single source. One possibility is that the correlations of the error terms can be due to some amount of policy synchronization, whether intended or unintended. At the same time, common external shocks that may hit a particular region may elicit similar co-movements. Formally, the SUR model can be expressed as

$$(5.9)\quad y_{it} = \alpha_i + x_{it}^{T}\gamma_i + \upsilon_t \qquad E(\upsilon_{it}\upsilon_{jt}) = \sigma_{ij}, \qquad E(\upsilon_{it}\upsilon_{is}) = 0 \quad \text{(for all i, j and } t \neq s)$$

The assumptions of equation (5.9) states that error terms for country i and country j at each point in time (υ_{it} and υ_{jt}) may not necessarily have zero covariance, σ_{ij}, although there is no serial correlation for each individual country. The LM test statistic for the absence of cross-unit correlations ($\sigma_{ij} = 0$ for all $i \neq j$) is $n\sum_{i=1}^{m-1}\sum_{j=i+1}^{m} r_{ij}^2$, where r_{ij} is the correlation coefficient for units i and j ($i \neq j$) and n = number of observations per cross-section unit. $LM \sim \chi^2(\frac{1}{2}m(m-1))$ where m is the number of cross-section units (i.e. number of countries). (See, for example Heij, et al., 2004).

5.3.2 The Exchange Rate Regime and the Output Gap

While the Welch and McLeod model (1993) investigates the inflation-international competitiveness tradeoff, the political economy models of Devarajan and Rodrik (1992) and Edwards (1996) investigate the role of the exchange rate regime in the

context of an inflation-output tradeoff. Exchange rate policy is seen as a tool that can either be used for inflation stabilization or to increase actual output beyond potential. For the purpose of comparison, I apply the same simultaneous equations econometric framework to investigate the link between the exchange rate regime and the output gap. The model is as follows:

(5.10) Exchange Rate Regime = f(Output Gap, CPI Inflation, Inflation Volatility, Trade Openness, GDP per capita, Trade Diversification)

(5.11) Output Gap = f(Exchange Rate Regime, Real Money Growth, Government Budget Surplus Growth, Financial Account Balance)

The most controversial aspect of this exercise is the selection of the method for computing the output gap. A casual look at the existing literature on this subject reveals that the best measure of the output gap is still very much subject to debate (see for example Faal (1993), Scott (2000), and Yap (2003) regarding the issues involved). For this study, I choose to use one of the simplest methods, which is to represent the output gap as the deviation of log output from a time trend.[1] The standardized residual from a simple regression of log GDP on time is used as the endogenous variable in the output gap equation. This specific method is intended only as a first approximation for the output process. The use of other methods for measuring potential output can be the subject of future research.

As in the case of the exchange rate regime-international reserves model discussed previously, the first equation in this pair of simultaneous equations is a qualitative

dependent variable model for the exchange rate regime. I use the same set of control variables but replace the international reserves variable with the output gap. In keeping with the idea that policymakers may target output, the expected coefficient of the output gap is negative. This means that if actual output is already high relative to potential, then there is less incentive for policymakers to use surprise devaluations to boost output. In this case, it is therefore logical to expect that the exchange rate regime be used for inflation-stabilization, which calls for a fixed regime. It must also be mentioned that the inclusion of two output measures in the regression (the other one being the level of GDP per capita) serves two different purposes. While the output gap is a target from the political economy approach, the level of development captured by GDP per capita is treated as an exogenous structural characteristic of the country at a point in time.

For the output gap equation, a new set of independent variables must be found in addition to the exchange rate regime. In the interest of simplicity and data availability, I include only the most basic macroeconomic policy indicators. The proxy for monetary policy is real money growth computed as the percentage change of the ratio of broad money to CPI. The measure of broad money used in this study is "Money Plus Quasi Money" in the Monetary Survey section of the IMF's *International Financial Statistics*. The proxy for fiscal policy is the growth of the government budget surplus. A higher growth in the budget surplus is interpreted as a contractionary fiscal policy while higher real money growth is expansionary monetary policy. The coefficient of real money growth is expected to be positive while the coefficient of the growth of the government budget surplus is expected to be negative.

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[1] The use of the log-linear specification corresponds to an exponential growth curve. This assumes that the output series grows with constant percentage increases. (see Pindyck and Rubinfield, 1991)

To assess the role of the international capital market in determining domestic output, I also include as an independent variable the balance on the Financial Account of the BOP. The idea behind this choice is to test whether domestic output responds more to developments in the international capital market rather than domestic policy actions. A popular belief surrounding the issue of globalization is the alleged disconnect between domestic macroeconomic variables such as output and domestic macroeconomic policies. For example, if international capital markets are the impetus to growth in countries after financial liberalization, then it is possible that the link between money growth and output may be weak or non-existent. The expected sign of this coefficient is positive if capital flows provide a boost to the economy and this is the rationale behind opening up to international capital markets. However, a contrary opinion coming from those opposed to the idea of fully open capital accounts point to the possibility of macroeconomic vulnerability owing to so-called sudden stops. If this is the case, then the sign of the coefficient must be negative.

The exchange rate regime's effect on the output gap is difficult to ascertain on purely theoretical grounds. The political economy models that see the exchange rate as a mechanism for engineering surprise devaluations obviously expect an expansionary effect of increased exchange rate flexibility. On the other side of the fence, there are many competing theories of contractionary devaluation. One can argue that the "fear of floating" phenomenon where countries are reluctant to make the exchange rate fully determined by market forces is a manifestation of this fear of contractionary devaluations. To complement the simultaneous equations framework and to examine the issue of contractionary devaluation more closely, I decide to form a single multiple

regression model of the output gap that explicitly takes into account some hypothesized interaction effects.

5.3.2.1 The Sources of Contractionary Devaluation

To test some theories of contractionary devaluation, I use the basic specification of the output gap model from the simultaneous equations model above but add interaction terms. The model is as follows:

(5.12) Output Gap = f(Exchange Rate Regime, Interaction Term 1, Interaction Term 2 Interaction Term 3, Real Money Growth, Government Budget Surplus Growth, Financial Account Balance)

where Interaction Term 1 = Exchange Rate Regime x Ratio of Imports to GDP
Interaction Term 2 = Exchange Rate Regime x Percentage of International Claims Denominated in Foreign Currency
Interaction Term 3 = Exchange Rate Regime x Currency Crisis Dummy

The first interaction term is the product of the exchange rate regime and the ratio of merchandise imports to GDP. This independent variable is intended to test the hypothesis from the old Structuralist tradition whereby devaluations are believed to lead to contraction since many developing nations have heavily import-dependent production structures. When combined with a more flexible exchange rate regime, frequent upward movements of the exchange rate raise the cost of imported inputs effectively causing a supply bottleneck. The expected sign of this term's coefficient must be negative. The second interaction term combines the degree of exchange rate flexibility with the percentage of all international claims on a country (by BIS reporting banks) denominated in foreign currency. Unlike the Structuralist tradition, this concept of the detrimental

output effects of currency mismatch and original sin when juxtaposed with exchange rate flexibility is more recent (see Goldstein and Turner (2004) and Kasa (1998), Cespedes, Chang, and Velasco (2002)). Behind this hypothesis is the idea that devaluations have large adverse effects on domestic borrowers' balance sheets. Since borrowing in foreign currency is rampant in much of the developing world, upward exchange rate changes can immediately raise borrowing costs and causes depressed investment levels. The third interaction term combines the exchange rate regime with a currency crisis dummy variable. Some authors such as Rajan and Shen (2003) believe that devaluations have their usual expansionary effects only during non-crisis periods. However, during crisis periods or when the country is a recent victim of speculative attacks, devaluation exposes the government's inability to defend the exchange rate and leads to greater investor pessimism. The currency crisis dummy variable is based on the historical information on currency crises starting dates found in Goldstein, Kaminsky, and Reinhart (2000) as well as from the popular press for later years. To simulate currency crises conditions, I do not restrict the dummy variable to operate only at the starting date. If the currency crisis starts in one quarter, I assume that currency crises conditions persist for three more quarters. Although this cut-off point is admittedly arbitrary, it is hoped that by adding some persistence I can capture some output effects, which may not materialize immediately during the start of the currency crisis. Like the first two interaction terms, the coefficient of this term is expected to be negative.

The contractionary devaluation tests are carried out using a single multiple regression approach rather than a simultaneous framework. This is done for simplicity since the interaction terms are combinations of various exogenous variables with the

exchange rate regime, which is an endogenous variable in the simultaneous equations framework. Carrying out the tests using a simultaneous equations approach will make the model non-linear and substantially increases the complexity of estimation. The problem is further complicated by the fact that the simultaneous equations framework with one qualitative endogenous variable is non-standard. This is a subject for future research.

5.3.3 The Exchange Rate Regime and Foreign Direct Investment (FDI)

Another application of the simultaneous equations modeling approach is to investigate if there is any link between the exchange rate regime chosen by policymakers and the inflow of foreign direct investment or FDI. The model I use is as follows:

(5.13) Exchange Rate Regime = f(Foreign Direct Investment, CPI Inflation, Inflation Volatility, Trade Openness, GDP per capita, Trade Diversification)

(5.14) Foreign Direct Investment = f(Exchange Rate Regime, Compensation of Employees, Electricity Production, Taxes on Income and Capital Gains, Taxes on International Trade, GDP per capita)

This particular application is of special interest to developing and emerging market economies that have invested greatly in reforming their economies to be more open. The inflow of FDI is considered by many countries in both Asia and Latin America to be an important contributor to their growth processes and also sends a signal to the international financial community that their countries will have the capacity to pay back foreign debt. As with the previous variables of interest (international reserves and

output), the exchange rate regime is modeled as being determined partly by the level of FDI and the usual control variables. Data on the control variables for equation (5.14) mainly come from *World Development Indicators 2005* CD-ROM. Data on FDI comes from IFS.

The a priori sign of the coefficient of FDI in the exchange rate regime equation is going to be negative just like for international reserves and the output gap if the theoretical model casts FDI as some real goal variable in the policymaker's objective function. This interpretation requires that increased exchange rate flexibility attract greater FDI inflows. Thus, if a country is already enjoying high levels of FDI, the exchange rate regime can be used to address the other goal, which is the reduction of inflation. The underlying hypothesis that greater exchange rate flexibility results in more FDI inflows can be justified depending on the nature of production actually carried out by these multinational firms in the host country. If FDI is geared for re-export, then a competitive real exchange rate helps the cause of FDI. However, if the activities of the foreign direct investor are import-dependent or are geared towards servicing the local market, then it cannot be assumed that increased exchange rate flexibility is desirable. In this case, it is plausible that foreign direct investors are on the side of more fixed exchange rates.

In the equation for FDI, some commonly cited factors that are important in the FDI decision are used as independent variables in addition to the exchange rate regime. While the exchange rate regime in the host country is rarely considered as one of the main factors in the decision of a firm to go overseas, factors such as labor cost, quality of infrastructure, host country tax policy, and level of development are often mentioned.

Note that since the WDI's series are annual, I have to assume that these series are the same on a quarterly basis. This is not an unrealistic assumption since variables such as wage and tax structures and infrastructure in developing economies tend to be rigid.

Labor cost is proxied by the variable Compensation of Employees, which is expressed as a percentage of GDP. The coefficient of this variable is expected to be negative if domestic labor cost is a dominant concern of the foreign investor. The quality of infrastructure is proxied by the variable Electricity Production. Although infrastructure is obviously multi-dimensional (i.e. paved roads, communications facilities, etc.), I choose to include only one variable since the inclusion of too many regressors in the equation decreases the statistical significance of the other independent variables. Electricity Production is selected due to its importance and is expected to have a positive coefficient. To represent the fiscal stance of the host country affecting FDI, I use two variables. The first is the Tax on Income and Capital Gains and the other is the Taxes on International Trade. Both tax variables are expressed as percentages of total tax revenue and are expected to be negatively related to the level of FDI. Developing countries that are aggressively courting FDI are known to engage in some form of tax competition such as tax holidays and other exemptions (Mutti, 2003). The popularity of special export processing zones or regions in some countries is due in part to this tax-exempt status given to international firms who choose to locate production in these zones. The Taxes on International Trade is also a deterrent to FDI if the firm is a re-exporter and engages in a lot of cross-border transactions. Lastly, the level of development of the host country represented by GDP per capita is expected to have a positive coefficient for possibly many reasons. A greater GDP per capita not only signifies the existence of a thriving

local market but it comes with many other benefits of economic development. These include a highly skilled workforce, well-developed financial institutions, political stability, etc.

As many of the time series that are used in the FDI equation are relatively short and some are not even available for some of the countries in this study, I cannot make any reliable statistical analysis on a per country basis. Thus, I pool together the observations from the Asian countries into one group and the observations from the Latin American countries into another.[2] Due to missing data problems, the first group excludes Thailand while the second excludes Argentina and Chile.

5.3.4 Capital Account Openness and International Reserves

5.3.4.1 The Exchange Rate Regime and de jure Capital Control Intensity

To examine the role of capital account openness, one might try to come up with a measure of capital control intensity that is not limited to an on-off scheme. The model I employ is as follows:

(5.15) Intensity of Capital Account Restrictions = f(Change/Level of International Reserves, Trade Openness, GDP per capita, Size of Government)

(5.16) Change/Level of International Reserves = f(Intensity of Capital Account Restrictions, Export Volatility Interest Rate Differential, Foreign Currency Claims, Trade Openness, GDP per capita)

[2] The pooled time series used for each region does not assume country fixed effects. Rather, it is assumed that each country within a specific region has common intercepts. This dummy variable approach implicitly assumes heterogeneity across regions but not for countries within regions. The modeling of unobserved heterogeneity within regions is a subject for future research.

I follow Von Hagen and Zhou (2002b) and make use of the new structure of the AREAR began in 1997. Starting with the 1997 volume, the presence or absence of capital account restrictions is no longer limited to two choices, fully open or fully closed. Rather, the 1997 volume subdivides capital account transactions into 10 categories and the 1998 volume expands the categories to 11. These 11 categories are: (a) capital market securities, (b) money market instruments, (c) collective investment securities, (d) derivatives and other instruments, (e) commercial credits, (f) financial credits, (g) guarantees, sureties, and financial backup facilities, (h) direct investment, (i) liquidation of direct investment, (j) real estate transactions, and (k) personal capital transactions. The presence or absence of restrictions for most countries is recorded for each of these categories (up to the 2004 volume of AREAR).

The approach taken by von Hagen and Zhou (2002b) (in a study of transition economies) is to take the ratio of the number of existing restrictions to the total number of possible restrictions, x. This gives rise to a continuous measure of capital control intensity. Since this measure is bounded by 0 and 1, they apply a transformation to the ratio, x. The Von Hagen-Zhou index (VHZ) is given as follows:

$$(5.17) \quad \text{VHZ Index} = \log\left[\frac{x}{(1-x)}\right]$$

where $x = 0$ is replaced by $x = 0.01$ and $x = 1$ is replaced by $x = 0.99$.

This index of capital control intensity is different from gross capital flows (% of GDP) in a number of ways. First, a higher number indicates less openness. Second, as it is based on the AREAR, it must be considered as de jure rather than de facto. Third, unlike gross capital flows, this index captures only policy barriers to the free flow of capital across national borders. Non-policy barriers such as imperfect substitutability of

domestic and foreign assets are not captured by this index. While this index may be more appropriate as a representation of policy stance, its limitation is that it only exists for small sample of years. Hence, I decide to pool all the observations for the ASEAN-5 as one group and all the observations for MERCOSUR+Chile as another group.

The Von Hagen-Zhou index (VHZ) is used in the same way as the other policy variables in this study. The simultaneous equations framework is applied using the index and international reserves as the endogenous variables. The same control variables are used as in the case of the exchange rate regime-international reserves pair. As the time frequency used in this study is quarterly, I make the assumption that the quarterly value of VHZ is constant at the yearly value. Again, this is not an unrealistic assumption since a policy of this nature tends to be persistent and not subject to frequent changes.

For the period 1998-2004, most countries in this study have a dominant exchange rate regime. In the case of most of the ASEAN-5 countries, the dominant exchange rate regime tends to be more on the flexible side (Malaysia, being the exception). In the case of MERCOSUR+ Chile, most have intermediate exchange rate regimes. As such, the expectation in the ASEAN-5 is that capital account openness should have a relatively negligible impact on the accumulation of reserves compared to MERCOSUR+Chile.

5.3.4.2 The Inverted-U Hypothesis of Capital Control Intensity

In addition to the simultaneous equations approach, I also try to test another hypothesis found in the literature: the inverted-U hypothesis regarding exchange rate regime flexibility and the intensity of capital controls. This hypothesis basically says that polar regimes should be associated with the absence or low degree of capital controls while intermediate exchange rate regimes should be associated with a higher degree of

capital controls. For example, Joshi (2003) points out that in a world of three kinds of exchange rate regimes (fixed, intermediate, flexible), and a choice between capital account convertibility or capital controls, there are six possibilities, found in Table 5.3.

Table 5.3

Six Possible Exchange Rate Regime/Capital Account Policy Mixes

A. Fixed Exchange Rate Regime + Capital Account Convertibitlity	B. Intermediate Exchange Rate Regime + Capital Account Convertibility	C. Flexible Exchange Rate Regime + Capital Account Convertibility
D. Fixed Exchange Rate + Capital Control	E. Intermediate Exchange Rate Regime + Capital Control	F. Flexible Exchange Rate Regime + Capital Control

In choosing which policy mix to implement, policymakers have to consider several factors: the size of the economy, the degree of trade openness, the degree of wage and price flexibility, and the level of financial development, to name a few. This is because the policy mix chosen dictates which instrument is going to be available. A combination that includes a fixed exchange rate regime provides a nominal anchor for inflation stabilization. This might be considered important for an economy that has to wrestle with low wage and price (downward) flexibility. On the other hand, a combination that includes flexibility of the exchange rate regime is appropriate for a country that stands to benefit from frequent exchange rate adjustment (such as a large, closed economy). The presence of capital controls makes available the domestic interest rate as an instrument to meet domestic objectives and also lessens the vulnerability to crisis.

In the case of capital account convertibility (the first row of the table), the interest rate is not available as an instrument. If the policymaker chooses A, then he must be doing so for the inflation-stabilization property of the fixed exchange rate regime. If the policymaker chooses C, then he must be doing so for the adjustment property of a flexible exchange rate regime. The policymaker may find that if he wants both desirable features through an intermediate exchange rate regime, it may not be feasible due to capital account convertibility. This renders combination B unsustainable and makes combination E more attractive.

In addition, policy combination E *dominates* combinations D and F. With capital controls, de-stabilizing capital flows are avoided. Choosing only between one of the two polar exchange rate regimes foregoes the benefit that can be obtained from the other. If one chooses D, the fixed exchange rate regime can be maintained since de-stabilizing capital flows are prevented but the adjustment property of the exchange rate is lost. If one chooses F, the adjustment property is available but not the inflation-stabilization feature. Choosing E means that the exchange rate can be used for both objectives without running the risk of crisis. It also makes available the domestic interest rate as an instrument in addition to the exchange rate.

The models I use to test the Inverted U-Hypothesis are of two kinds: a dummy variable approach and one that uses a quadratic term:

(5.18) Intensity of Capital Account Restrictions = f(Dummy for Intermediate Regime 1,
Dummy for Intermediate Regime 2.
Dummy for Intermediate Regime 3,
Trade Openness, GDP per capita,
Size of Government)

(5.19) Intensity of Capital Account Restrictions = f(Exchange Rate Regime, (Exchange Rate Regime)^2, Trade Openness, GDP per capita, Size of Government)

The traditional way to test for threshold effects is through the dummy variable approach, equation (5.18). While the quadratic approach, in general, is a test of non-linearity, equation (5.19) is often considered as an inferior model when the source of the non-linearity is a qualitative variable.

5.3.4.3 De Facto Capital Flows

The last application of the simultaneous equations econometric framework in this study deals with the link between *de facto* capital account openness and international reserves. This exercise may be considered as running parallel to section 5.4.4.1 on the link between the de jure exchange capital account openness and international reserves. Like the degree of exchange rate flexibility, the degree of capital account openness is a policy choice and a component of the impossible trinity theorem of international macroeconomics. However, like the output gap, its measurement is highly controversial. Edison, et al. (2002) surveys a wide range of measures found in the recent literature and divides them into two classes, qualitative and quantitative measures. Their survey article points out that results of different studies are very sensitive to the way capital account openness is defined and measured.

The more traditional measures are qualitative and are based on country statements such as those found in AREAR. The most straightforward way of measuring capital account openness is to use the AREAR and construct a binary variable where a country's capital account is considered either entirely open or entirely closed. Unfortunately, for

each individual country in the sample, the capital account openness series from a binary classification scheme yields very little variability over time and poses a problem for estimation. I experimented with a method to convert the binary series into a de facto continuous measure based on the work of Dumas, Lee and Mark (2005) which applied a multinomial logit technique in the context of exchange rate classification. The basic idea is to estimate a logit model of the de jure variable and obtain the predicted probabilitites as the de facto series. However, I find that this technique does not give encouraging results in the context of capital controls due to the lack of variability in the original series. Furthermore, the choice of explanatory variables for the logit model tends to be arbitrary.

The de facto measure I employ is in the same spirit as Lane and Milesi-Ferretti (2001) where they propose a quantitative measure based on actual capital inflows and outflows as a percentage of GDP. I use the variable Gross Capital Flows (as a % of GDP) from the World Bank's *World Development Indicators*. Admittedly, this is a crude and imperfect measure since one may consider this as a "noisy" indicator of policy stance. The actual flow of capital may not be attributed entirely to the policy stance of the recipient country. The benefits of using this approach include (a) the series displays greater variability over time and (b) it complements the earlier use of a de jure measure, the Von Hagen-Zhou index . Edison et al. (2002) concludes in their survey that this is the best existing method to use if one is searching for "a good indicator of (capital account) openness at a point in time." Furthermore, the changes in these measures over longer periods are likely to be indicative of changes in openness.

The model is as follows:

(5.20) Gross Private Capital Flows = f(Change/Level of International Reserves, Trade Openness, GDP per capita, Size of Government)

(5.21) Change/Level of International Reserves = f(Gross Private Capital Flows, Export Volatility, Interest Rate Differential, Foreign Currency Claims by BIS-reporting Banks, Trade Openness, GDP per capita)

In the capital account openness equation, (5.20) the dependent variable is continuous unlike in the case of the exchange rate regime. The independent variables, aside from the international reserves, include trade openness, GDP per capita, and some measure of the size of government. For the latter, I choose a variable used in the earlier applications – the growth of the government budget surplus. An increasing government budget deficit is indicative of an increasing trend towards a bigger government role. However, this series is unavailable on a quarterly basis for some of the countries in the sample. Alternatively, I simply use the ratio of government final expenditure to GDP as a measure of government size. While both trade openness and GDP per capita are expected to exert positive influences on the degree of capital account openness, the size of government is expected to result in less openness and the coefficient of budget surplus growth must be positive.

The exact mechanism by which a bigger government size is expected to result in less capital account openness is rooted in the government's motive to preserve the inflation tax base. According to Kohli (2005), restrictions on domestic residents' ability

to hold foreign currency assets makes it easier to expand the inflation tax base through changes in reserve requirements.

In the international reserves equation, the impact of capital account openness on reserve accumulation is conditional on the prevailing exchange rate regime. In the case of a pure float, the inflow of foreign capital is believed to manifest itself in a trade deficit and therefore does not have much effect on reserves accumulation. If the exchange rate regime is fixed and the policymaker counters the pressure of appreciation, capital inflows are reflected in increasing international reserves. Since exchange rate regimes are quite persistent over time, I employ a strategy of dividing the entire sample period (1984Q1-2004Q4) into two sub-samples of roughly equal length. For the Asian countries, there has been a historical trend towards increasing exchange rate regime flexibility so that the earlier period should be considered as the "relatively fixed regime" phase while the latter period should demonstrate greater flexibility. The cut-off date I use for the Asian countries is the financial crisis of 1997 since most of these countries floated their currencies, with the exception of Malaysia, which temporarily instituted capital controls. For the sample of Latin American countries, I split the sample somewhat in the middle such that the first sub-sample is 1984Q1-1994Q4 and the latter sub-sample is 1995Q1-2004Q4. Interestingly, this split makes the turning point the Mexican tequila crisis of 1994 (although Mexico is not part of the sample).

Based on the arguments sketched above, it is *not* expected that international reserve accumulation be affected as the countries move into the greater exchange rate flexibility years. On the other hand, for fixed exchange rate regime episodes, international reserves should increase with the increase in capital account openness.

Chapter 6

Estimation Results

6.1 The Exchange Rate Regime and International Reserves

I first discuss the results of the simultaneous equations estimation between the exchange rate regime and the *change* in international reserves. I follow this with a discussion of the parallel estimation results using instead the *level* of international reserves. Although the results obtained are quite similar, there is a difference in interpretation. By using the change in international reserves, I am adhering more closely to the political economy approach since changes in reserves reflect the outcomes of policy decisions, particularly the exchange rate regime and the policy regarding the capital account. The use of the level of international reserves, on the other hand, has a more structural interpretation since it gives the stock of reserves at a point in time. This alternative model specification is more in the spirit of the optimal currency area approach where the structural features of an economy at any given point in time are believed to be responsible for the choice of exchange rate regime.

6.1.1 The Change in International Reserves

6.1.1.1 Simultaneous Equations (2SLS)

For the ASEAN-5 exchange rate regime equation (Table B.1, panel A), the coefficient of the change in international reserves is negative for the Philippines and Thailand. For the latter, it is also statistically significant. This means that for these two countries, decisions by the monetary authorities to add to the stock of international reserves tend to be associated with less flexible exchange rate regimes. This result comes from the idea that if the reserves target is close to being attained, generating further

currency depreciation to generate trade surpluses may no longer be necessary. For the other three countries in ASEAN-5, the coefficient is positive but only statistically significant for Singapore. This shows that Singapore has a strong preference for reserve accumulation even though it has moved to the flexible end of the spectrum. Among the ASEAN-5 countries, this specific finding is not surprising given that Singapore has the highest level of economic development and is also the most open.

For MERCOSUR+Chile, (Table B.4, panel A) the expected negative coefficient of the change in international reserves can be found for Chile and Paraguay. This time, it is statistically significant only for Chile. What is interesting is that the coefficient is *positive* and significant for Argentina. Given that Argentina is famous for its ten-year currency board regime, one should expect that declining exchange rate flexibility must be accompanied with increases in reserves (i.e. a negative relationship). This is true for the *level* of reserves since the essence of a currency board must be a one-to-one correspondence between the stock of domestic currency and the stock of foreign reserves. This is indeed the case if one examines the levels regression, as seen in Table B.10, panel A.

With respect to the exogenous or control variables, the results are mixed. I begin by discussing the two explanatory variables that are directly linked to the political economy approach: CPI inflation and inflation volatility.

For the ASEAN-5 countries, one interesting pattern is that both inflation and inflation volatility tend to be positively related to the degree of exchange rate regime flexibility. The coefficients of inflation and inflation volatility are statistically significant for the Philippines. Inflation is statistically significant for Malaysia while inflation

volatility is statistically significant for Thailand. What these results suggest is that using the exchange rate regime as an anchor for domestic price stability is *not* the overriding concern of the ASEAN-5 countries. Rather, the exchange rate regime is geared more towards the pursuit of international competitiveness. Historically, the ASEAN-5 countries have successfully battled inflation so that adjustments in the nominal exchange rate are instead used to prevent the real exchange rate from being significantly misaligned. Also, much of the literature that grew out of the Asian financial crisis supports the observation that most of them followed sound macroeconomic policies before the collapse (see Agenor, et al (1999)), Montes and Popov (1999)). In the post-crisis period, there was no widespread tendency for runaway inflation since the adversely affected countries (Indonesia, Thailand, and Malaysia) suffered large output declines.

The findings for MERCOSUR+Chile are similar to ASEAN-5. Neither inflation nor inflation volatility tend to be associated with a retreat to more fixed exchange rate regimes. At first glance, this result might be surprising given the high inflation reputation of many Latin American countries in the past. However, for the period covered (1984-2004), Latin America has entered what some economists have called the second stage of macroeconomic reform (see Gonzalez, et al (2003)). While the first stage was focused on stabilization and inflation control, the second stage deals with the further reduction of *already* stabilized inflation rates, financial sector reforms, and solidifying the gains from past fiscal reforms.

Among the exogenous variables suggested by OCA, GDP per capita is the variable that performed well in the regressions. With the exception of Malaysia, Singapore, and Argentina, all the other countries have the expected positive sign of this

coefficient. For these seven countries, all coefficients for GDP per capita are statistically significant except for Thailand. This finding suggests that greater exchange rate regime flexibility goes hand-in-hand with the level of economic development. The results for trade openness and trade diversification are less impressive. The reason for this might be due to the fact that these variables do not display much variation in a time-series context. They are included, however, for completeness. Including them in the regressions do not worsen the statistical properties of the results.

Turning to the effect of exchange rate regime flexibility on the change in international reserves (Table B.1, panel B), all four countries in ASEAN-5, except Singapore, have the expected negative coefficients. The overall statistical significance of these coefficients, however, is quite weak except for Indonesia. The negative and/or insignificant coefficients of the exchange rate regime indicate that as countries move towards greater exchange rate regime flexibility, reserves are either declining or unaffected. One possible explanation for this result is that the process of opening the capital account tended to go side-by-side with the abandonment of fixed and intermediate exchange rate regimes. In this scenario, the motive for absorbing capital flows through the accumulation of international reserves is absent since the exchange rate is allowed to float. Similar results are obtained for MERCOSUR+Chile (Table B.4, panel B). Two of the five countries in this group have negative coefficients and all five (including the positive coefficients) are statistically insignificant.

The difficulty in pinpointing one singular variable that can track the change in reserves lies in the fact that many possible factors are involved. For example, authors such as Aizenmann and Lee (2005) claim that the demand for reserves can be dictated by

two major motives: a precautionary demand and a mercantilist demand. The first has something to do with the prevention of macroeconomic vulnerability while the latter involves the strategic manipulation of reserves for competitiveness reasons. The exchange rate regime (as an independent variable in the change in reserves equation) captures this mercantilist motive. A fixed exchange rate regime requires the accumulation of reserves in the face of capital inflows to prevent currency appreciation.

For ASEAN-5, the two variables representing concern with macroeconomic vulnerability, the Foreign Currency Claims of BIS-reporting banks and Export Volatility, have the correct sign for the most part. For Malaysia, the Philippines, and Singapore, foreign currency claims positively increase the demand for international reserves, although lacking in statistical significance. Export volatility increases the demand for international reserves for Indonesia, Malaysia, and the Philippines (with the coefficient for the first being statistically significant). In the case of MERCOSUR+Chile, the foreign currency claims variable loses explanatory power except for Paraguay, which has the correct sign. Export volatility, however, positively impacts the change in reserves for all countries in the group except for Argentina.

The interest rate differential representing the fiscal cost of holding reserves has the expected negative sign for Thailand, Chile, and Uruguay. For the other seven countries, this cost aspect do not seem to be a deterrent to holding international reserves. Considering that all countries in the sample have had previous experiences with currency crises, it is not surprising to find a generally high importance given to macroeconomic vulnerability. This observation that many emerging market countries seem to ignore the cost of insurance may be considered rational.

The remaining control variables capturing the structural characteristics of the economy, trade openness and GDP per capita tend to have the expected signs for both ASEAN-5 and MERCOSUR+Chile. However, they are also mostly statistically insignificant. Greater trade openness and higher level of economic development are expected to increase the demand for international reserves. In the case of the former, a country that engages in a lot of international transactions is better served by having a large buffer stock of reserves. In the case of the latter, a higher level of development also means a higher level of transactions demand. The regression results give some support to these a priori beliefs but the weakness of the estimates suggest that other influential factors are still not captured by the model. For both ASEAN-5 and MERCOSUR+Chile, this is evident in the low values of the goodness-of-fit.

6.1.1.2 Seemingly Unrelated Regression (SUR)

The expected negative effect of the change in international reserves on exchange rate regime flexibility is more pronounced in ASEAN-5 using the SUR estimation method (Table B.2, panel A). This time, Indonesia, Malaysia, the Philippines, and Thailand all have the expected negative coefficients and except for the first, are all statistically significant. Singapore's coefficient remains positive but has turned insignificant. For MERCOSUR+Chile (Table B.5, panel A), the results are closer to the simultaneous equations results. Chile and Paraguay retain their negative coefficients. Thus, the results from this alternative estimation technique generally confirm the negative relationship between changes in international reserves and exchange rate regime flexibility. The encouraging results from this equation give credence to the political economy approach.

The slight improvement in econometric performance using SUR implies that there may be some co-movement in terms of policies and macroeconomic trends that are not captured by the simultaneous equations model within an individual country. It is possible that there is some feedback across countries' selection of policies. In general, however, the correlation coefficients obtained are not very high and must be interpreted with caution.

A few noticeable differences in the results of SUR do exist. For Thailand, inflation now has a significant negative impact on exchange rate regime flexibility. Also, the statistical significance of GDP per capita for Indonesia and the Philippines disappears. In contrast, the coefficients of GDP per capita for the Latin American countries remain positive and significant.

The residual correlation matrices for the exchange rate regime equation for both ASEAN-5 and MERCOSUR+Chile show roughly the same amount of interdependence (see Table B.2, panel B and Table B.5, panel B, respectively). The average degree of interdependence, calculated as the simple average of the absolute values of the correlation coefficients, is 0.3734 for ASEAN-5 and 0.3278 for MERCOSUR+Chile. A great majority of the correlation coefficients are positive indicating some synchronization of policy decisions regarding the exchange rate regime. The only countries that showed negative correlations with their neighbors are Malaysia (vis-à-vis Indonesia, the Philippines and Singapore) and Argentina (vis-à-vis Paraguay). This is not surprising, especially for the first, since Malaysia was the only country in ASEAN-5 that chose to go to a pegged exchange rate regime after the 1997 crisis. The negative correlation between Argentina and Paraguay (-0.21) seems be more significant for the latter. Paraguay's

correlation coefficients with the other three Latin American countries do not exceed ten percent whereas for Argentina, this correlation is it's lowest.

With respect to the change in international reserves equation (Table B.3, panel A), all the countries in ASEAN-5 have the expected negative sign for the coefficient of the exchange rate regime. There is also some improvement in the statistical significance of the estimates. These findings strengthen our earlier conclusion (using the simultaneous equations approach) that increasing exchange rate regime flexibility in ASEAN-5 coupled with increasing capital account openness depresses the mercantilist motive for reserve accumulation. Other motives such as those for precautionary purposes (i.e. foreign currency claims and export volatility) still show their expected positive impacts on reserve accumulation. In MERCOSUR+Chile (Table B.6, panel A), the SUR estimates for the exogenous variables are remarkably similar to the simultaneous equations results. However, the SUR results for the impact of exchange rate regime flexibility on reserve accumulation has many sign changes but are still statistically weak in general.

The residual correlation matrices for the change in reserves equation show marked differences between ASEAN-5 and MERCOSUR+Chile (Table B.2, panel B and Table B.6, panel B, respectively) although correlation coefficients are generally on the low side once again. First, the average degree of interdependence is higher for ASEAN-5 than MERCOSUR+Chile. The average correlation coefficient in absolute terms for the former is 0.2339 while it is only 0.0849 for the latter. (The LM test statistic for Latin America in Table B.6, panel B is the lowest obtained of all the SUR estimations, indicating a clear non-rejection of the null hypothesis of zero cross-country correlation.)

This suggests that there is greater uniformity in reserve policy among the sample of Asian countries than in the sample of Latin American countries. One possibility is that the Asian countries may have been subjected to similar external shocks over the time span while the shocks hitting the Latin American countries may be more idiosyncratic and localized. Nevertheless, it should also be noted that the correlations involving the movements of international reserves are substantially less than the correlations pertaining to exchange rate regime choice. What this demonstrates is that countries may have different ways of approaching reserve policy but cannot afford to be too much out of line when it comes to exchange rate policy. A common perception in the literature on economic integration, for example, is that the ASEAN nations may find it relatively difficult to form any sort of economic union since most of them are competitors in world export markets and that they produce roughly similar products. If this is indeed true, then the greater correlation in exchange rate policy may be the result of fears of competitive devaluation.

6.1.2 The Total Stock of International Reserves (minus Gold)

6.1.2.1 Simultaneous Equations (2SLS)

In the exchange rate regime equation (Table B.7, panel A), the expected negative coefficient of total international reserves is found in Malaysia, the Philippines, and Thailand for ASEAN-5. For MERCOSUR+Chile (Table B.10, panel A), all five countries have negative coefficients. However, the case for the hypothesis that a larger stock of reserves enables foreign exchange market intervention to fix the exchange rate is more convincing for the Latin American sample since four of the five are statistically significant. In ASEAN-5, only in the case of Thailand is the relevant coefficient

statistically significant. As discussed earlier, the interpretation differs from the case of the change in reserves. The total stock of international reserves (minus gold) represents a structural feature of the economy at a point in time (see Frankel, 1999). In terms of credibility, demonstrating that a sufficient stock of reserves exists is crucial in making a fixed exchange rate arrangement more sustainable. The more convincing results for the Latin American sample illustrates a greater need to have the ammunition to defend against speculative attacks on the currency. This is only logical considering that the Latin American countries had more experience with exchange crises and the use of the exchange rate as a nominal anchor to counter devaluation-inflation cycles.

The expected negative impact of inflation is confirmed for Chile, Paraguay, and Uruguay while the negative impact of the volatility of inflation is confirmed for Brazil, Chile and Uruguay. As in the case of the first model where the change in reserves is used, both inflation and inflation volatility do not appear to have the expected coefficients for the ASEAN-5 countries. Trade openness has the correct sign for Indonesia, Malaysia and Chile. GDP per capita has the correct sign for Malaysia, the Philippines, Thailand, Argentina, Brazil, Chile, and Paraguay. Except for the first, all are statistically significant. Trade diversification has the correct sign for Indonesia, Malaysia, the Philippines, Argentina, and Chile.

In the total international reserves equation, the expected negative impact of exchange rate regime flexibility on the stock of international reserves is complicated by our interpretation of the latter as a structural characteristic of the economy. In this case, it is not surprising if the results return insignificant coefficients and/or "wrong" signs. This is indeed the case for the ASEAN-5 countries (Table B.7, panel B). The exchange rate

regime coefficient is only negative for the Philippines and Thailand. In addition, it is only statistically significant for Thailand. In MERCOSUR+Chile (Table B.10, panel B), the coefficients are negative for all four except Uruguay. The statistically significant negative coefficients are for Brazil and Paraguay.

The control variables contribute to explaining the level of international reserves *more* than they do the change in international reserves. This is partly because the level of international reserves has comparatively smaller volatility than the change. Another part of the story is the structural nature of the level, since many of the independent variables such as export volatility, trade openness, and level of development are themselves structural characteristics. This is particularly true for GDP per capita. For *all* countries in ASEAN-5 and MERCOSUR+Chile, GDP per capita is positive and significant. This confirms the hypothesis that countries with a higher level of economic development, and thus a greater volume of transactions, keep higher stocks of international reserves. Most of the countries in the sample also have the correct sign for the trade openness variable, foreign currency claims and export volatility. Trade diversification has mixed results.

One interesting difference in using the level of international reserves instead of the change is that the interest rate differentials have the expected negative coefficients. In other words, the fiscal cost of holding reserves cannot be ignored in the long run. If the total stock of reserves becomes excessive for extended periods of time, then the country is foregoing huge opportunity costs.

6.1.2.2 Seemingly Unrelated Regressions (SUR)

For ASEAN-5, the results of the exchange rate regime equation (Table B.8, panel A) estimated by SUR follow closely the simultaneous equations results. The coefficients

of total reserves and GDP per capita for Malaysia become significant. Likewise, there is an improvement in efficiency for Thailand as the coefficient of inflation becomes significant. In the case of MERCOSUR+Chile (Table B.11, panel A), there is an improvement in the estimated coefficients for total reserves in Argentina, Brazil, and Chile while the reverse holds for Paraguay and Uruguay. The coefficients for inflation and inflation volatility for Uruguay turned positive and insignificant, respectively. Also, the statistical significance of the coefficients for GDP per capita improved for all four countries except Argentina.

The residual correlation matrix for the exchange rate regime equation for ASEAN-5 (Table B.8, panel B) shows mainly positive cross-country correlations, except for Malaysia. The average residual correlation in absolute terms is 0.4290 indicating a fair amount of economic interdependence. The comparative figure for the Latin American sample (Table B.11, panel B) is only 0.1625. Also, four out of the ten possible cross-country correlations are negative. As explained earlier, these results suggest that the Southeast Asian countries in the sample display greater coordination of exchange rate policy than their Latin American counterparts.

For the total reserves equation (Table B.9, panel A), one interesting result for the ASEAN-5 group is the improvement in statistical significance for the interest rate differential variable. In the simultaneous equations model, the interest rate differentials have the expected sign for Indonesia, Malaysia, the Philippines, and Thailand but are insignificant. With the SUR estimates, these coefficients become significant. The results for the other explanatory variables are pretty much the same as those obtained through the simultaneous equations estimation. It is striking that the effect of SUR estimation on

the interest rate differential can also be found in the case of MERCOSUR+Chile (Table B.12, panel A). The negative coefficients for both Argentina and Chile become statistically significant.

What could be the reason for the increased significance of the interest rate variable when cross-country interdependence is factored in? If the demand for international reserves becomes highly sensitive to its price, then one can imagine that the individual demand curves for each country become more interest-elastic with greater interdependence. This suggests that the market for international reserves become increasingly competitive.

An examination of the residual correlation matrices for ASEAN-5 versus MERCOSUR+Chile reveals that the average cross-country correlation in absolute terms is now lower in the former (Table B.9, panel B and Table B.12, panel B, respectively). Recall that the same correlation measure is higher for ASEAN-5 if we consider the change rather than the level of international reserves. The average cross-country correlation in absolute terms is only 0.1981 for ASEAN-5 while it is 0.2571 for MERCOSUR+Chile. Nevertheless, both correlation measures are very low suggesting that this particular structural feature varies across countries in each group. In a sense, this diversity in the amount of total reserves held is a reflection itself of the diversity of the countries themselves. For example, in ASEAN-5, Singapore and Malaysia are more developed than the other three countries. In MERCOSUR+Chile, Argentina and Brazil are large economies in comparison to Paraguay and Uruguay.

6.2 The Exchange Rate Regime and the Output Gap

6.2.1 Simultaneous Equations (2SLS)

An interesting complement to the study of the link between the exchange rate regime and international reserves is to use same basic framework (i.e. simultaneous equations) and see whether a domestic objective plays a role as well. I focus now on the possibility of a domestic output objective.

Exchange rate regime flexibility can also be used to target domestic output as in Devarajan and Rodrik (1993). Let Y stand for actual domestic output and Y* its potential level. Assuming that potential output is relatively stable, an increase in the gap, (Y-Y*), indicates expansion in actual output. The response of exchange rate flexibility depends on whether output expansion makes the absolute value of the gap smaller or greater. If Y is less than Y*, an increase in output decreases the absolute value of the gap and we can therefore expect the social loss to be diminished. In this case, the response of exchange rate regime flexibility must be tilted towards the inflation objective instead. If Y is greater than Y*, then social loss increases with output expansion. Output decline in this case must be welfare improving. A fall in exchange rate regime flexibility is warranted since further depreciation overheats the economy. Based on these considerations, the expected sign of the output gap term must be negative.

Before I present the results, note that I exclude from the analyses the countries where quarterly data on GDP are purely constructed from the annual series (Singapore, Paraguay, and Uruguay). This is because the output gap is a dependent variable in these

regressions and not just a control variable as in the case of the international reserves regressions.

The results for ASEAN-5 (Table, B.13, panel A) show that the coefficient of the output gap is negative for the Philippines and Thailand. Furthermore, it is statistically significant for the Philippines. When the exchange rate regime is responding strongly to the output gap, then it is logical to expect that inflation may be of secondary concern (i.e. the classic output-inflation tradeoff). There is evidence to suggest that this is the case. The coefficients of inflation and inflation volatility are positive for the two countries. These results mean that increases in inflation and inflation volatility are not being addressed through the exchange rate. In the two reverse cases where the output gap coefficients are positive Indonesia and Malaysia, inflation volatility does have the expected negative coefficients. Hence, I can only speculate that for the latter two countries, past inflation volatility is the relevant indicator of price instability rather than current inflation.

For MERCOSUR+Chile (Table B.14, panel A), the output gap coefficients for Argentina, Brazil, and Chile are negative. Hence, there is again some support for the hypothesis that output is one possible target of exchange rate regime choice. In contrast to the case of ASEAN-5 where there appears to be no evidence of using the exchange rate to attain inflation objectives, inflation seems to be targeted as well. Inflation volatility for Brazil, and both inflation and inflation volatility for Chile, return negative coefficients. However, *none* of the aforementioned negative inflation-related coefficients are statistically significant. This is consistent with the popular belief that many Latin

American countries are *past* the era of *very high* inflation. Rather, the recent trend is for the reduction of *high* inflation to *low* inflation.

In the output gap equation, the effect of increased exchange rate flexibility should be to increase (Y-Y*) if devaluation is expansionary. There is an increase in social welfare if Y is initially less than Y*. On the other hand, social welfare decreases with expansionary devaluation if Y is initially higher than Y*. I investigate the origins of contractionary devaluation in the next section but for now I discuss whether it surfaces in the output gap equation.

One can see from the results of the simultaneous equations estimation that exchange rate regime flexibility tends to be expansionary for ASEAN-5 (Table B.13, panel B). The exchange rate regime variable has positive coefficients for Indonesia, Malaysia, the Philippines, and Thailand. In stark contrast, the coefficients obtained for the Latin American sample are mostly negative suggesting that devaluation is of the contractionary type (Table B.14, panel B). This set of results does not overturn the conventional wisdom regarding the modern histories of these two regions. It is well-known that while most of Southeast Asia opted for export-oriented strategies early on, their Latin American counterparts experimented to a larger degree with import-substitution regimes. Even after the demonstrated failure of the latter approach, the effects of import substitution linger as dependencies get built into the economic structure.

Countries such as Malaysia and Thailand are known to have sustained their rates of economic growth during the pre-crisis period by adopting export-oriented strategies. While comparatively less successful, Indonesia and the Philippines have also embarked on this strategy of development in attempts to copy their more successful neighbors.

However, export-oriented growth strategies cannot be successful if they are not accompanied by competitive real exchange rates. Hence, at least for the first two countries, they combined nominal exchange rate regime flexibility with low inflation to maintain competitive real exchange rates. The same can also be said of the Philippines although its inflation record is less strong. In the case of Indonesia, the high statistical level of significance of exchange rate regime flexibility is a reflection of the fact that it has the worst record on inflation among the five countries. It must therefore rely on nominal exchange rate regime flexibility more than its neighbors to keep pace with international competition.

Turning to the control variables in the output gap equation, a few comments can be made. There are two countries where all the expected signs of the coefficients are met, the Philippines and Argentina. Real money growth and the balance on the financial account are expected to boost domestic output while the growth of the government budget surplus is expected to have a dampening effect on output. In the case of the Philippines, only the real money growth variable is statistically significant indicating that its level of financial integration in the world capital market is not so strong as to severe the link between money growth and output. The same thing can be said of Thailand since it has a statistically negative coefficient for real money growth. Unfortunately, quarterly data on the financial account variable for Malaysia is unavailable. Hence, although the results show that real money growth is weak for Malaysia, we cannot ascertain if the financial account balance does spell the difference.

The striking result for the Latin American countries (Argentina, Brazil, and Chile) is the large explanatory power of the financial account balance compared to real money

growth. Although real money growth still has a positive influence on output, the effect is weak relative to the stimulus brought about by foreign capital flows. This is not to say that Latin America received a larger share of capital flows than the Asian countries. Rather, it suggests that output was largely external debt-driven instead of being determined by domestic monetary policy.

6.2.2 The Sources of Contractionary Devaluation

Most, if not all, theories of contractionary devaluation do not consider devaluation contractionary unless there is some other factor involved. This is the rationale behind the choice of test that I employ where different interaction terms are included in the model specification. In what follows, I present the results on the interaction of exchange rate regime flexibility with three factors: (a) the ratio of imports to GDP, (b) the percentage of international claims denominated in foreign currency, and (c) the incidence of some form of macroeconomic disturbance such as a currency crisis. I also include the exchange rate regime without interaction for the purpose of comparison. The set of control variables still include real money growth, the financial account balance, and the growth of the government budget surplus.

In the case of ASEAN-5 (Table B.15), the estimation results show that the interaction term involving the ratio of imports to GDP return negative coefficients for Indonesia, the Philippines, and Thailand. The coefficients for the first two are also statistically significant. The interaction term involving the percentage of foreign currency denominated debt has the expected negative coefficients for Indonesia and Thailand. Both coefficients are statistically significant. The interaction term involving

currency crises only returns a negative coefficient for Indonesia but it is not statistically significant.

These results suggest that if contractionary devaluation exists, the likely reasons are rooted in the dependence on imports and the extent of currency mismatch in the foreign debt position of the country. Devaluation during periods of crises does not cause output to decline. Rather, the positive coefficients of this particular interaction term even point to the possibility that devaluation may be expansionary during the crisis period. This is especially noticeable in the case of Thailand since its coefficient is statistically significant. Also, it is probably not that surprising that the currency crisis interaction term has the anticipated sign only for Indonesia. It is a well-known fact that Indonesia was the hardest hit country during the Asian financial crisis of 1997. The case of the Philippines where the only credible source of contractionary devaluation is import dependence reflects its relatively smaller role involving the distribution of foreign capital flows in the region. This is partially the reason why a particular commentator (Montes, 1999) calls the Philippines an "unwitting participant" in the regional turmoil.

Note also that exchange rate regime flexibility without interaction has positive and statistically significant signs for all the ASEAN-5 countries except for Malaysia. Given that the negative coefficient for the latter is statistically insignificant anyway, this is almost a unanimous verdict that exchange rate regime flexibility, by itself, is expansionary. Again, this finding can be rationalized by the historical experience where export-oriented growth is the development strategy of choice in the ASEAN-5.

Turning now to the results for MERCOSUR+Chile (Table B.16), it can be seen that the interaction term involving the ratio of imports to GDP is the only one that

consistently returns statistically significant negative coefficients. The only exception to the rule is Chile. As already mentioned earlier, the import-substitution strategy implemented in the past may still have strong residual effects. A somewhat puzzling result involves the interaction term involving the percentage of foreign currency denominated debt. All coefficients are positive and statistically significant. One possible explanation for this is that Latin America was largely spared from contagion arising from the Asian financial crisis of 1997, except for Brazil. In other words, there has not been a shock on the scale of the Asian crisis to test the fragility of financial sector balance sheets. The reasons for the collapse of the Argentine currency board, for example, are still being debated (see, for example, Powell (2002), Hausmann and Velasco (2002), and Galiani, et al. (2003)), but the crisis had very minimal contagion effects. For now, the strong positive relationship between this second interaction term and the output gap suggests a pattern of foreign currency denominated debt combining with exchange rate regime flexibility to boost output in the region.

The interaction term involving currency crisis is tested only for Argentina and Brazil as the incidence of such crises in Chile, at least for the time period covered, is absent. As with the case of the ASEAN-5 countries, there is no evidence to suggest that devaluation during currency crises periods is detrimental to output. In this aspect, the similarity in results between the two sub-samples of countries leads me to conclude that devaluation's possible negative effect on output may not manifest itself immediately after the start of crisis. It is possible that these negative output effects may actually be gradual but long lasting, a kind of *hysteresis*. This seems to be the case for Indonesia and the

Philippines although it cannot be said that other domestic factors such as political disruption do not play significant roles in the propagation mechanism.

Lastly, I would be ignoring an important result if I do not call attention to the findings regarding exchange rate regime flexibility without any interaction. In stark contrast to ASEAN-5, all coefficients are negative and statistically significant for MERCOSUR+Chile. This piece of evidence is a rather strong confirmation of the contractionary effect of devaluation. The fact that it occurs without the benefit of interacting with another factor suggests that devaluation by itself may have such an overwhelming impact in Latin America. This is consistent with the notion that past experiences with devaluation-inflation spirals have been so ingrained in the region's collective memory that devaluations have come to disrupt the payments mechanism every time it occurs.

6.3 The Exchange Rate Regime and Foreign Direct Investment (FDI)

In this section, I present results of the simultaneous determination between exchange rate regime flexibility and the level of inward foreign direct investment or FDI. The motivation behind this application is to provide another dimension to the overall framework of the study –the role of the exchange rate regime in the external sector. It is also crucial for many emerging market countries to have some information about this possible link. The reality of increasing international financial integration and the response of exchange rate policy makes it necessary to examine whether the "good" type of capital flows, FDI, is enhanced or diminished in the process. Due to some data availability problems, the countries in each region are pooled together and we only have two sets of results to analyze.

For the exchange rate regime equation (Table B.17, panel A), the ASEAN-5 case shows that there is a negative and significant relationship between exchange rate regime flexibility and the level of inward FDI. In the case of MERCOSUR+Chile, the coefficient of FDI is positive but insignificant. The ASEAN-5 result suggests that a higher level of inward FDI tends to be associated with less exchange rate regime flexibility. In the context of a political economy approach, the implication is that exchange rate regime flexibility need not be used as an additional incentive if the inward flow is already substantial. Recall that for many of the export-oriented host countries, their share of inward FDI tends to be composed largely of firms that engage in *re*-export (Benassy-Quere, et al., 1999). Hence, these foreign firms also benefit from a competitive exchange rate in the same manner as local exporters. For the Latin American countries, the positive coefficient may be construed as evidence pointing in the other direction. If FDI is set up to be import substituting, then devaluation is a negative incentive. Hence, the intuition is that a higher than normal influx of import-substituting FDI can relax the devaluation constraint to some extent.

With respect to the control variables, CPI inflation, trade openness, and GDP per capita all have the expected signs for ASEAN-5. For MERCOSUR+Chile, inflation volatility and GDP per capita have the correct signs. The overall statistical significance of these control variables, however, is on the low side.

In the FDI equation (Table B.17, panel B), both regions display significant negative coefficients for exchange rate regime flexibility. What this suggests is that a relatively stable host country exchange rate might be desirable from the vantage point of attracting new FDI, regardless of whether FDI is export-oriented or import-substituting.

FDI entails set-up costs, which often require the importation of essential equipment not available in the host country. Hence, it is possible that FDI may favor relatively fixed exchange rate regimes early on but prefer greater flexibility especially if it engages in export activity at a later stage.

Among the control variables in the FDI equation, some interesting results emerge. In the case of ASEAN-5, the strongest determinant of inward FDI is the level of economic development of the prospective host country. In the case of MERCOSUR+Chile, the variable that seems to be most significant is electricity production, which is a proxy for the quality of physical infrastructure. This is also true for ASEAN-5, although to a lesser degree. The level of economic development, GDP per capita, also possesses the anticipated sign for the Latin American case but on a somewhat weaker level. Labor cost as measured by the variable Compensation of Employees seems to only matter for ASEAN-5 as evidenced by its negative (though insignificant) coefficient. This suggests that one attractive feature of the ASEAN-5 countries in terms of FDI is lower labor costs. Hence, any decease in this advantage due to rising labor costs tends to have a dampening effect on FDI. Lastly, and contrary to expectations, none of the tax variables have negative coefficients. Based on this result, FDI does not seem to be deterred by higher taxes on income/capital gains or higher taxes on international trade. This supports the idea that non-fiscal incentives may be more important in the FDI decision than fiscal incentives.

6.4 The Intensity of Capital Account Restrictions and International Reserves

The use of capital controls following crises brought about by the non-sustainability of intermediate exchange rate regimes is a controversial policy response.

Drastic impositions of capital controls such as those in Malaysia and Chile invited initial strong criticisms from advocates of open capital markets. Despite the fact that there is no definitive verdict on the optimality of such controls, the recent experiences of those two countries seem to suggest that they do more good than bad if the goal is to prevent excessive volatility. Malaysia was able to stabilize its economy quickly during the Asian financial crisis and Chile's capital control experiment is acknowledged by many as a key component in its resurgence. In this section, I discuss the results of another application of the simultaneous equations framework. This time I investigate if there is any link between a nation's international reserves and the decision to impose capital account restrictions. In some sense, this additional exercise parallels that performed on the exchange rate regime.

The measure of the intensity of capital account restrictions, the Von Hagen-Zhou index, can only be computed from 1998 to the present due to data availability. Hence, I pool the country-quarter observations for ASEAN-5 as one sample and the observations for MERCOSUR+Chile as another.

6.4.1 Change in International Reserves

First I discuss the regressions using the change in reserves as an independent variable in the capital restrictions equation (Table B.18, panel A). The coefficient for this variable is positive and statistically significant for ASEAN-5 while it is negative and statistically significant for MERCOSUR+Chile. The expected sign of this coefficient is *positive* since countries tend to accumulate reserves during periods of increasing capital flows only if they are preserving the stability of their exchange rates. In this scenario, the only way to preserve monetary autonomy (assumed to be a desirable social goal) is to

increase the intensity of capital account restrictions. This seems to be the case for the ASEAN-5 countries in the post-crisis period. At first glance this seems to be at odds with the observation that most countries in the region chose floating exchange rate regimes after the crisis. In the ideal case, such generalized floating should have depressed the motive for reserve accumulation. However, many of the ASEAN countries are practicing *managed* floating with the possibility of significant amounts of intervention. This "fear of floating" motive could be behind the positive link between increases in international reserves and the increased intensity of capital account restrictions.

In the case of MERCOSUR+Chile, the negative significant coefficient of the change in reserves means that countries in the region cannot afford to erect barriers to international capital flows. This is consistent with an earlier result where we established the importance of the financial account of the balance of payments for boosting domestic output in the region.

The performances of the regression equations for capital account restrictions are quite good as far as the control variables are concerned. Except for GDP per capita in the case of MERCOSUR+Chile, all coefficients are of the expected sign and are statistically significant. Based on the OCA criteria, small open economies benefit more from fixed exchange rates. Note that for both regions, trade openness has positive and significant coefficients. This means that as trade openness increases, a country will guard against excessive exchange rate fluctuations and one way to accomplish this is to institute some restrictions on the capital account. On the other hand, a higher GDP per capita should tilt country preference towards exchange rate regime flexibility rendering capital account restrictions unnecessary. This seems to be the case for ASEAN-5 (negative coefficient)

but not for MERCOSUR+Chile. For the latter, increasing GDP per capita is positively related to the intensity of capital account restrictions. One possible hypothesis is that capital controls increase with the level of development because the administration of such restrictions is costly and can only be handled by a country that has the resources to implement such schemes. Given that Latin American countries are currently focusing their attention on institutional reforms in the post-stabilization era, this explanation might not be too far-fetched. Lastly, note that our hypothesis that bigger government results in higher levels of capital account restrictions is supported by the regressions. The government expenditure to GDP ratio exhibits positive and statistically significant coefficients for both regions.

The estimates for the change in reserves equation are not satisfactory for both regions (Table B.18, panel B). While many of the control variables have the expected signs, almost all coefficients are statistically insignificant and overall goodness of fit is extremely wanting. This is the same result I obtained in the exchange rate regime/change in reserves regressions. As I indicated in that discussion, the change in reserves is rather difficult to model as there may be omitted variables and the series is extremely volatile.

6.4.2 Total International Reserves (minus gold)

As discussed previously, using the level of international reserves instead of the change treats it as a structural feature of the economy rather than a policy action. The regression result for ASEAN-5 in the capital account restrictions equation now returns a weak positive coefficient for the level of international reserves (Table B.19, panel A). This is understandable since there is no reason to expect that there is a necessary link between total reserves and the type of exchange rate arrangement. Although movement

towards a fixed exchange rate regime requires that the country *add* to its stock of international reserves (i.e. a change in reserves), it is not inconsistent for a country with a great stock of reserves to choose a flexible exchange rate regime. Having a large stock of reserves can be the result of factors unrelated to the choice of exchange rate regime, such as the level of economic development. Since the link between the exchange rate regime and the level of international reserves is not guaranteed, then there is no necessary connection to capital account openness as well.

In MERCOSUR+Chile (Table B.19, panel A), there is a reversal in the result. This time, total international reserve has a significant positive coefficient. Even if the stock of international reserves is high, capital account restrictions may still be needed to make the a fixed or intermediate regime sustainable.

Based on the evidence discussed above, it is possible to conjecture that reserve accumulation (or change) may be interpreted by the market as a signal of proactive policy in support of increasing rigidity of the exchange rate regime. On the other hand, the total level of international reserves does not send such a signal since capital account restrictions are still needed despite the presence of a large stock. In some sense, there is a counter-intuitive element in this analysis because one might argue that a large stock of reserves should be an effective commitment tool. This brings our attention to the distinction between so-called *first-generation* currency crises models and *second-generation* currency crises models. The idea behind the latter is not the availability of resources to fend off speculative attacks on a currency but rather the willingness of the monetary authorities to defend the fixed exchange rate.

In the equation for total reserves as a function of the intensity of capital account restrictions, there is a significant negative relationship in the case of ASEAN-5 and a significant positive relationship in the case of MERCOSUR+Chile (Table B.19, panel B). The implication for ASEAN-5 is that having a high intensity of capital account restrictions minimizes the need for maintaining a high stock of international reserves. The opposite seems to hold for the Latin American countries. The conflicting results suggest that there may be differences when it comes to the *de facto* exchange rate regime in place. If a country declares a move to floating and has in place some capital controls to prevent excessive volatility in the capital account, its commitment to floating must be weak if it still requires a high buffer-stock of international reserves.

6.4.3 The Intensity of Capita Controls and the Inverted-U Hypothesis

In this section, I discuss the results of some tests that seek to detect if the intensity of capital controls is dependent on the degree of exchange rate flexibility in a non-monotonic fashion. Specifically, there are reasons to suspect that perhaps there is an inverted-U relationship such that the restrictions on the capital account are highest for intermediate exchange rate regimes and lower for the two polar regimes. The Von Hagen-Zhou index used in the previous section is used in two additional regression equations. In the first regression, dummy variables representing different degrees of exchange rate regime flexibility are used as explanatory variables. In the second regression, a single qualitative variable is used for the exchange rate regime in a quadratic specification. Ordinarily, the first regression is the correct way to test for threshold effects. Using multiple dummy variables uses the weaker assumption that the increments in the dependent variable at each threshold are different. On the other hand,

using a single qualitative variable assumes that such increments are uniform. Even though this latter approach is considered unsatisfactory from a methodological standpoint, I also perform such a test not only for comparison but also to see if a quadratic specification will yield any interesting result.

The set of control variables are still trade openness, GDP per capita, and the government expenditure to GDP ratio.

The result of the dummy variable approach (Table B.20) for ASEAN-5 shows that all three dummy variables have negative coefficients, two of which are statistically significant. Interestingly, the two dummy variables that are significant are for the two intermediate regimes and the dummy variable for independent floating is not significant. Also, the dummy variables for the two intermediate regimes have almost identical t-values. The implication of these observations is that rather than having an inverted-U pattern, there seems to be an opposite trend (see Figure 6.1). Note also that all the control variables in the ASEAN-5 regression are statistically significant and of the correct sign. The goodness of fit is also quite high.

In the case of MERCOSUR+Chile, the first dummy variable (intermediate regime1) and the third dummy variable (independent floating) have negative statistically significant coefficients. The second dummy variable (intermediate regime 2 or managed float) has a positive but insignificant coefficient. Thus, there seems to be some (albeit, weak) support for the inverted-U hypothesis (see Figure 6.2). With the exception of GDP per capita, the other two control variables are statistically significant and have the anticipated signs. These observations suggest that relatively fixed intermediate regimes and independent floating tends to lower capital account restrictions. On the other hand,

relatively flexible intermediate regimes (i.e. managed floats) tend to increase capital account restrictions.

In the quadratic model (Table B.21), our suspicions generated from the dummy variable approach seem to be confirmed. For ASEAN-5, the coefficient of the exchange rate regime is negative while the coefficient for the square of the exchange rate regime is positive. This implies a U-shaped pattern. For MERCOSUR+Chile, the coefficient of the exchange rate regime is positive while the coefficient for the square of the exchange rate regime is negative. This implies an inverted-U pattern. Note also that the control variables perform very well as they are generally significant and of the correct sign.

Why do we observe the inverted-U or hump-shaped pattern in the case of the Latin American countries but not in the case of the ASEAN countries? One possible explanation is the inclusion of Chile. Chile is known for its use of capital controls and was considered by many as one of the least open countries in the region. At the same time, Chile operated a crawling band for much of the nineties before instituting a managed float from Sept 1999 to the end of 2001. On the other hand, the only country known to have instituted drastic capital controls in ASEAN-5 is Malaysia right after the 1997 crisis. Although Malaysia operated with an intermediate regime before the crisis, it shifted to a polar extreme (pegging) after the crisis. Hence, the absence of the inverted-U pattern in ASEAN-5 may be traced to Malaysia's simultaneous use of capital controls with an exchange rate peg.

Figure 6.1 ASEAN-5

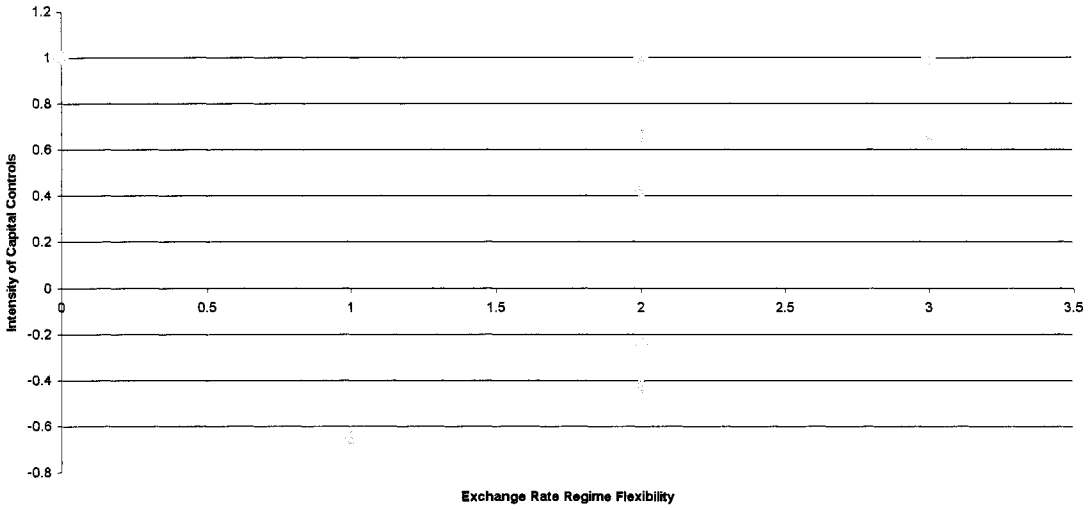
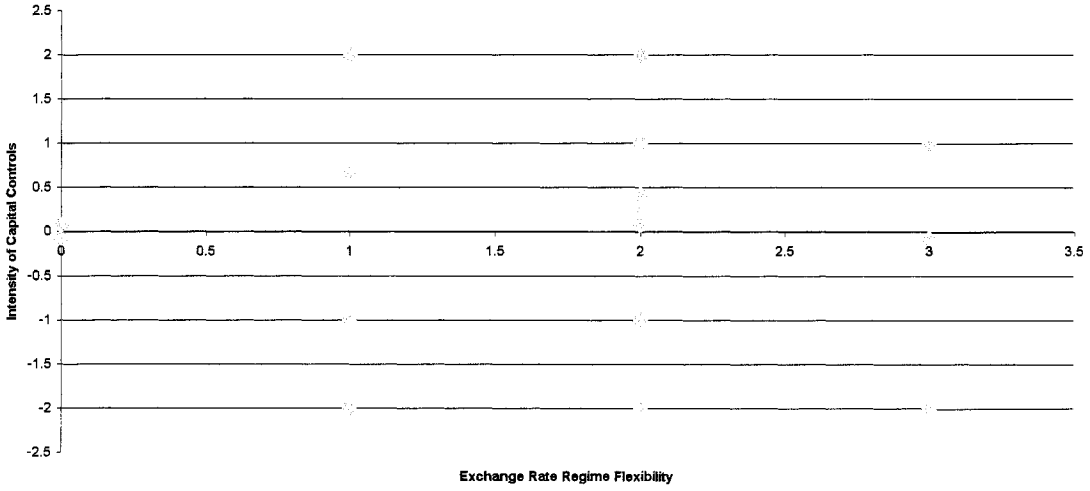


Figure 6.2 MERCOSUR+Chile



6.4.4 De Facto Capital Flows and International Reserves

A supplementary exercise that I will discuss in this section tests if there is any link between de facto capital flows and international reserves. Using the same simultaneous equations framework I used with the exchange rate regime, I investigate the relationship between Gross Private Capital Flows (as % of GDP) and the change/level of

international reserves. Since I am controlling for the exchange rate regime, I decide to split the sample into two periods: for ASEAN-5 the first period is 1984Q1-1996Q4 and the second period is 1997Q1-2004Q4; for MERCOSUR+Chile the first period is 1984Q1-1994Q4 and the second period is 1995Q1-2004Q4.

The general pattern of results suggests a weak link between de facto capital flows and the change/level of international reserves. The only evidence of there being a strong link is in the gross private capital flow equation for MERCOSUR+Chile for the period 1995Q1-2004Q4 (see Table B.27, panel A). For this particular regression, the coefficient of the change in reserves is negative for all five countries and statistically significant for four. What this result suggests is that a higher change in reserves acts as a signal of greater foreign exchange market intervention to keep the exchange rate relatively stable. It is possible that de facto capital flows responded negatively to this signal in anticipation of a relatively closed capital account.

Chapter 7

Summary of Major Empirical Findings and Conclusion

After examining the links between the exchange rate regime and several macroeconomic variables for ASEAN-5 and MERCOSUR+Chile during 1984-2004, the following findings emerge:

1. The hypothesized simultaneous relationship between the exchange rate regime and the change in international reserves exists for some countries but not for others. Furthermore, the direction of causation is stronger running from *change* in reserves to exchange rate regime rather than the other way around.

There is some evidence that the assumed negative relationship suggested by the political economy approach is supported in the Philippines, Thailand, Chile, and Paraguay. The direction of causation is stronger from change in reserves to the choice of exchange rate regime rather than the other way around. This suggests that changes in reserves are motivated by other factors aside from the exchange rate regime chosen. I find equal support for the precautionary and mercantilist motives for reserves since variables such as foreign currency claims and export volatility seem to explain changes in reserves just as well as the exchange rate regime.

2. The findings regarding the relationship between the exchange rate regime and the *level* of international reserves provides stronger support (and better statistical fit) for the hypothesis that countries do target some macroeconomic variable other than inflation.

In contrast to the change in reserves, more countries display the expected negative relationship when the level of reserves is used. Unlike the change in reserves, which is a

signal of policy intentions, the level of reserves is a structural feature of the economy. When higher levels of international reserves are required to support less flexible exchange rate regimes, this reflects the importance of credibility. This is especially true for the Latin American sample. Furthermore, there is an overall improvement in the statistical significance of the estimates for both regions.

3. Results coming from the seemingly unrelated regression (SUR) estimates reveal that there tends to be greater co-movement of exchange rate regimes and international reserves within ASEAN-5 than within MERCOSUR+Chile. Also, there is in general, greater co-movement of exchange rate regimes relative to reserves. Most correlation coefficients, however, are on the low side.

The Asian countries' residual correlations tend to be higher on average compared to the Latin American countries. There is also evidence that these Asian correlations tend to be more on the positive side whereas there are more instances of negative co-movement on the Latin American side. The difference may lie in the previous historical experiences of these regions such as the export-orientation of Asia versus the relatively less-open, import substitution experience of Latin America. The greater co-movement of exchange rate regimes relative to reserves policy, true for ASEAN-5, points to the possibility that countries are wary of beggar-thy-neighbor exchange rate policies.

4. There is evidence for some countries that the exchange rate regime responds to the output gap and that some countries may be using exchange rate policy to target domestic output. The results generally confirm that when domestic output is targeted, there is a corresponding lack of attention devoted to inflation.

The countries where such evidence is found are the Philippines, Singapore, Argentina, Brazil, and Chile. Using the exchange rate regime to target output instead of inflation is understandable from the point of view of ASEAN-5 because of its low to moderate inflation history. Using the exchange rate to target output instead of inflation is understandable from the point of view of MERCOSUR+Chile given that the time frame of the study (1984-2004) is a *post*-hyperinflation phase.

5. Exchange rate flexibility is expansionary in the case of the ASEAN-5 but shows contractionary tendencies in the case of MERCOSUR+Chile.

For four Asian countries, the output gap tends to be positively associated to exchange rate regime flexibility while the opposite holds for Latin America. The deliberate move to foster export-oriented growth in the former is probably the reason for this. It is also interesting to note that output expansion in Latin America, rather than coming from exchange rate flexibility, is strongly linked to the financial account of the balance of payments suggesting that foreign financial flows are a prime stimulus.

6. Contractionary Devaluation tests for both regions point to import dependence and the extent of currency mismatch as possible culprits.

There is no evidence to support the hypothesis that output falls when devaluation occurs during currency crises periods. This suggests two things: (a) either that the negative output effect is slow to materialize (takes more than a year) or (b) devaluation actually helps countries out of the crisis by improving international comeptitiveness. The more traditional explanation based on import dependence seems to be the strongest source of contractionary devaluation in the two regions. Currency mismatch in the form

of the percentage of international claims denominated in foreign currency is a close runner-up, particularly in the case of Thailand.

7. There is mixed evidence that the exchange rate regime responds to the level of foreign direct investment. FDI decreases exchange rate regime flexibility in ASEAN-5 while the effect in MERCOSUR+Chile is inconclusive.

A not so surprising and strong result is that when FDI is low, the Asian countries increase exchange rate regime flexibility and vice versa. Whether this is a conscious policy decision, we do not know. However, given that most FDI in Asia engages in re-export, then it might be possible that the flexibility of exchange rates acts as some kind of incentive for multinational firms to invest in the host country.

8. The *de jure* intensity of capital account restrictions is affected by the policy on international reserves.

A higher change in reserves for ASEAN-5 is associated with an increase in the intensity of capital restrictions while the reverse holds true in MERCOSUR+Chile. In the case of the former, this reflects foreign exchange market intervention to preserve the stability of the exchange rate in a setting where most countries in the region are practicing managed floats. In the case of the latter, there is a decrease in capital restrictions alongside the increases in reserves. This is a confirmation of our result that the financial account of the balance of payments is an important stimulus to the economy for the Latin American sample.

9. There is no evidence to suggest that intermediate regimes generate higher intensities of capital account restrictions in ASEAN-5. There is some evidence that

intermediate regimes in MERCOSUR+Chile do result in higher capital account restrictions.

The inverted-U hypothesis seems to find some support only in the Latin American sample. An inverted-U pattern of the intensity of capital controls is a theoretical prediction that countries prefer the benefits of intermediate regimes versus polar regimes but requires the safeguard function of capital controls against macroeconomic vulnerability. Such a pattern does not seem to exist in ASEAN-5 because Malaysia instituted a pegged exchange rate alongside strict capital controls after the 1997 crisis. On the other hand, the other countries in the region also adopted some controls while in the process of moving towards generalized floating.

10. There is no evidence that exchange rate policy and its associated implication for the change or level of international reserves affects *de facto* capital flows.

The regressions performed using actual or de facto capital flows as a function of international reserves (and vice versa) indicate that the link is very weak. This also means that the link between de facto capital flows and the exchange rate regime is also weak given that reserves are directly connected to the latter. The de facto level of capital flows is difficult to account for since there are policy and non-policy factors at work. Also, as shown in the discussion of the country chronologies, there is generally a weak relationship between existing de jure measures of capital account openness and actual capital flows.

This study presents some empirical findings regarding the simultaneous determination of de facto exchange rate regimes and selected macroeconomic variables,

with particular emphasis on the external sectors of selected emerging market countries. It is shown that the choice of regime matters for macroeconomic performance. Linkages between the exchange rate regime, on the one hand, and international reserves, output, and foreign direct investment, on the other, are shown to exist for most countries in the study. This is in addition to the usual link between the exchange rate regime and inflation. It is also shown that policies pertaining to the openness of the capital account have implications on the external position of a country (i.e. international reserves) and are related to the exchange rate regimes in place.

The study of de facto exchange rate regimes and their linkages with important macroeconomic variables is of utmost importance from a macroeconomic policy perspective. To be sure, further advances in the methodology of classifying exchange rate regimes will continue to emerge. These will present future challenges, as they will provide alternative data sets that will always be compared to the official or de jure classification scheme. There is also a great need to improve the measurement of policies pertaining to capital account openness. As the impossible trinity doctrine tells us, the exchange rate regime and the capital account are intertwined and one cannot have a comprehensive analysis without both. My future research agenda includes further study of the evolution of de facto exchange rate regimes, the development of better measures of capital account openness, and possibly the inclusion of other macroeconomic policies in the analysis, such as monetary policy and fiscal policy rules.

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APPENDIX A: COUNTRY CHRONOLOGIES

Table A.1
Indonesia Chronology of Exchange Rate Regimes, Average Interest Rate Differentials, and Measures of Capital Account (KA) Openness

Period	Exchange Rate Regime	Average Interest Rate Differential	Average Degree of KA Openness		
			GPKF	0/1	VHZ
1984-1986	Crawling Peg	5.01	1.42	1	-
1987-1989	Crawling Peg	5.88	1.74	1	-
1990-1992	Crawling Peg	7.57	3.81	1	-
1993-1995	Crawling Peg	5.99	5.29	1	-
1996-1998	Crawling Peg (1996-Jul 1997) Float (Aug 1997-Dec 1998)	29.24	12.44	1	0.6352
1999-2001	Float	11.07	9.25	-	0.6352
2002-2004	Managed Float	7.35	4.48	-	0.6352

Table A.2
Malaysia Chronology of Exchange Rate Regimes, Average Interest Rate Differentials, and Measures of Capital Account (KA) Openness

Period	Exchange Rate Regime	Average Interest Rate Differential	Average Degree of KA Openness		
			GPKF	0/1	VHZ
1984-1986	Moving band	-1.00	10.09	1	-
1987-1989	Moving band	-4.74	7.63	1	-
1990-1992	Moving band	0.94	14.00	1	-
1993-1995	Moving band	0.95	18.39	1	-
1996-1998	Moving band (1996-Jul 1997) Float (Aug 1997-Sept 1998) Peg (Oct 1998-Dec 1998)	2.04	11.17	1	1
1999-2001	Peg	-2.29	7.99	-	1
2002-2004	Peg	1.18	21.72	-	1

Table A.3
Philippines Chronology of Exchange Rate Regimes, Average Interest Rate Differentials, and Measures of Capital Account (KA) Openness

Period	Exchange Rate Regime	Average Interest Rate Differential	Average Degree of KA Openness GPKF	0/1	VHZ
1984-1986	Float (1984 - Feb 1985) Crawling Peg (Mar 1985–Dec 1986)	10.18	7.93	0	-
1987-1989	Crawling Peg	3.92	5.86	0	-
1990-1992	Crawling Peg (Jan 1990-Apr 1992) Band (May 1992-Dec 1992)	10.73	7.42	0	-
1993-1995	Band (Jan 1993-Aug 1995) Peg (Sept 1995-Dec 1995)	6.91	11.92	0	-
1996-1998	Peg (Jan 1996-Jun 1997) Float (Jul 1997- Dec 1997) Managed Float (Jan 1998-Dec 1998)	7.10	15.54	0	1
1999-2001	Managed Float	4.31	52.68	-	1
2002-2004	Float	4.94	40.38	-	1

Table A.4
Singapore Chronology of Exchange Rate Regimes, Average Interest Rate Differentials, and Measures of Capital Account (KA) Openness

Period	Exchange Rate Regime	Average Interest Rate Differential	Average Degree of KA Openness GPKF	0/1	VHZ
1984-1986	Moving Band	-2.96	43.13	1	-
1987-1989	Moving Band	-3.64	48.55	1	-
1990-1992	Moving Band	-1.34	42.90	1	-
1993-1995	Moving Band	-1.78	59.91	1	-
1996-1998	Moving Band (Jan 1996-Nov 1998) Managed Float (Dec 1998)	-1.53	86.51	1	-0.6532
1999-2001	Managed Float	-3.04	85.82	-	-0.3650
2002-2004	Managed Float	-0.63	83.06	-	-0.4260

Table A.5
Thailand Chronology of Exchange Rate Regimes, Average Interest Rate Differentials, and Measures of Capital Account (KA) Openness

Period	Exchange Rate Regime	Average Interest Rate Differential	Average Degree of KA Openness GPKF	0/1	VHZ
1984-1986	Peg	2.98	5.24	0	-
1987-1989	Peg	0.25	7.34	0	-
1990-1992	Peg	4.27	11.71	0	-
1993-1995	Peg	3.56	17.40	0	-
1996-1998	Peg (Jan 1996-Jul 1997) Float (Aug 1997-Jan 1998) Managed Float (Feb 1998-Dec 1998)	6.66	15.11	0	0.4260
1999-2001	Managed Float	-3.33	12.21	-	0.5017
2002-2004	Managed Float	-0.11	11.89	-	0.6352

Table A.6
Argentina Chronology of Exchange Rate Regimes, Average Interest Rate Differentials, and Measures of Capital Account (KA) Openness

Period	Exchange Rate Regime	Average Interest Rate Differential	Average Degree of KA Openness GPKF	0/1	VHZ
1984-1986	Float (Jan 1984-Jun 1985) Peg (Jun 1985-Mar 1986) Float (Apr 1986-Dec1986)	817.35	5.24	0	-
1987-1989	Float	462643.6	6.46	0	-
1990-1992	Float (Jan 1990-Mar 1991) Currency Board (Apr 1991-Dec 1992)	3231834	8.84	0	-
1993-1995	Currency Board	3.12	13.86	1	-
1996-1998	Currency Board	0.94	12.45	1	-0.0792
1999-2001	Currency Board	8.11	16.01	-	0.0792
2002-2004	Managed Floating	14.14	28.61	-	0.2494

Table A.7
Brazil Chronology of Exchange Rate Regimes, Average Interest Rate Differentials, and Measures of Capital Account (KA) Openness

Period	Exchange Rate Regime	Average Interest Rate Differential	Average Degree of KA Openness GPKF	0/1	VHZ
1984-1986	Float (Jan 1984-Feb 1986) Peg (Mar 1986-Sept 1986) Float (Oct 1986-Dec 1986)	206.00	4.74	0	-
1987-1989	Float (Jan 1987-Jan 1989) Peg (Jan 1989-Apr 1989) Float (Apr 1989-Dec 1989)	2665.93	3.75	0	-
1990-1992	Float	6060.749	3.84	0	-
1993-1995	Float (Jan 1993-Jun 1994) Crawling Band (Jul 1994-Dec 1995)	2714.80	8.98	0	-
1996-1998	Crawling Band	21.70	10.83	0	0.6532
1999-2001	Crawling Band (Jan 1999) Float (Feb 1999-Aug 1999) Managed Float (Sept 1999-Dec 2001)	15.20	11.63	-	1.0
2002-2004	Float	18.03	8.75	-	0.2805

Table A.8
Chile Chronology of Exchange Rate Regimes, Average Interest Rate Differentials, and Measures of Capital Account (KA) Openness

Period	Exchange Rate Regime	Average Interest Rate Differential	Average Degree of KA Openness GPKF	0/1	VHZ
1984-1986	Managed Float	21.84	14.99	0	-
1987-1989	Managed Float (Jan 1987-Jan 1988) Crawling Band (Jan 1988-Dec 1989)	18.21	14.74	0	-
1990-1992	Crawling Band	24.35	12.53	0	-
1993-1995	Crawling Band	13.63	16.25	0	-
1996-1998	Crawling Band	9.98	21.21	0	1.9956
1999-2001	Crawling Band (Jan 1999-Aug 1999) Managed Float (Sept 1999-Dec 2001)	5.31	28.59	-	1.9956
2002-2004	Float	3.05	23.27	-	-0.2430

Table A.9
Paraguay Chronology of Exchange Rate Regimes, Average Interest Rate Differentials, and Measures of Capital Account (KA) Openness

Period	Exchange Rate Regime	Average Interest Rate Differential	Average Degree of KA Openness GPKF	0/1	VHZ
1984-1986	Managed Float (Jan 1984-Mar 1985) Float (Apr 1985-Apr 1986) Crawling Band (May 1986-Dec 1986)	n.a.	6.39	0.33	-
1987-1989	Crawling Band (Jan 1987-Feb 1989) Float (Mar 1989-Dec 1989)	n.a.	5.47	0	-
1990-1992	Float (Jan 1990-Jan 1991) Crawling Peg (Feb 1991-Dec 1992)	20.53	6.80	0	-
1993-1995	Crawling Peg	23.07	7.07	0	-
1996-1998	Crawling Peg	17.25	8.64	0	-1.0
1999-2001	Crawling Peg (Jan 1999-June 1999) Crawling Band (July 1999-Dec 2001)	17.58	7.45	-	-1.0
2002-2004	Managed Float	18.03	13.79	-	-1.3319

Table A.10
Uruguay Chronology of Exchange Rate Regimes, Average Interest Rate Differentials, and Measures of Capital Account (KA) Openness

Period	Exchange Rate Regime	Average Interest Rate Differential	Average Degree of KA Openness GPKF	0/1	VHZ
1984-1986	Float	28.61	6.86	1	-
1987-1989	Float	30.23	14.55	1	-
1990-1992	Float (Jan 1990-Dec 1990) Crawling Band (Dec 1990-Nov 1991) Float (Dec 1991-Dec 1992)	39.50	11.04	1	-
1993-1995	Float (Jan 1993-Sept 1995) Crawling Band (Oct 1995-Dec 1995)	23.54	6.90	1	-
1996-1998	Crawling Band	15.23	11.81	0	-1.9956
1999-2001	Crawling Band	9.45	16.99	-	-1.6638
2002-2004	Crawling Band (2002) Float (2003-2004)	24.41	59.44	-	-1.9956

Table A.11
Monetary Policy Frameworks

A. Monetary Policy Frameworks in ASEAN-5

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Explicit Target-1998 (based on Fry, et al. (2001)) (Year in parentheses indicates start year)	Money (1993)	Inflation (1970s), Exchange Rate (1998)	Money/ Exchange Rate* (1980s-1990s)	None	None
Explicit Target-2001 (based on 2001 issue of AREAR)	Fund	Exchange Rate	Money/ Fund	None	Inflation /Fund
Explicit Target-2004 (based on 2004 issue of AREAR)	Money	Exchange Rate	Inflation	None	Inflation

*Taken from Gochoco-Bautista and Canlas (2003).

B. Monetary Policy Frameworks in MERCOSUR + Chile

	Argentina	Brazil	Chile	Paraguay	Uruguay
Explicit Target-1998 (based on Fry, et al. (2001) (Year in parentheses indicates start year)	Exchange Rate (1991)	n.p.*	Exchange Rate (1986), Inflation (1991)	n.a.	Exchange Rate(1995) Inflation (1995)
Explicit Target-2001 (based on 2001 issue AREAR)	Exchange Rate/Fund	Inflation	Inflation	None	Exchange Rate/Fund
Explicit Target-2004 (based on 2004 issue of AREAR)	Fund	Inflation	Inflation	None	Money/ Fund

*Franco (2003) describes this period as "non-policy" with respect to the monetary policy framework due to severe constraints such as hyperinflation .

APPENDIX B: REGRESSION TABLES

(t-statistics in parentheses)

Table B.1

Simultaneous Equations (2SLS) – ASEAN-5, 1984Q4-2004Q4

A. Dependent Variable - Exchange Rate Regime

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Constant	-1.2587	2.0667	-2.1154	-1.6549	-16.7625
	(-2.6578)*	(1.8681)	(-2.8633)*	(-3.7013)*	(-3.05)*
Change in Reserves	0.12E-02	0.27E-03	-0.11E-03	0.13E-02	-0.2E-02
	(1.0321)	(0.7790)	(-1.1734)	(3.2454)*	(-2.32)*
CPI Inflation	0.1693	0.7471	0.1494	-0.5535	0.1591
	(1.2988)	(2.7817)*	(2.2351)*	(-1.5517)	(0.4431)
Inflation Volatility	0.1297	1.2044	0.5056		2.8553
	(0.4977)	(1.4609)	(3.7924)*		(2.532)*
Trade Openness	0.0288	-0.8864	0.8895	1.1488	13.5334
	(0.0171)	(-0.6963)	(0.6654)	(1.1791)	(2.960)*
GDP per capita	70.2374	-1.5695	14.4142	-9.7693	8.2988
	(2.8547)*	(-0.8844)	(3.1952)*	(-3.5680)	(1.1549)
Trade Diversification	-0.1644	-0.5107	0.4936		0.6064
	(-1.1524)	(-0.8486)	(0.8350)		(1.2856)
R-squared	0.4020	0.4338	0.5658	0.2619	0.8676

B. Dependent Variable - Change in Reserves

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Constant	-368.655	2591.16	-232.798	505.452	-614.150
	(-1.0848)	(1.2805)	(-0.4089)	(0.4802)	(-0.275)
Exchange Rate Regime	-1570.13	-301.665	-116.252	1841.12	-64.2958
	(-2.0305)*	(-0.4563)	(-0.9793)	(1.4559)	(-0.373)
Foreign Currency	-0.98E-02	0.02627	0.41E-02	0.97E-02	-0.01768
Claims by BIS banks	(-0.8708)	(0.0971)	(0.1029)	(1.3202)	(-1.014)
Export Volatility	187.505	161.323	0.8720	-298.985	-6.5911
	(2.4791)*	(0.8680)	(0.2307)	(-1.0079)	(-0.655)
Interest Rate	38.8536	223.370	51.1835	136.486	-14.056
Differential	(2.7024)*	(0.9445)	(1.6366)	(0.7146)	(-0.301)
Trade Openness	1.8033	-1569.06	-313.706		1283.00
	(1.8033)	(-0.4256)	(-0.3716)		(0.3772)
GDP per capita	14148.4	-161.084	2549.48		2127.82
	(0.8449)	(-0.0111)	(1.1627)		(0.5210)
R-squared	0.1471	0.1096	0.0572	0.0516	0.1079

Table B.2
Seemingly Unrelated Regression (SUR) – ASEAN-5, 1984Q1-2004Q4

A. Dependent Variable – Exchange Rate Regime

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Constant	0.2222 (3.8927)*	1.1139 (3.4860)*	-0.0238 (-0.0901)	0.3013 (5.6749)*	-1.4752 (-6.09)*
Change in Reserves	-0.13E-04 (-0.4104)	-0.70E-04 (-2.7821)*	-0.20E-03 (-2.3977)*	0.88E-05 (0.6389)	-0.1E-03 (-3.35)*
CPI Inflation	0.0258 (2.8106)*	0.2978 (3.1691)*	0.1106 (4.8294)*	-0.0468 (-0.7740)	-0.1727 (-3.19)*
Inflation Volatility	0.0212 (1.2969)	0.0504 (0.2521)	0.1911 (3.9229)*	0.1592 (0.9346)	0.1058 (0.710)
Trade Openness	0.0758 (0.3917)	-0.5047 (-1.2865)	6.7776 (7.3075)*	-0.2995 (-0.8611)	2.9464 (6.475)*
GDP per capita	6.9485 (1.8463)	0.4080 (0.7521)	-0.0507 (-0.2226)		0.3989 (0.5857)
Trade Diversification	0.64E-02 (0.4562)	0.0451 (0.2378)			0.4E-02 (-0.139)
R-squared	0.1847	0.2887	0.5586	0.1191	0.7387

B. Residual Correlation Matrix

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Indonesia	1.0000				
Malaysia	-0.4171	1.0000			
Philippines	0.5451	-0.0258	1.0000		
Singapore	0.8985	-0.6637	0.3983	1.0000	
Thailand	0.5458	0.2394	0.6953	0.2502	1.0000

LM test statistic for null hypothesis: $\sigma_{ij} = 0, i \neq j \quad \Rightarrow \quad 233.4752$

Table B.3
Seemingly Unrelated Regression (SUR) – ASEAN-5, 1984Q1-2004Q4

A. Dependent Variable – Change in Reserves

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Constant	-.234.714 (-0.8657)	1734.57 (1.1843)	-438.576 (-0.8768)	361.180 (0.4014)	-1002.53 (-1.290)
Exchange Rate Regime	-564.798 (-1.7838)	-2603.57 (-2.3129)*	-508.719 (-1.6977)	-91.1962 (-0.1189)	-1262.36 (-2.01)*
Foreign Currency Claims by BIS banks	-0.43E-02 (-0.4344)	0.0840 (0.9849)	0.0128 (0.4345)	0.51E-02 (0.8665)	-0.6E-02 (-0.458)
Export Volatility	100.200 (2.5423)*	323.616 (2.6086)*	2.8061 (0.7778)	227.898 (1.1706)	9.7008 (1.089)
Interest Rate Differential	31.4723 (3.2241)*	170.864 (2.0419)*	46.8551 (1.9571)	115.479 (0.7285)	-33.962 (-0.863)
Trade Openness	961.460 (1.5633)	-1899.17 (-1.0557)	5.2811 (0.0068)		4005.46 (1.881)
GDP per capita	1929.77 (0.1515)	-480.413 (-0.1258)	1488.74 (0.7680)		-2821.08 (-0.836)
R-squared	0.1260	0.1866	0.0511	0.0175	0.1056

B. Residual Correlation Matrix

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Indonesia	1.0000				
Malaysia	0.3227	1.0000			
Philippines	0.2298	0.2015	1.0000		
Singapore	0.4426	0.4854	0.0158	1.0000	
Thailand	0.2442	0.3973	0.2279	0.5964	1.0000

LM test statistic for null hypothesis: $\sigma_{ij} = 0, i \neq j \Rightarrow$ 105.3709

Table B.4

Simultaneous Equations (2SLS), MERCOSUR+Chile, 1984Q1-2004Q4

A. Dependent Variable – Exchange Rate Regime

	Argentina	Brazil	Chile	Paraguay	Uruguay
Constant	-1.7207	-0.3236	-5.2304	-16.3972	-3.2085
	(-2.7227)*	(-0.3433)	(-4.1482)*	(-2.8054)*	(-3.22)*
Change in Reserves	0.20E-02	0.35E-03	-0.22E-02	-0.68E-02	0.0158
	(2.4860)*	(1.7198)	(-2.6017)*	(-0.6472)	(3.602)*
CPI Inflation	0.1042	0.0258	0.1285	0.4248	0.4128
	(4.0430)*	(1.9188)	(1.4255)	(2.5043)*	(3.959)*
Inflation Volatility	0.88E-02	-0.24E-02	0.2111	0.7510	-0.8343
	(0.6161)	(-0.2583)	(1.2660)	(1.9905)*	(-2.83)*
Trade Openness	0.35E-04	0.21E-07	2.4629	5.5214	-0.4218
	(0.0986)	(2.0543)*	(3.7265)*	(1.8225)	(-1.720)
GDP per capita	-0.0211	2.4745	3.4849	29.8195	19.6468
	(-0.2237)	(2.4585)*	(4.6719)*	(2.6286)*	(1.988)*
Trade Diversification	-0.0118	0.1060	0.3440	1.1536	-0.3425
	(-0.3287)	(2.3388)*	(0.6601)	(3.1804)*	(-0.714)
R-squared	0.7983	0.5669	0.4995	0.7211	0.6233

B. Dependent Variable – Change in Reserves

	Argentina	Brazil	Chile	Paraguay	Uruguay
Constant	795.81	8567.69	714.029	-378.423	422.412
	(1.2732)	(1.7660)	(0.7461)	(-2.2663)*	(1.7672)
Exchange Rate Regime	17.7911	-216.624	-22.3075	0.9007	77.4804
	(0.6085)	(-0.7060)	(-0.1460)	(0.3234)	(1.1018)
Foreign Currency Claims by BIS banks	-0.0177	-0.1425	-0.0594	0.0757	-0.0720
	(-1.2542)	(-1.8919)	(-1.7955)	(0.5158)	(-1.799)
Export Volatility	-0.7361	1.2622	0.0412	0.7691	1.6919
	(-0.7795)	(1.0390)	(0.0945)	(1.4031)	(1.8417)
Interest Rate Differential	0.15E-04	0.7665	-0.7486	6.5883	-12.536
	(-0.3482)	(0.6796)	(-0.0950)	(2.1216)*	(-3.67)*
Trade Openness	-0.33E-02	0.77E-05	43.4216	141.875	1.9812
	(-0.1010)	(0.8576)	(0.1006)	(1.0637)	(0.3757)
GDP per capita	92.1172	-798.646	408.013	193.573	1071.72
	(1.5227)	(-0.5082)	(0.9713)	(0.4673)	(1.6788)
R-squared	0.0524	0.0583	0.1449	0.1531	0.2514

Table B.5

Seemingly Unrelated Regression (SUR), MERCOSUR+Chile, 1984Q1-2004Q4

A. Dependent Variable – Exchange Rate Regime

	Argentina	Brazil	Chile	Paraguay	Uruguay
Constant	1.1581 (5.1165)*	2.0226 (9.9308)*	-0.4303 (-1.1896)	-1.2708 (-3.7160)*	0.0833 (0.9197)
Change in Reserves	0.29E-04 (0.5289)	0.72E-05 (0.4654)	-0.12E-04 (-0.1560)	-0.58E-05 (-0.0108)	0.8E-03 (4.151)*
CPI Inflation	0.32E-02 (2.2326)*	0.38E-02 (2.2292)*	0.02149 (0.8133)	0.0966 (4.6255)*	0.0556 (7.264)*
Inflation Volatility	0.82E-02 (4.1605)*	-0.57E-02 (-1.7102)	0.1902 (3.6602)*	0.2557 (4.8648)*	-0.0965 (-2.74)*
Trade Openness	0.29E-04 (1.5080)	0.94E-09 (1.5352)	0.8909 (4.0581)*	0.6065 (4.7019)*	-0.0298 (-2.77)*
GDP per capita	-0.0683 (-2.1175)*	0.0650 (0.2579)	1.4466 (6.8145)*	4.7202 (6.1602)*	3.5931 (2.749)*
Trade Diversification	0.52E-02 (1.5136)	0.0202 (3.2852)*	-0.1611 (-1.2160)	0.1285 (3.6944)*	0.0115 (0.1562)
R-squared	0.3869	0.2143	0.4201	0.5387	0.4321

B. Residual Correlation Matrix

	Argentina	Brazil	Chile	Paraguay	Uruguay
Argentina	1.0000				
Brazil	0.3294	1.0000			
Chile	0.6950	0.5022	1.0000		
Paraguay	-0.2198	0.0764	0.0993	1.0000	
Uruguay	0.4273	0.3869	0.5103	0.0310	1.0000

LM test statistic for null hypothesis: $\sigma_{ij} = 0, i \neq j \Rightarrow$ 126.1166

Table B.6
Seemingly Unrelated Regression (SUR), MERCOSUR+Chile, 1984Q1-2004Q4

A. Dependent Variable – Change in Reserves

	Argentina	Brazil	Chile	Paraguay	Uruguay
Constant	-2069.42 (-1.4101)	3407.63 (0.4817)	820.427 (0.8992)	-384.803 (-2.4918)*	1121.52 (2.933)*
Exchange Rate Regime	-1746.54 (-2.4364)*	568.998 (0.3098)	95.6017 (0.3924)	-4.3351 (-0.1094)	47.0193 (0.6922)
Foreign Currency Claims by BIS banks	-0.0444 (-2.4397)*	-0.0581 (-0.5430)	-0.0618 (-1.9388)	0.0454 (0.3919)	-0.1770 (-2.94)*
Export Volatility	-0.9709 (-0.9653)	2.8036 (1.6806)	0.0956 (0.1997)	0.9379 (1.8139)	1.5564 (1.4913)
Interest Rate Differential	-0.13E-03 (-2.1403)*	0.0862 (0.6395)	-4.8054 (-0.3206)	6.7730 (2.2626)*	-23.089 (-4.35)*
Trade Openness	28333.6 (3.1874)*	0.6813 (-1.3393)	274.637 (0.2646)	140.897 (1.3084)	-190.323 (-1.614)
GDP per capita	515.743 (3.2929)*	-4404.28 (-1.5039)	213.870 (0.2677)	232.576 (0.6887)	-110.068 (-0.108)
R-squared	0.2082	0.0706	0.1469	0.1491	0.3365

B. Residual Correlation Matrix

	Argentina	Brazil	Chile	Paraguay	Uruguay
Argentina	1.0000				
Brazil	-0.1344	1.0000			
Chile	-0.0196	-0.2009	1.0000		
Paraguay	-0.0523	0.0790	0.1576	1.0000	
Uruguay	0.0595	0.0740	0.0085	0.0629	1.0000

LM test statistic for null hypothesis: $\sigma_{ij} = 0, i \neq j \Rightarrow$ 8.8761

Table B.7
Simultaneous Equations (2SLS), ASEAN-5, 1984Q1-2004Q4

A. Dependent Variable – Exchange Rate Regime

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Constant	-4.0825	2.3789	-4.2739	-2.3492	-13.9037
	(-4.8833)*	(1.8803)	(-3.1232)*	(-4.1571)*	(-3.81)*
Total Reserves minus Gold	0.22E-03	-0.28E-04	-0.87E-03	0.34E-04	-0.3E-03
	(4.3571)*	(-0.2285)	(-1.7407)	(3.9424)*	(-2.49)*
CPI Inflation	0.1581	0.8128	0.0586	-0.5480	0.4400
	(1.3227)	(3.1742)*	(0.6960)	(-1.3459)	(1.264)
Inflation Volatility	0.1594	0.6322	0.6133		1.5124
	(0.7859)	(0.9702)	(4.2256)*		(1.5515)
Trade Openness	-0.2568	-1.4392	8.3776	1.2924	2.6926
	(-0.1471)	(-1.3318)	(1.9972)*	(1.2601)	(0.9378)
GDP per capita	-34.886	0.5988	39.1686	-0.8271	44.7192
	(-1.200)	(0.0978)	(2.4771)*	(-0.4818)	(2.92)*
Trade Diversification	-0.2086	-0.3452	-1.7831		0.4289
	(-1.7684)	(-0.5239)	(-1.3607)		(1.3711)
R-squared	0.6351	0.4284	0.5779	0.3058	0.8571

B. Dependent Variable – Total Reserves minus Gold

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Constant	1074.08	-9095.93	-2613.63	-10139.3	-14996.8
	(0.4597)	(-1.9066)	(-2.2034)*	(-1.6015)	(-4.57)*
Exchange Rate Regime	7106.75	2328.39	-45.6602	60821.8	-517.561
	(1.3367)	(1.4939)	(-0.1846)	(7.9959)*	(-2.04)*
Foreign Currency Claims by BIS banks	0.1946	-1.0821	-0.0405	0.4280	0.0819
	(2.5086)*	(-1.697)	(-0.4855)	(9.6578)*	(3.196)*
Export Volatility	1042.68	8.4499	8.3917	-315.887	-71.3134
	(2.005)*	(0.0193)	(1.0655)	(-0.1770)	(-4.83)*
Interest Rate Differential	-160.319	-729.299	-91.498	3343.20	-64.5323
	(-1.6217)	(-1.3079)	(-1.404)	(2.9099)*	(-0.942)
Trade Openness	3838.86	-15536.7	5645.16		5088.54
	(0.7758)	(-1.7874)	(3.2086)*		(1.0182)
GDP per capita	229003	101133	39878		88271.2
	(1.9890)*	(2.9599)*	(8.7274)*		(14.71)*
R-squared	0.6362	0.8606	0.9273	0.8132	0.9812

Table B.8
Seemingly Unrelated Regression (SUR), ASEAN-5, 1984Q1-2004Q4

A. Dependent Variable – Exchange Rate Regime

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Constant	0.3117 (-8.3281)*	1.1556 (4.3589)*	-0.0259 (-0.0991)	-0.2349 (-3.3134)*	-2.2987 (-11.8)*
Total Reserves minus Gold	0.39E-04 (20.0242)*	-0.35E-04 (-4.5389)*	-0.57E-04 (-1.6252)	0.11E-04 (9.3556)*	-0.1E-03 (-9.77)*
CPI Inflation	0.0258 (4.9570)*	0.2254 (3.0483)*	0.1104 (4.9992)*	-0.0416 (-0.8516)	-0.1082 (-2.52)*
Inflation Volatility	0.0216 (2.5299)*	-0.0752 (-0.5086)	0.1742 (3.6540)*		0.1378 (1.1715)
Trade Openness	-0.0979 (-0.9401)	-0.3329 (-1.1374)		0.1381 (1.0824)	1.2256 (3.156)*
GDP per capita	-1.6355 (-0.7378)	1.1919 (2.0736)*	10.2386 (5.1970)*	-0.0862 (-0.3465)	13.810 (9.66)*
Trade Diversification	-0.0114 (-1.4710)	-0.0276 (-0.1942)	-0.4302 (-1.8456)		-0.0318 (-1.369)
R-squared	0.8639	0.3349	0.5311	0.4984	0.8738

B. Residual Correlation Matrix

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Indonesia	1.0000				
Malaysia	-0.0692	1.0000			
Philippines	0.7110	0.0668	1.0000		
Singapore	0.5230	-0.7425	0.4318	1.0000	
Thailand	0.6942	0.0977	0.6461	0.3075	1.0000

LM test statistic for null hypothesis: $\sigma_{ij} = 0, i \neq j \Rightarrow$ 166.6329

Table B.9
Seemingly Unrelated Regression (SUR), ASEAN-5, 1984Q1-2004Q4

A. Dependent Variable – Total Reserves Minus Gold

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Constant	4333.22 (4.9723)*	-10431.2 (-3.4272)*	-1866.49 (-1.7312)	-8468.5 (-2.01)*	-12042.9 (-11.5)*
Exchange Rate Regime	18153.4 (17.9143)*	-15745.8 (-6.5547)*	367.383 (0.5628)	49004.0 (13.4079)*	-6373.34 (-7.51)*
Foreign Currency Claims by BIS banks	0.2124 (6.6615)*	0.6834 (3.6025)*	-0.0699 (-1.0855)	0.3857 (13.8686)*	0.0317 (1.7236)
Export Volatility	173.271 (1.3814)	876.447 (3.3628)*	7.6034 (0.9726)	2191.43 (2.3212)*	-30.8622 (-2.53)*
Interest Rate Differential	-307.121 (-9.8628)*	250.602 (1.4292)	-127.965 (-2.4578)*	2825.89 (3.7603)*	-180.256 (-3.43)*
Trade Openness	2818.00 (1.4467)	3319.44 (0.8814)	5387.31 (3.2268)*		4525.28 (1.5427)
GDP per capita	56764.9 (1.4027)	20880.5 (2.5981)*	38706.7 (9.2852)*		91023.1 (19.73)*
R-squared	0.9181	0.9073	0.9276	0.8924	0.9873

B. Residual Correlation Matrix

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Indonesia	1.0000				
Malaysia	0.2897	1.0000			
Philippines	0.1092	-0.0419	1.0000		
Singapore	0.5353	-0.0000	0.0678	1.0000	
Thailand	0.1722	0.2907	0.2399	0.2342	1.0000

LM test statistic for null hypothesis: $\sigma_{ij} = 0, i \neq j \Rightarrow$ 51.6861

Table B.10
Simultaneous Equations (2SLS), MERCOSUR+Chile, 1984Q1-2004Q4

A. Dependent Variable – Exchange Rate Regime

	Argentina	Brazil	Chile	Paraguay	Uruguay
Constant	-0.7546 (-0.9130)	2.0248 (1.0774)	4.3684 (1.1693)	-9.3830 (-2.1595)*	110.420 (2.860)*
Total Reserves minus Gold	-0.24E-03 (-2.0368)*	-0.18E-03 (-1.8877)	-0.18E-02 (-2.8075)*	-0.0143 (-2.4392)*	-0.5336 (-2.91)*
CPI Inflation	0.1013 (4.0481)*	0.04671 (4.5811)*	-0.1743 (-1.3549)	-0.0126 (-0.0634)	-4.8005 (-2.87)*
Inflation Volatility	0.498E-02 (0.4167)	-0.35E-02 (-0.3773)	-0.0295 (-0.1468)	0.9682 (2.0512)*	-5.8248 (-2.90)*
Trade Openness	0.189E-05 (0.0072)	0.200E-07 (1.8930)	-0.7373 (-0.5336)	11.0448 (2.8275)*	0.4455 (1.842)
GDP per capita	0.3858 (2.7849)*	8.9938 (2.8228)*	19.4686 (3.4016)*	37.6611 (3.3672)*	-73.2092 (-1.937)
Trade Diversification	-0.950E-02 (-0.1674)	0.0686 (1.2971)	-0.7271 (-1.2330)	0.9429 (1.7061)	6.3440 (3.187)*
R-squared	0.8065	0.5733	0.5112	0.8242	0.8573

B. Dependent Variable – Total Reserves minus Gold

	Argentina	Brazil	Chile	Paraguay	Uruguay
Constant	-6310.18 (-8.5619)*	15106.8 (1.4644)	-578.728 (-0.1947)	74.7341 (0.3205)	874.570 (1.4585)
Exchange Rate Regime	-14.4406 (-0.4189)	-1534.70 (-2.3524)*	-895.318 (-1.8860)	-12.7993 (-3.2911)*	4.2452 (0.0241)
Foreign Currency Claims by BIS banks	0.2873 (17.2608)*	0.0538 (0.3361)	0.0930 (0.9044)	0.2098 (1.0240)	0.2494 (2.484)*
Export Volatility	1.6891 (1.5169)	-1.6941 (-0.6558)	-0.2729 (-0.2014)	-0.3933 (-0.5137)	3.5056 (1.5212)
Interest Rate Differential	-0.266E-04 (-0.5184)	5.5507 (2.3147)*	-9.8505 (-0.4024)	-4.6207 (-1.0654)	-36.6146 (-4.28)*
Trade Openness	0.36E-02 (0.0955)	0.258E-04 (1.3534)	434.959 (0.3242)	478.366 (2.5681)*	13.3011 (1.0056)
GDP per capita	1198.42 (16.8002)*	35227.0 (10.5412)*	11412.0 (8.7439)*	1374.40 (2.3757)*	3837.98 (2.397)*
R-squared	0.9411	0.7015	0.9230	0.4366	0.7164

Table B.11
Seemingly Unrelated Regression (SUR), MERCOSUR+Chile, 1984Q1-2004Q4

A. Dependent Variable – Exchange Rate Regime

	Argentina	Brazil	Chile	Paraguay	Uruguay
Constant	1.6979 (7.2737)*	2.5610 (11.03)*	0.1589 (0.4650)	-1.2520 (-3.0257)*	0.4005 (1.5406)
Total Reserves minus Gold	-0.104E-03 (-4.6749)*	-0.359E-04 (-4.7055)*	-0.223E-03 (-8.9047)*	-0.205E-03 (-0.6481)	-0.2E-03 (-1.627)
CPI Inflation	0.263E-02 (1.7355)	0.475E-02 (2.7354)*	0.895E-02 (0.3613)	0.0968 (4.5068)*	0.0314 (2.253)*
Inflation Volatility	0.711E-02 (3.3788)*	-0.584E-02 (-1.7428)	0.1313 (2.7048)*	0.2554 (4.7409)*	-0.0676 (-1.675)
Trade Openness	0.239E-04 (1.2300)	0.664E-09 (1.1364)	0.8369 (4.5441)*	0.6126 (4.7152)*	-0.0260 (-2.16)*
GDP per capita	0.0713 (1.5541)	1.2474 (3.8224)*	3.6910 (13.3662)*	5.1730 (6.8241)*	3.9126 (2.66)*
Trade Diversification	0.369E-02 (1.0097)	0.0127 (1.9926)*	-0.0769 (-0.6128)	0.1434 (3.9138)*	0.1053 (1.2754)
R-squared	0.5296	0.3948	0.7406	0.5350	0.4102

B. Residual Correlation Matrix

	Argentina	Brazil	Chile	Paraguay	Uruguay
Argentina	1.0000				
Brazil	-0.0025	1.0000			
Chile	0.3107	0.1305	1.0000		
Paraguay	-0.3649	0.0919	-0.0244	1.0000	
Uruguay	0.2847	0.1744	0.1661	-0.0745	1.0000

LM test statistic for null hypothesis: $\sigma_{ij} = 0, i \neq j \Rightarrow$ 33.6313

Table B.12
Seemingly Unrelated Regression (SUR), MERCOSUR+Chile, 1984Q1-2004Q4

A. Dependent Variable – Total Reserves minus Gold

	Argentina	Brazil	Chile	Paraguay	Uruguay
Constant	-7988.97 (-4.6366)*	11011.6 (1.3692)	3693.68 (2.3988)*	114.577 (0.5074)	3249.47 (3.477)*
Exchange Rate Regime	-1018.69 (-1.2264)	-15214.5 (-7.2775)*	-3566.85 (-8.6795)*	-107.216 (-1.8139)	-134.688 (-0.815)
Foreign Currency Claims by BIS banks	0.3070 (14.663)*	0.4061 (3.3381)*	0.0744 (1.3648)	0.6059 (3.5801)*	-0.0898 (-0.610)
Export Volatility	0.1955 (0.1700)	4.7624 (2.4935)*	0.1465 (0.1832)	-1.0914 (-1.4480)	0.3264 (0.1286)
Interest Rate Differential	-0.14E-03 (-2.0183)*	0.5053 (3.2908)*	-50.0567 (-1.9873)*	-0.8451 (-0.1929)	-67.1264 (-5.19)*
Trade Openness	21658.6 (2.0895)*	-3.0869 (-5.3414)*	-967.120 (-0.5521)	310.236 (1.957)*	-320.115 (-1.111)
GDP per capita	1342.81 (7.3904)*	12281.0 (3.6765)*	10218.8 (7.5367)*	706.099 (1.4169)	-325.211 (-0.129)
R-squared	0.9121	0.8437	0.9217	0.3283	0.6309

B. Residual Correlation Matrix

	Argentina	Brazil	Chile	Paraguay	Uruguay
Argentina	1.0000				
Brazil	0.2315	1.0000			
Chile	-0.3276	0.2567	1.0000		
Paraguay	0.4861	0.1446	-0.3913	1.0000	
Uruguay	0.0826	0.0917	-0.4832	0.0764	1.0000

LM test statistic for null hypothesis: $\sigma_{ij} = 0, i \neq j \Rightarrow$ 74.9009

Table B.13
Simultaneous Equations (2SLS): ASEAN-5, 1984Q1-2004Q4

A. Dependent Variable: Exchange Rate Regime

	Indonesia	Malaysia	Philippines	Thailand
Constant	2.5034 (2.4613)*	6.2831 (2.1874)*	-2.0584 (-2.7336)*	-16.2274 (-3.31)*
Output Gap	5.1017 (3.9087)*	1.4321 (0.8345)	-1.6920 (-2.7443)*	-1.2101 (-0.961)
CPI Inflation	0.1835 (1.2522)	0.3441 (0.7283)	0.1879 (2.7660)*	1.2904 (1.4996)
Inflation Volatility	-0.7529 (-2.2505)*	-1.6365 (-0.9450)	0.5300 (3.8564)*	2.9036 (2.388)*
Trade Openness	3.3280 (2.0533)*	-1.4330 (-0.3662)	-1.4063 (-0.8375)	1.3365 (0.1802)
GDP per capita	-46.1802 (-1.1306)	-5.0880 (-0.4062)	21.8918 (3.7873)*	25.9201 (1.969)*
Trade Diversification	-0.4268 (-1.9006)	2.3196 (1.2711)	0.8220 (1.3208)	0.7353 (1.5977)
R-squared	0.7534	0.1948	0.5968	0.8336

B. Dependent Variable – Output Gap

	Indonesia	Malaysia	Philippines	Thailand
Constant	-0.7183 (-3.9370)*	-0.4166 (-1.1084)	-0.1238 (-0.7667)	-0.0176 (-0.099)
Exchange Rate Regime	1.6603 (4.8999)*	0.2590 (1.0831)	0.0449 (0.8187)	0.0478 (1.4453)
Real Money Growth	-0.716E-02 (-0.4045)	-0.0129 (-0.3784)	0.0217 (3.9075)*	0.1201 (2.026)*
Financial Account Balance	-0.277E-04 (-0.4183)		0.839E-04 (1.2732)	-0.4E-04 (-0.375)
Government Budget Surplus Growth		-0.448E-04 (-1.2331)	-0.340E-03 (-1.7620)	-0.1E-04 (-0.375)
R-squared	0.5176	0.0389	0.1955	0.0647

Table B.14
Simultaneous Equations (2SLS): MERCOSUR+Chile, 1984Q1-2004Q4

A. Dependent Variable – Exchange Rate Regime

	Argentina	Brazil	Chile
Constant	-1.2346 (-1.7519)	-6.4561 (-3.8395)*	1.4982 (1.3984)
Output Gap	-0.8661 (-2.3594)*	-0.6513 (-1.2538)	-0.9839 (-1.2357)
CPI Inflation	0.0942 (3.6882)*	0.0959 (3.6516)*	-1.2508 (-1.5088)
Inflation Volatility	0.0160 (1.2060)	-0.0625 -1.1312	-1.8005 (-1.3075)
Trade Openness	-0.235E-04 (-0.1359)	0.885E-06 (0.2931)	8.0992 (1.0215)
GDP per capita	-0.770E-03 (-0.883E-02)	7.4619 (3.9372)*	10.6705 (1.6082)
Trade Diversification	-0.6263 (-0.1325)	0.2409 (4.0850)*	1.1431 (1.2322)
R-squared	0.7856	0.8733	0.6666

B. Dependent Variable – Output Gap

	Argentina	Brazil	Chile
Constant	0.0862 (0.7742)	0.1377 (1.0031)	-0.3013 (-2.0164)*
Exchange Rate Regime	0.684E-02 (0.9063)	-0.143E-02 (-1.5657)	-0.2137 (-6.0267)*
Real Money Growth	0.190E-03 (0.0180)	0.0106 (0.7873)	0.0394 (0.8576)
Government Budget Surplus Growth	-0.128E-03 (-0.6368)	0.273E-04 (0.5739)	
Financial Account Balance	0.134E-03 (4.3597)*	0.549E-04 (2.5819)*	0.261E-03 (2.0687)*
R-squared	0.2188	0.8733	0.4950

Table B.15
The Sources of Contractionary Devaluation: ASEAN-5, 1984Q1-2004Q4

Dependent Variable – Output Gap	Indonesia	Malaysia	Philippines	Thailand
Constant	-0.5185 (-4.8120)*	-0.0112 (-0.0522)	-0.0176 (-0.2177)	-0.1426 (-0.821)
Exchange Rate Regime	4.7761 (8.9348)*	-4.6443 (-0.1308)	1.0038 (2.2122)*	3.2495 (2.69)*
(Exchange Rate Regime) x (Ratio of Imports to GDP)	-5.1689 (-3.6136)*	4.8062 (0.1988)	-3.0122 (-2.531)*	-1.8173 (-0.553)
(Exchange Rate Regime) x (Percentage of International Claims in Foreign Currency)	-19.2885 (-7.5312)*	6.9652 (0.0785)	1.6323 (0.5458)	-6.0764 (-3.28)*
(Exchange Rate Regime) x (Currency Crisis Dummy)	-0.7583 (-1.5157)	1.2336 (0.6324)	0.2562 (0.8849)	0.9961 (1.974)*
Real Money Growth	-0.659E-02 (-0.5001)	-0.0264 (-0.8263)	0.0233 (4.5882)*	-0.0195 (-0.521)
Government Budget Surplus Growth		-0.432E-04 (-1.2470)	-0.393E-03 (-2.1827)*	-0.3E-04 (-1.98)*
Financial Account Balance	-0.756E-04 (-1.6544)		0.268E-04 (0.5372)	0.3E-03 (7.881)*
R-squared	0.7351	0.1430	0.3333	0.6749

Table B.16
The Sources of Contractionary Devaluation: MERCOSUR+Chile, 1984Q1-2004Q4

Dependent Variable – Output Gap

	Argentina	Brazil	Chile
Constant	0.3921 (2.7361)*	1.0915 (5.3874)*	0.9454 (8.6383)*
Exchange Rate Regime	-4.9110 (-4.7718)*	-3.2681 (-7.0851)*	-10.4308 (-4.3017)*
(Exchange Rate Regime) x (Ratio of Imports to GDP)	-0.114E-03 (-2.3053)*	-0.466E-08 (-2.9309)*	7.6171 (1.6978)
(Exchange Rate Regime) x (Percentage of International Claims in Foreign Currency)	5.1586 (4.5974)*	2.7735 (4.6688)*	14.4644 (3.1974)*
(Exchange Rate Regime) x (Currency Crisis Dummy)	0.2767 (0.5789)	0.2206 (0.4113)	
Real Money Growth	0.195E-02 (0.2288)	0.493E-02 (0.4975)	0.0440 (1.6215)
Government Budget Surplus Growth	-0.117E-03 (-0.6682)	0.270E-04 (0.7728)	
Financial Account Balance	0.474E-04 (1.3475)	0.386E-04 (2.1853)*	0.140E-04 (0.1932)
R-squared	0.4359	0.5731	0.8525

Table B.17
Simultaneous Equations (2SLS): ASEAN-5 and MERCOSUR+Chile

A. Dependent Variable- Exchange Rate Regime

	ASEAN-5	MERCOSUR+Chile
Constant	2.1327 (3.1146)*	-2.0241 (-0.8194)
Foreign Direct Investment	-0.364E-09 (-2.0931)*	0.1815E-10 (0.3492)
CPI Inflation	-0.0470 (-0.8619)	0.8515E-03 (0.7323)
Inflation Volatility	0.7038 (1.4747)	-0.0327 (-0.5155)
Trade Openness	-0.7108 (-1.7580)	0.7747 (0.2746)
GDP per capita	0.2580 (2.9067)*	0.2171E-03 0.8635
Trade Diversification	0.0144 (0.0778)	0.6565 (2.1474)*
R-squared	0.3560	0.4360

B. Dependent Variable – Foreign Direct Investment

	ASEAN-5	MERCOSUR+Chile
Constant	-0.3357E+10 (-0.7878)	-0.2369E+11 (-1.6303)
Exchange Rate Regime	-0.1229E+10 (-2.0745)*	-0.1656E+09 (-2.0497)*
Compensation of Employees (% of GDP)	-0.1367E+11 (-0.3545)	0.7399E+11 (0.7164)
Electricity Production	0.2776E-02 (0.1136)	0.0870 (3.7962)*
Taxes on Income and Capital Gains (% of Total Revenue)	0.1150E+09 (1.7701)	0.6833E+08 (0.2709)
Taxes on International Trade (% of Total Revenue)	0.1306E+09 (1.3086)	0.6832E+09 (1.5520)
GDP per capita	648295.0 (4.9891)*	0.2804E+07 (1.7781)
R-squared	0.7282	0.7163

Table B.18
Simultaneous Equations (2SLS), ASEAN-5 and MERCOSUR+Chile, 1998Q1-2004Q4

A. Dependent Variable: Intensity of Capital Account Restrictions (Von Hagen-Zhou Index)

	ASEAN-5	MERCOSUR+Chile
Constant	0.2429 (4.0134)*	-6.2177 (-10.5347)*
Change in Reserves	0.1694E-03 (4.9041)*	-0.1652E-03 (-2.0588)*
Trade Openness	0.1340 (2.3089)*	6.9078 (8.3299)*
GDP per capita	-0.3299 (-17.4351)*	0.3080 (7.8186)*
Government Expenditure to GDP ratio	0.0410 (6.2639)*	0.2604 (9.5136)*
R-squared	0.9373	0.4506

B. Dependent Variable: Change in Reserves

	ASEAN 5	MERCOSUR+Chile
Constant	-1913.88 (-0.7986)	-18266.5 (-0.8676)
Intensity of Capital Account Restrictions	2031.31 (0.6888)	-5023.05 (-0.9437)
Export Volatility	-3.2688 (-0.4985)	2.4719 (2.7475)*
Interest Rate Differential	23.5070 (1.1724)	29.0167 (0.3304)
Foreign Currency Claims by BIS banks	0.8306E-02 (0.3526)	0.1564 (0.7258)
Trade Openness	662.517 (0.6220)	32144.5 (0.8807)
GDP per capita	285.633 (0.3319)	990.908 (0.9151)
R-squared	0.0976	0.0856

Table B.19
Simultaneous Equations (2SLS), ASEAN-5 and MERCOSUR+Chile, 1998Q1-2004Q4

A. Dependent Variable: Intensity of Capital Account Restrictions (Von Hagen-Zhou Index)

	ASEAN 5	MERCOSUR+Chile
Constant	0.1875 (1.1482)	-2.8755 (-3.7776)*
Total Reserves minus Gold	0.1674E-05 (0.3489)	0.6794E-04 (6.1422)*
Trade Openness	0.3472 (6.8206)*	5.2613 (6.6404)*
GDP per capita	-0.4032 (-8.9490)*	0.2102 (5.4442)*
Government Expenditure to GDP ratio	0.0361 (3.6161)*	-0.0282 (-0.5296)
R-squared	0.9262	0.5571

B. Dependent Variable: Total Reserves minus Gold

	ASEAN 5	MERCOSUR+Chile
Constant	60992.0 (5.7546)*	92480.5 (3.0322)*
Intensity of Capital Account Restrictions	-48748.9 (-3.7710)*	23177.5 (3.0059)*
Export Volatility	-116.199 (-4.0070)*	7.2591 (5.5698)*
Interest Rate Differential	-55.2557 (-0.6232)	-415.552 (-3.2663)*
Foreign Currency Claims by BIS banks	-0.2870 (-2.7543)*	-0.5380 (-1.7240)
Trade Openness	16875.6 (3.5826)*	-154363 (-2.9197)*
GDP per capita	-3391.77 (-0.8912)	-5421.96 (-3.4564)*
R-squared	0.8717	0.9142

Table B.20
Test of the Inverted-U Hypothesis of Capital Controls: Dummy Variable Approach
ASEAN-5 and MERCOSUR+Chile, 1998Q1-2004Q4

Dependent Variable: Intensity of Capital Account Restrictions (Von Hagen-Zhou Index)

	ASEAN-5	MERCOSUR+Chile
Constant	0.3781 (4.3199)*	-5.9971 (-10.4557)*
Dummy Variable for Intermediate Exchange Rate Regime 1	-0.4491 (-5.4376)*	-1.0511 (-3.4198)*
Dummy Variable for Intermediate Exchange Rate Regime 2	-0.2513 (-5.8631)*	0.2346 (0.8732)
Dummy Variable for Flexible Exchange Rate Regime	-0.0497 (-1.0748)	-1.0250 (-3.3748)*
Trade Openness	0.1421 (3.0446)*	7.4765 (10.4984)*
GDP per capita	-0.2815 (-13.9062)*	0.2320 (6.2220)*
Government Expenditure to GDP ratio	0.05119 (8.0691)*	0.2888 (11.8696)*
R-squared	0.9516	0.6079

Note: The excluded dummy variable is for fixed exchange rate regime. Intermediate Exchange Rate Regime 1 is defined as including adjustable pegs, crawling pegs, crawling bands, and bands. Intermesiate Exchange Rate Regime 1 is managed floating.

Table B.21
Test of the Inverted-U Hypothesis of Capital Controls: Quadratic Specification
ASEAN-5 and MERCOSUR+Chile, 1998Q1-2004Q4

	ASEAN-5	MERCOSUR+Chile
Constant	0.2913 (3.4059)*	-6.9459 (-10.6524)*
Exchange Rate Regime	-0.3189 (-6.9746)*	0.8308 (2.5514)*
(Exchange Rate Regime)^2	0.1061 (7.5249)*	-0.2404 (-2.5492)*
Trade Openness	0.1834 (3.9769)*	6.8417 (8.2829)*
GDP per capita	-0.3037 (-15.5392)*	0.3282 (8.0805)*
Government Expenditure to GDP ratio	0.0530 (8.1333)*	0.2762 (9.7347)*
R-squared	0.9481	0.4600

Table B.22
Simultaneous Equations (2SLS), ASEAN-5, 1984Q1-1996Q4

A. Dependent Variable: Gross Private Capital Flow (% of GDP)

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Constant	0.4502 (0.2572)	79.2279 (3.1803)*	3.4915 (1.4895)	17.8487 (0.9624)	-12.1446 (-1.415)
Change in Reserves	0.1357E-03 (0.3058)	0.4383E-03 (0.6504)	0.4267E-02 (1.9817)*	-0.0104 (-1.8791)	-0.3E-02 (-0.845)
Trade Openness	-0.4712 (-1.2556)	-1.8180 (-0.3580)	-6.4583 (-0.7815)	0.2027 (0.0326)	40.0119 (1.7495)
GDP per capita	81.5648 (7.0200)*	-14.2679 (-1.1672)	75.3728 (2.7971)*	13.3720 (3.2499)*	3.1794 (0.2644)
Government Budget Surplus Growth			-0.2591E-03 (-0.1482)	0.3642E-02 (0.8732)	-0.7E-03 (-0.455)
Government Expenditure to GDP ratio	0.0624 (0.3666)	-4.2447 (-3.0387)*			
R-squared	0.8517	0.3424	0.4877	0.3841	0.5312

B. Dependent Variable – Change in Reserves

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Constant	-860.785 (-1.1284)	-7479.71 (-2.1956)*	-919.240 (-0.1760)	-366.892 (-0.1758)	-1782.41 (-2.04)*
Gross Private Capital Flow (% of GDP)	-982.959 (-1.2972)	175.637 (1.7032)	127.550 (0.2586)	26.7670 (0.1893)	132.493 (0.3879)
Export Volatility	97.2843 (1.8230)	-1629.08 (-3.5923)*	-38.9248 (-0.3864)	-112.468 (-0.6394)	23.3502 (0.6796)
Interest Rate Differential	64.0701 (1.3164)	164.350 (1.5079)	28.0316 (0.2848)	237.793 (0.6548)	22.4445 (0.3727)
Foreign Currency Claims by BIS banks	0.0556 (1.0006)	0.3726 (1.6007)	-0.4288E-02 (-0.0142)	0.0172 (0.8770)	0.0699 (0.4693)
Trade Openness	-56.8197 (-0.1537)	9876.79 (2.5222)*	1300.43 (0.7907)	-122.676 (-0.1045)	7412.08 (1.5479)
GDP per capita	58521.6 (0.7196)	-16564.1 (-1.6627)	-6308.50 (-0.1098)	-191.312 (-0.1071)	-19495 (-0.555)
R-squared	0.3735	0.2950	0.2397	0.5001	0.3149

Table B.23
Simultaneous Equations (2SLS), ASEAN-5, 1997Q1-2004Q4

A. Dependent Variable – Gross Private Capital Flow (% of GDP)

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Constant	60.2951 (7.2092)*	25.5685 (1.8176)	-121.300 (-2.6001)*	-110.039 (-1.0271)	26.4112 (4.237)*
Change in Reserves	0.1128E-02 (0.8909)	0.3382E-02 (3.0410)*	0.0754 (2.3810)*	-0.601E-02 (-2.3112)*	-0.4E-03 (-0.723)
Trade Openness	-14.3957 (-3.1782)*	-13.3561 (-2.8873)*	109.423 (2.8984)*	31.0443 (1.9151)	-11.309 (-2.69)*
GDP per capita	-83.4190 (-3.8552)*	0.0961 (0.624E-02)	201.790 (3.2802)*	21.3642 (0.9825)	-3.1234 (-0.297)
Government Budget Surplus Growth			-0.0601 (-2.3003)*	0.0126 (0.8181)	0.3E-04 (0.5521)
Government Expenditure to GDP Ratio	-3.5225 (-5.7076)*	0.7240 (1.3221)			
R-squared	0.7833	0.7910	0.3550	0.2448	0.5982

B. Dependent Variable – Change in Reserves

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Constant	6944.06 (1.5164)	17351.3 (0.1764)	8195.53 (1.7799)	-36662.5 (-1.4682)	-46664.4 (-1.086)
Gross Private Capital Flow (% of GDP)	97.1268 (0.5682)	834.957 (0.3481)	-432.738 (-1.4662)	-164.389 (-1.0812)	1545.85 (1.1176)
Export Volatility	85.5622 (0.8105)	688.741 (0.3150)	71.6383 (1.4892)	-1062.16 (-1.9731)*	-25.1623 (-0.638)
Interest Rate Differential	15.1927 (0.3481)	-1048.52 (-0.2845)	-1507.62 (-1.4307)	-295.737 (-0.7080)	-258.252 (-1.280)
Foreign Currency Claims by BIS banks	-0.1693 (-1.7459)	0.1340 (0.4997)	0.1288 (0.6223)	0.0329 (0.5400)	-0.0246 (-0.421)
Trade Openness	1585.97 (0.5055)	-1630.74 (-0.1028)	-909.666 (-0.5683)	10032.5 (2.1795)*	18815.6 (0.9435)
GDP per capita	-14194.3 (-1.1745)	-33012.6 (-0.2622)	44213.2 (1.4839)	4169.37 (1.0213)	18731.7 (1.3194)
R-squared	0.2125	0.2635	0.1212	0.3270	0.3744

Table B.24
Simultaneous Equationes (2SLS), ASEAN-5, 1984Q1-1996Q4

A. Dependent Variable: Gross Private Capital Flow (% of GDP)

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Constant	2.4861 (0.7569)	81.5816 (3.2684)*	11.4400 (2.1343)*	30.1436 (1.5501)	-39.5500 (-5.10)*
Total Reserves minus Gold	0.2996E-03 (0.7499)	-0.99E-04 (-0.2654)	0.205E-02 (1.8468)	0.97E-03 (1.6601)	-0.4E-02 (-4.74)*
Trade Openness	-0.6308 (-1.4727)	-1.6788 (-0.3196)	-12.2820 (-1.4199)	9.9104 (1.3497)	-14.5456 (-1.363)
GDP per capita	16.3706 (0.1814)	-10.6838 (-0.5005)	-25.4981 (-0.3587)	-12.0203 (-1.1024)	445.247 (4.840)*
Government Budget Surplus Growth			-0.998E-03 (-0.5611)	0.383E-02 (0.9058)	-0.4E-02 (-2.60)*
Government Expenditure to GDP Ratio	-0.1112 (-0.4121)	-4.4457 (-3.2609)*			
R-squared	0.8531	0.3375	0.4825	0.3745	0.6780

B. Dependent Variable – Total Reserves minus Gold

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Constant	-4446.86 (-3.6387)*	-24120.7 (-3.4046)*	-12815.2 (-1.3022)	-1892.46 (-0.1909)	-9050.92 (-7.46)*
Gross Private Capital Flow (% of GDP)	3202.61 (2.6382)*	283.370 (1.3213)	-455.212 (-0.4899)	-80.4218 (-0.2466)	782.132 (1.6519)
Export Volatility	-91.6163 (-1.0717)	1309.47 (1.3885)	-245.219 (-1.2918)	-498.046 (-0.9189)	-90.852 (-1.907)
Interest Rate Differential	-193.054 (-2.4759)*	225.999 (0.9970)	95.0742 (0.5126)	-2329.97 (-2.5096)*	-53.8260 (-0.645)
Foreign Currency Claims by BIS banks	0.3061 (3.4382)*	1.3911 (2.8732)*	0.4614 (0.8128)	0.0437 (1.0808)	0.4298 (2.08)*
Trade Openness	2238.68 (3.7793)*	17550.2 (2.1550)*	6464.71 (2.0862)*	-11602.8 (-5.5649)	8722.06 (1.3139)
GDP per capita	-216912 (-1.6649)	-11900.4 (-0.5744)	121473 (1.1224)	18283.0 (5.2173)*	8714.51 (0.1790)
R-squared	0.9589	0.8671	0.8734	0.9875	0.9937

Table B.25
Simultaneous Equations (2SLS), ASEAN-5, 1997Q1-2004Q4

A. Dependent Variable – Gross Private Capital Flow (% of GDP)

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Constant	69.5632 (13.9168)*	-10.2180 (-0.5730)	-49.6316 (-2.4963)*	-89.7546 (-0.7675)	18.7596 (4.120)*
Total Reserves minus Gold	-0.1097E-02 (-4.0525)*	-0.195E-04 (-0.0696)	0.683E-02 (3.8132)*	-0.495E-02 (-0.3638)	-0.6E-03 (-3.42)*
Trade Openness	-16.9382 (-6.6616)*	-15.0756 (-2.8101)*	20.9559 (1.1283)	18.9524 (0.4981)	-14.165 (-5.13)*
GDP per capita	-18.2420 (0.7828)	40.9357 (1.6389)	-55.7515 (-0.9082)	30.1037 (1.2879)	56.5686 (2.817)*
Government Budget Surplus Growth			0.123E-02 (0.1738)	-0.103E-02 (-0.0629)	0.6E-04 (1.4087)
Government Expenditure to GDP Ratio	-2.1415 (-3.5576)*	1.0891 (1.7473)			
R-squared	0.8613	0.7195	0.5006	0.0998	0.7142

B. Dependent Variable – Total Reserves minus Gold

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Constant	29830.1 (5.2677)*	116695 (0.6095)	11188.8 (2.0010)*	5220.46 (0.1136)	-76934.9 (1.4706)
Gross Private Capital Flow (% of GDP)	174.709 (0.8265)	4839.27 (1.0364)	13.5860 (0.0379)	148.264 (0.5300)	1782.03 (1.0580)
Export Volatility	-137.624 (-1.0542)	3951.98 (0.9286)	-5.2066 (-0.0891)	-1915.63 (-1.9341)	-94.2398 (-1.96)*
Interest Rate Differential	-147.207 (-2.7273)*	-7888.08 (-1.0994)	-433.136 (-0.3385)	1245.54 (1.6208)	-485.837 (-1.98)*
Foreign Currency Claims by BIS banks	-0.2123 (-1.7707)	1.2029 (2.3036)*	-0.2198 (-0.8749)	-0.0905 (1.6208)	0.1162 (1.634)
Trade Openness	886.164 (0.2284)	-16606.3 (-0.5375)	1492.56 (0.7679)	25930.8 (3.0618)*	27604.9 (1.1367)
GDP per capita	37232.2 (2.4914)*	-176941 (-0.7220)	21104.6 (0.5833)	1401.26 (0.1866)	115102 (6.657)*
R-squared	0.9257	0.8095	0.7816	0.8887	0.7768

Table B.26
Simultaneous Equations (2SLS), MERCOSUR+Chile, 1984Q1-1994Q4

A. Dependent Variable – Gross Private Capital Flow (% of GDP)

	Argentina	Brazil	Chile	Paraguay	Uruguay
Constant	6.1880 (6.31.51)*	6.7518 (3.0822)*	-0.1855 (-0.0343)	-28.8180 (-3.9646)*	14.8740 (17.76)*
Change in Reserves	0.2744E-03 (0.1390)	0.8877E-03 (2.0739)*	0.3189E-02 (0.6965)	-0.0246 (-4.8179)*	0.2E-02 (0.1329)
Trade Openness	0.3017E-04 (0.3399)	-0.1257E-08 (-0.5124)	16.2472 (5.4500)*	2.1413 (4.1937)*	-0.1484 (-6.37)*
GDP per capita	1.2071 (4.0646)	29.9353 (8.0390)*	17.9704 (2.8268)*	26.9196 (4.6058)*	-20.770 (-6.27)*
Government Budget Surplus Growth	0.2043E-03				0.2E-03 (0.1989)
Government Expenditure to GDP Ratio		-0.2016 (-1.2629)	-0.8412 (-1.3849)	4.5373 (4.2967)*	
R-squared	0.35.95	0.6722	0.5257	0.4910	0.6110

B. Dependent Variable – Change in Reserves 1984Q1-1994Q4

	Argentina	Brazil	Chile	Paraguay	Uruguay
Constant	-35214.1 (-0.5294)	12495.6 (1.4261)	-256.037 (-0.3267)	-944.140 (-3.0670)*	777.825 (0.3104)
Gross Private Capital Flow (% of GDP)	839.574 (0.5264)	-626.082 (-0.5285)	31.7320 (0.7309)	34.2633 (1.6057)	-127.05 (-0.494)
Export Volatility	9.1826 (0.7232)	-2.1374 (-1.0034)	1.6161 (1.6359)	1.8787 (2.4501)*	1.9130 (0.6437)
Interest Rate Differential	0.8449E-06 (0.0212)	-0.0533 (-1.0591)	3.8033 (0.5736)		-0.9763 (-0.207)
Foreign Currency Claims by BIS banks	0.9289 (0.5167)	-0.1142 (-1.7394)	-0.1661E-02 (-0.0423)	0.7290 (2.5912)*	0.4457 (1.0183)
Trade Openness	0.1109 (0.5801)	0.1234E-05 (0.5598)	-288.133 (-0.4389)	77.8480 (3.3982)*	-15.888 (-0.470)
GDP per capita	-1222.49 (-0.5032)	12005 (0.3840)	192.378 (0.1758)	690.799 (2.3915)*	-3347.9 (-0.564)
R-squared	0.1682	0.2077	0.2953	0.4000	0.2641

Table B.27
Simultaneous Equations (2SLS), MERCOSUR+Chile, 1995Q1-2004Q4

A. Dependent Variable – Gross Private Capital Flow (% of GDP)

	Argentina	Brazil	Chile	Paraguay	Uruguay
Constant	56.0099 (3.2123)*	15.4624 (0.9760)	133.078 (3.4587)*	16.2059 (2.1603)*	41.2868 (1.2293)
Change in Reserves	-0.2766E-02 (-2.4452)*	-0.4804E-03 (-2.6030)*	-0.0164 (-4.6395)*	-0.0124 (-0.8626)	-0.0488 (-3.66)*
Trade Openness	-890.515 (-5.0915)	-48.0351 (-3.5655)*	-65.6231 (-3.3507)*	-4.6483 (-1.2931)	-104.641 (-2.11)*
GDP per capita	-0.0720 (-0.0538)	-9.8687 (-3.9846)*	10.5388 (1.6664)	24.1211 (1.8423)	13.3665 (1.0081)
Government Budget Surplus Growth	-0.2859E-02 (-1.4513)				-0.4E-02 (-0.243)
Government Expenditure to GDP ratio		0.6824 (0.9658)	-7.8236 (-2.4814)*	-1.5110 (-3.4197)*	
R-squared	0.7645	0.4777	0.5106	0.5718	0.6816

B. Dependent Variable – Change in Reserves 1995Q1-2004Q4

	Argentina	Brazil	Chile	Paraguay	Uruguay
Constant	-2985.96 (-0.2178)	7014.10 (0.2159)	-1615.51 (-0.3233)	-600.445 (-1.8566)	1722.94 (1.9049)
Gross Private Capital Flow (% of GDP)	-14.2782 (-0.0651)	346.320 (0.2695)	120.495 (0.6962)	10.0427 (0.6406)	-9.3125 (-0.412)
Export Volatility	-1.7234 (-1.3447)	2.5364 (1.1070)	-0.3765 (-0.4950)	0.1979 (0.3079)	0.7889 (0.2767)
Interest Rate Differential	-47.9280 (-0.8848)	-26.9664 (-0.1526)	55.7368 (0.5496)		-18.375 (-0.301)
Foreign Currency Claims by BIS banks	-0.0202 (-0.6008)	-0.2033 (-0.7361)	-0.2250 (-1.0144)	0.3142 (1.4360)	-0.2293 (-1.267)
Trade Openness	45816.1 (0.2630)	15667.8 (0.2104)	638.357 (0.2242)	45.8317 (0.2748)	-725.90 (-0.248)
GDP per capita	480.528 (1.1478)	-3904.18 (-0.2623)	2176.00 (0.7403)	605.602 (0.8263)	42.2433 (0.1501)
R-squared	0.4688	0.0719	0.1144	0.1278	0.5479

Table B.28
Simultaneous Equations (2SLS), MERCOSUR+Chile, 1984Q1-1994Q4

A. Dependent Variable – Gross Private Capital Flow (% of GDP)

	Argentina	Brazil	Chile	Paraguay	Uruguay
Constant	12.2374 (5.3372)*	4.2190 (2.5699)*	-33.5081 (-1.7071)	-16.3367 (-1.9042)	15.5922 (4.931)*
Total Reserves minus Gold	-0.2356E-02 (-2.7997)*	0.2234E-03 (2.2983)*	-0.946E-02 (-1.7767)	-0.641E-03 (-0.0699)	-0.2E-02 (-0.234)
Trade Openness	-0.4704E-04 (-0.5500)	0.1069E-08 (0.5587)	19.8928 (6.4459)*	0.9058 (0.6898)	-0.1538 (-4.63)*
GDP per capita	4.5732 (3.7466)*	10.8389 (1.5193)	171.968 (2.0288)*	11.5504 (0.4460)	-19.556 (-3.79)*
Government Budget Deficit Growth	0.2872E-03 (0.2419)				0.5E-04 (0.0414)
Government Expenditure to GDP Ratio		-0.1591 (-1.1530)	1.5456 (1.0122)	3.1508 (2.4262)*	
R-squared	0.4664	0.6795	0.5971	0.1881	0.6114

B. Dependent Variable – Total Reserves minus Gold

	Argentina	Brazil	Chile	Paraguay	Uruguay
Constant	-20973.2 (-0.2224)	30639.0 (1.2565)	-3724.60 (-4.2192)*	238.804 (0.3749)	9391.18 (2.356)*
Gross Private Capital Flow (% of GDP)	417.679 (0.1856)	807.998 (0.2451)	-144.052 (-2.9460)*	-14.8817 (-0.3371)	-898.69 (-2.20)*
Export Volatility	8.6957 (0.4853)	-5.5283 (-0.9325)	-0.9647 (-0.8670)	-1.3549 (-0.8540)	8.7088 (1.843)
Interest Rate Differential	-0.312E-04 (-0.5547)	-0.0402 (-0.2867)	9.3707 (1.2548)		4.5553 (0.6080)
Foreign Currency Claims by BIS banks	0.6169 (0.2432)	-0.2926 (-1.6019)	0.0831 (1.8764)	0.1224 (0.2394)	1.6055 (2.306)
Trade Openness	0.0584 (0.2167)	-0.733E-05 (-1.1941)	3106.60 (4.2016)*	132.993 (2.8059)*	-123.871 (-2.31)*
GDP per capita	714.356 (0.2084)	48553.1 (0.5581)	19649.3 (15.9421)*	3071.79 (5.1398)*	-20626.2 (-2.19)*
R-squared	0.9100	0.6779	0.9837	0.4864	0.8081

Table B.29
Simultaneous Equations (2SLS), MERCOSUR+Chile, 1995Q1-2004Q4

A. Dependent Variable – Gross Private Capital Flow (% of GDP)

	Argentina	Brazil	Chile	Paraguay	Uruguay
Constant	87.2182 (7.9438)*	-11.4893 (-0.5012)	1.3965 (0.0389)	17.5940 (2.3767)*	120.693 (6.807)*
Total Reserves minus Gold	-0.4662E-03 (-1.4269)	0.1968E-03 (2.3628)*	0.751E-02 (4.3726)*	-0.3945E-02 (-0.9166)	-0.0301 (-9.00)*
Trade Openness	-933.646 (-4.2069)*	-71.8735 (-4.9238)*	-90.4738 (-3.9916)*	-2.2022 (-0.4522)	-187.101 (-7.07)*
GDP per capita	-2.5458 (-3.1821)*	-13.7223 (-5.1031)*	-17.2358 (-2.4892)*	20.9991 (1.8713)	11.5097 (1.5223)
Government Budget Surplus Growth	-0.3965E-02 (-1.9338)				-0.0158 (-1.477)
Government Expenditure to GDP Ratio		2.0460 (1.9217)	-2.1483 (-0.7700)	-12870 (-3.3233)*	
R-squared	0.7355	0.4624	0.4889	0.5729	0.8670

B. Dependent Variable – Total Reserves minus Gold 1995Q1-2004Q4

	Argentina	Brazil	Chile	Paraguay	Uruguay
Constant	-22094.8 (-1.5669)	3744.11 (0.1018)	8303.80 (1.2475)	-705.276 (-1.8221)	2804.87 (1.636)
Gross Private Capital Flow (% of GDP)	173.106 (0.7672)	-3214.90 (-2.2098)*	-55.8614 (-0.2423)	-10.4957 (-0.5594)	26.875 (0.6268)
Export Volatility	1.7292 (1.3118)	7.4718 (2.8804)*	0.9657 (0.9532)	0.7220 (0.9385)	3.4217 (0.6331)
Interest Rate Differential	-105.142 (-1.8873)	-203.530 (-1.0171)	-10.4016 (-0.0770)		-136.05 (-1.174)
Foreign Currency Claims by BIS banks	0.3071 (8.8736)*	1.0621 (3.3974)*	0.2130 (0.7208)	0.8898 (3.3972)*	-0.2302 (-0.671)
Trade Openness	171912.0 (0.9594)	22826.5 (0.2708)	6412.35 (1.6909)	557.367 (2.7922)*	2566.86 (0.4631)
GDP per capita	1848.89 (4.2941)*	-6078.26 (-0.3608)	361.339 (0.0923)	1756.99 (2.0030)*	406.164 (0.7611)
R-squared	0.9157	0.4820	0.3457	0.5257	0.6877

ABSTRACT

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Exchange Rate Regime Choice and the External Sector

Dissertation directed by Bartholomew J. Moore, PhD

This study investigates the choice of de facto exchange rate regime and the consequences for some external sector variables such as the change in international reserves, the total stock of international reserves, foreign direct investment, and foreign capital flows. The issue of contractionary devaluation is also addressed and the effect of the exchange rate regime on the domestic output gap is examined. Political economy and optimum currency area theory guide the empirical work. The Simultaneous Equations with Limited Dependent Variable model is the main econometric tool I use to study the experiences of five Southeast Asian nations and five Latin American nations over the period 1984-2004. Other techniques employed include the Seemingly Unrelated Regressions model, a model with interaction terms, and a test of non-linearity using dummy variables. Empirical results suggest that there are links between the exchange rate regime and the macroeconomic variables considered. It is also shown that the type of exchange rate regime selected has implications for the degree of capital controls.

VITA

Noel P. De Guzman finished his Bachelor of Arts (Major in Economics) at the Ateneo de Manila University, Philippines in 1984. He then took masters classes in economics at Ateneo while teaching at the same university. After being offered a scholarship, he eventually decided to pursue a Masters of Social Science (Major in Economics) degree at the National University of Singapore, which was completed in 1995. Upon returning to Ateneo, he continued his teaching as a tenured Assistant Professor and was appointed Associate Chairperson in 1998 before leaving for Fordham University to pursue doctoral studies in economics in1999 as a Millar scholar. At Fordham, he was inducted into Omicron Delta Epsilon and Phi Kappa Phi, and was awarded the Rev. William T. Hogan, S.J. Teaching Award for excellence in teaching in 2005.